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NATURAL RESOURCE STUDY

PIKES PEAK / POINT ANN STATE PARK

CLAYTON COUNTY, IOWA

GEOLOGY, VASCULAR PLANTS AND VERTEBRATES

REPORT TITLE

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NATURAL RESOURCES INVENTORY

of

PIKES PEAK/POINT ANN STATE PARK

CLAYTON COUNTY, IOWA

by

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Iowa Conservation Commission

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INTRODUCTION

On June 17, 1673 Joliet and Marquette, apparently the first white men to see Iowa, floated down the Wisconsin River and out onto the broad expanse of the Mississippi. Marquette noted "a large chain of very high mountains" and that the Mississippi (Mischosipi) was "divided by islands." According to his journal, Marquette was filled with an inexpressible joy at the beauty of the scenery about him. On September 5, 1805 another explorer, Zebulon Pike, ascended the "very high mountains" which bear his name.

Today, Pikes Peak/Point Ann State Park is situated on the crest of Marquette's "mountains" nearly 500 feet above the confluence of the Wisconsin and Mississippi Rivers and the islands that Marquette observed. The ineffable beauty of the area remains, perhaps enhanced by the perspective from the bluff.

The extremes in relief and the craggy topography, unique to this part of the state, have earned it the name "Switzerland of Iowa." While most of Iowa is covered by a thick mantle of glacial debris, upon which the topography is formed, the "driftless region" was formed by the erosion of bedrock. Prior (1976, p. 28) refers to this area as "the only region in Iowa where bedrock so completely controls the surface form of the land."

The Mississippi River valley is approximately three miles wide in this vicinity. The main channel crowds the Iowa side of the valley, leaving a central portion of islands and sloughs. On the Wisconsin side there is a fairly broad floodplain which is bordered to the east by steep

cliffs that mirror those on the Iowa side. The town of Prairie du Chien, Wisconsin is situated on this floodplain approximately two miles north of the Mississippi-Wisconsin confluence, with some urban development extending south to encompass portions of a terrace on the north bank of the Wisconsin River. Directly across the river at the foot of the Prairie du Chien bridge is the town of Marquette, built on the floodplain of Bloody Run, a minor tributary of the Mississippi. Approximately one mile south of Marquette is the town of McGregor which, like Marquette, is developed on the floodplain of a tributary of the Mississippi. However this stream is much narrower and steeper, crowding McGregor into a northeast-trending "V" which opens only at the very mouth of the stream. These cramped quarters have given the nickname "pocket city" to the town.

The bluffs at Point Ann directly overlook the town from the south and form a part of its confining perimeter. From Point Ann a jeep/hiking trail extends south to the parking lot of Pikes Peak/Point Ann State Park. The heights of the park is formed from rocks which are, with the exception of some in northwest Iowa, the oldest in the state. Their exposure and dissection by running water have produced some of Iowa's most beautiful scenery. Lee's (1933, p. 12) description of the area is difficult to improve upon:

> No spot in northeast Iowa exceeds in beauty of form or delight of outlook the rugged mound known as Pike's hill...Not only does this hill afford one of the highest points of vantage along the entire course of the valley, but, in addition, the view upstream and down from the edge of the cliff is probably unprecedented in its sweep ...on the north side [of the park] towards McGregor a deep gash cleaves the valley to its base and adds another bit of scenic

beauty--a mossy, shady gorge known as pictured rocks glen, named for the fact that here a great bed of soft rock, the St. Peter sandstone, is tinted by a whole series of shades--reds and browns and purples and oranges and yellows...probably no spot in Iowa excels this one in the range of its geologic formations and history or in the beauty of the forms into which nature has carved the resistant limestone and yielding sandstone. Trickling brook and swirling waterfall, quiet pool and dripping spring, each adds its share to the picture.

which are common in the surrounding areas. (This absence of glacial features has enhanced the plain-like appearance of the "driftless" skyline in contrast to the rolling till-covered surrounding areas.) Subsequent investigations disclosed isolated patches of glacial till, deposited during the earliest glacial advances, but no evidence of subsequent invasions. Thus while the areas outside this region were repeatedly molded and modified by glacial action, the driftless area was cut by streams, which removed most of the early glacial debris and left sharp scars in the underlying bedrock. The work of these streams was, however, strongly influenced by glacial activity outside the area.

During times of maximum glacial development, sea levels were lowered because of loss of water to ice. At these times the streams with large volumes of seasonal melt water cut much deeper into this region, forming relatively straight, steep-walled valleys as much as 150 feet lower than the present levels. With the retreat of the glaciers and concomitant rising of the sea level, the "drowned" rivers would fill their valleys with glacial debris in an effort to readjust to their lowered gradients. The terrace above the Wisconsin River represents a vestige of one such depositional adjustment and the present level of the Mississippi represents the latest adjustment to the last retreat of the glaciers some 7,000 years ago. The resulting back-filling has produced the broad flat river valley, the floodplain on which Prairie du Chien is built, and the filling of the channels and mouths of the local tributaries, providing level spaces for the towns of Marquette and McGregor.

These massive deposits are a rich source for sand and gravel and for water which fills the interstices of these deposits. However, they also represent engineering problems for bridge and dam builders who must penetrate the 150 feet of debris to reach bedrock below the Mississippi channel.

Because of the geologically short interval since the last glaciation, the streams of the area have not yet been able to reduce the slopes girding the river system and the sharp steep relief remains to capture the eye and provoke the imagination.

The floodplain of the Mississippi-Wisconsin displays many interesting stream features. The channel itself hugs the Iowa side of its valley. This position is dictated by the effects of the Coriolis force which causes fluids to be deflected to their right (in the northern hemisphere) from their direction of flow.

The central portion of the valley displays a series of curved islands and oxbows (horseshoe bends), produced by previous meanderings of the channel. At 'normal' river level these old channels or sloughs are separated by arcuate islands in the dissected floodplain. During flood, most of the central portion is under water with only the tops of the trees exposed as evidence of the islands' presence. During times of low water the sloughs exhibit a central channel and shoal or exposed banks on either side with lower, often marshy areas beyond. These shoals are natural levees consisting of silts and clays deposited by the stream adjacent to the channel when it leaves its banks during flood.

A floodplain of varying widths has developed in the east side of the valley. This feature is also developed by deposition of river materials when the area is flooded. Such flooding was considered beneficial to early farming settlers who counted on the new muds to maintain soil fertility, but the use of floodplains as sites for urban development has produced many problems and occasional disasters.

Park Geology

Stratigraphy

Pikes Peak State Park is located on sedimentary rocks of Late Cambrian and Early and Middle Ordovician and Pleistocene ages. These rocks represent a time span ranging from approximately 510 million years before the present for the earliest Cambrian to about one million years before present for the latest Pleistocene materials.

The lithologies present include marine sandstones, shales, and carbonates (limestones and dolomites) as well as glacial tills and loess. The sediments exposed in the Park totals some 530 feet in thickness (see fig. 1). The beds dip gently to the southwest. The following is a general description of the units in descending order, as seen on the Pikes Peak trails. The Prairie du Chien formation is partly exposed in the Park; the Jordan sandstone is seen only at Point Ann.

The Pleistocene.--The bedrock on the bluff crests is veneered by varying thicknesses of glacial till and loess. The till of probable Nebraskan age (oldest Pleistocene) (Prior, 1976, p. 28) is widely scattered and outcrops

are rare. The loess is presumed to be of Wisconsin age (youngest Pleistocene) (Ruhe, 1969). This fine-grained material is the most common mantle material overlying Ordovician-aged rock.

The Galena Formation.--It consists of three members, but only the basal, Prosser, member is present in the park area. It is a medium bedded, light gray, fine-grained dolomite with medium to thin bedded light gray to light brownish gray, fine-grained limestone. The unit is cherty and contains Receptaculites. Its thickness in the park is 100 feet (Steinhilber et al., 1961).

The Decorah Formation.--Like the Galena it consists of three members: the Ion limestone, Guttenberg limestone and Specht's Ferry shale.

The Ion member is a thin-bedded, nodular, light yellow brown, fine-grained limestone. The limestone beds are undulatory and separated by greenish gray shale partings. It is very fossiliferous. The Ion is 15 feet thick in the Park.

The Guttenberg member is a thin-bedded, gray to brown, very fine to medium grained limestone. Like the Ion, it is characterized by undulating carbonate beds with shaley partings. These shales are brown in color, however. A distinctive characteristic of this unit, sometimes called the "oil rock" is the petroliferous smell given off on fresh break. The Guttenberg limestone is fossiliferous and cherty. It is 10 feet thick in the Park.

The Specht's Ferry member is a dark greenish gray shale interbedded with thin-bedded, greenish gray, fine-grained limestone. It is

phosphatic at its top and contains a bentonite bed near its base. The unit is 10 feet thick.

The Platteville Formation.--The Platteville consists of three members: the McGregor limestone, the Pecatonica dolomite, and the Glenwood shale.

The McGregor member is a thin-bedded, gray to bluish gray, very fine- to medium-grained limestone. It is fossiliferous and contains gray shale beds. The unit is 25 feet thick in the park.

The Pecatonica member is a medium- to thick-bedded, brownish gray, fine-medium grained dolomite. This unit is sandy at its base and contains phosphate pellets. It is sparsely fossiliferous. The Pecatonica is 16 feet in thickness.

The Glenwood member is a bluish-gray to green shale, pyritic, and sandy and phosphatic at its top. It is five feet thick.

The St. Peter Sandstone.--The St. Peter sandstone varies from massive to thinly cross-bedded. It consists of fine to coarse quartz sand, ranging in color from pure white to shades of green, brown, red and purple. The grains are well rounded and frosted. The unit contains scattered lenses of laminated dolomitic shales at its base. Because it was deposited on a high relief, erosional surface of the Prairie du Chien it varies considerably in thickness. Trowbridge (1917) measured it along the trails in the Park and obtained thicknesses of 123, 178 and 223 feet.

Prairie du Chien group.--The Prairie du Chien group is presently divided into two formations, the Shakopee formation and the Oneota formation.

The Shakopee formation consists of dolomites, cherty oolitic dolomites, and sandstone. The dolomites range from thin-bedded to massive, reef-like units and are fine grained to granular in texture. The upper portions are highly brecciated. Some dolomites contain cherty lenses and nodules, certain of which contain silicified oolites. The sandstones are fine to medium grained. All lithologies range from white to light yellow brown. The Shakopee is 37 feet thick in the Park.

The Oneota formation is a thin- to medium-bedded, very fine-grained to granular, light gray to light yellow brown dolomite. It becomes sandy and calcareous at its base and contains white chert and oolites. The unit is 190 feet thick in the Park.

The Jordan Sandstone.--The Jordan formation is a thin-bedded to thickly cross-bedded, fine- to coarse-grained, quartzrose sandstone. The grains are well rounded and frosted and the unit varies in color from white to light yellow brown. The total Jordan is over 1,600 feet.

Geologic History

The repetitious sequence in lithologies indicates a cyclic sedimentary history. The sequence, from sandstone through shales to carbonates, is termed a 'fining-upward sequence' (a reduction in grain size upward). Such a sequence is typical of marine encroachment and is caused by a reduction in average energy in the depositional environments and/or a

retreat of a source for clastic sediments as the waters deepen. The surf zone represents a high energy environment where wave action rolls, abrades, and sorts whatever materials are available. The coarsest materials are left behind and the finer debris is transported to deeper water where it settles below the wave base onto a relatively quiet bottom. Organisms are active in both of these zones. Their presence is rarely recorded in the beach zone where rock and mineral fragments abrade and destroy hard parts. But in the intermediate depths, where wave action is reduced and finer debris settle, shells and hard parts are often well preserved and abundant. In areas further from the shoreline, often in deeper water but not necessarily so, even fine shore-derived debris is rare or lacking and the shells of organisms, or the fragments from their hard parts, constitute the major or only sediment deposited. These carbonate deposits, although nearly exclusively organic in nature, may not appear fossiliferous because of the destruction of the shells and hard parts by abrasion or solution.

The beginning of the first cycle of marine encroachment and retreat is represented by the Jordan sandstone. Although it is uniform in composition (quartz), it varies widely in its bedding characteristics and less so in its texture and sorting. In some outcrops it is thickly cross bedded and well sorted suggesting beach, or near beach, deposition. In other areas it exhibits thin, tabular cross bedding with the beds dipping in opposite directions indicating deposition in conditions of alternating current directions as with tidal exchange. The Jordan, then,

represents deposition in strand-line environments--beaches, subaqueous dunes, and tidal channels. With continuing encroachment, the strandline moved further north and deeper, quieter waters covered the area. This change is marked by the upper layers of the Jordan consisting of alternating beds of fine sand and shales which contain increasing amounts of carbonate.

The retreat of the shore line and the reduction in the volume of continental debris during Prairie du Chien time resulted in the deposition of the Oneota dolomite which ranges from a dolomitic sand at its base through shales to dolomite at its top. This unit contains much chert. The origins of the chert are problematic; it has been attributed to radiolarians, diatoms, and sponges (Pettijohn, 1975, p. 403) and to algae (Kapp and Willis, 1974 in Myers et al., p. 66). In any case, its close association with oolites indicates deposition in warm, shallow, wave-agitated environments. It has been suggested (Kapp and Willis, p. 66 in Myers et al.) that the unit developed in an offshore interreef and reef bank zone.

Retreat of the seas after deposition of the Oneota allowed a period of exposure and erosion of the unit as is indicated by an angular unconformity between the Oneota and Shakopee.

The seas then re-advanced, producing a 'second cycle' strand-line deposit, the new Richmond sandstone, the lower member of the Shakopee formation. As with the Jordan, it is locally a well-sorted, cross-bedded sandstone and a dolomitic sandstone. It also contains some oolitic sandstone

beds.

The overlying Willow River member of the Shakopee is a dolomite similar in overall lithology to its first cycle analog, the Oneota, including reef-like beds at its base, and was presumably deposited in a similar marine off-shore environment. Another sea retreat followed and this unit was exposed to a much longer period of erosion. The high relief on its upper surface and the abundance of brecciated beds indicate both surface erosion and subsurface solution with extensive cavern formation and attendant collapse.

The third marine advance is marked by the deposition of the St. Peter sandstone where basal units filled the underlying irregularities. The St. Peter is an analog to the Jordan, is considered to be a shore and/or near-shore deposit.

As with previous on-lap cycles, the northward advance of the beach environment through the area was followed by a progression of off-shore environments and their characteristic sediments. The overlying Platteville formation displays once more the fining-upward sequence of sandy shales through shales to carbonates--indicative of this progression.

The Decorah formation, with its increase in shale, has been variously interpreted as indicating a shoaling and closer proximity to a land source for the muds and as a deepening with the muds having bypassed the near shore environment (Witzbe, 1979). I favor the shallow water, near shore interpretation because of the undulating limestone beds and abundant fossils which I feel indicate a shallow wave-influenced

environment with attendant high biologic activity and occasional incursions of muds from the shore area.

The conditions which influenced deposition of the Decorah, whatever they were, changed during Galena time. The basal Galena is a pure limestone lacking the muds so much in evidence in the Decorah. This unit is a very extensive and uniform one, suggesting deposition in a basin under constant sedimentary conditions and the lack of any clastic source.

Post Ordovician erosion has removed younger marine deposits. The material capping the lower Galena is continental in origin, the result of glacial and glacial-eolian deposition. During the Pleistocene the northern portion of the United States experienced extensive and repeated glaciation. The Pikes Peak area was, apparently, invaded only once, by the earliest (Nebraskan) ice masses. However, the Nebraskan till is covered by loess (a wind-transported material derived from glacial outwash) which has been interpreted as Wisconsin (latest) Pleistocene. Because post-Nebraskan glaciers did not reach this area, fluvial erosion removed most of the glacial debris and dissected the underlying bedrock. This stream-developed topography characterizes the region.

Park Trails

Both Point Ann and Pikes Peak are traversed by a series of hiking trails.

Point Ann has a loop trail which leads from the parking area north to the bluffs which overlook the Mississippi and the town of McGregor,

and west and south to connect with a five-mile jeep/hiking trail to Pike's Peak.

Point Ann's trails traverse several botanic environments and should be of particular interest to the biologist. Rock outcrops are, however, rare. The Jordan sandstone is exposed in the northeast corner of the Park along the river road which leads to the parking area. This is the only exposure of the Jordan in the park. The Prairie du Chien formation has scattered outcrops which can be seen from the trails. Maximum thicknesses of ten to twenty-five feet are all that can be seen, as ledges near the crest of the park, and contacts with sub- or superjacent units are lacking. The St. Peter sandstone is exposed along the trail leading to Pike's Peak, but it, too, is a very limited outcrop without contacts.

Although not seen in outcrop, pieces of chert and silicified oolites attributed to the Prairie du Chien are found in float along the trail.

If Point Ann is the biologists' park, Pikes Peak belongs to the geologist. Its looped trail leads from the picnic area on the crest of the bluff to the bottom of Pictured Rocks Glen through a series of overlooks and viewpoints. These range from spectacular views of the Mississippi to waterfalls and cascades and outcrops of the rock units which form the bluffs. The visitor can admire the physiographic development of the park area and its environs or study the lithology of the country rock and its included fossils. As such it is almost a classroom/laboratory for the geologist.

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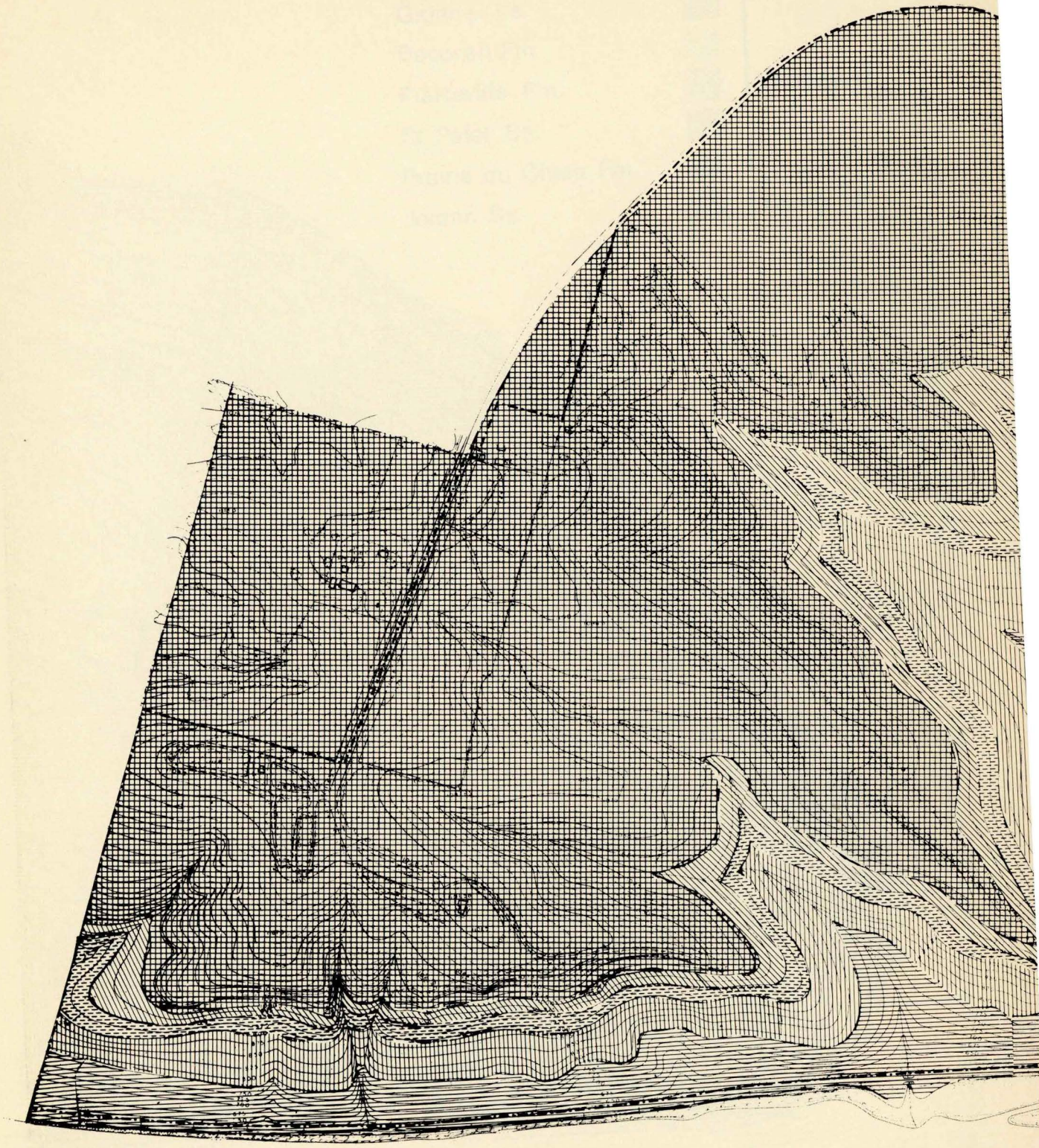
Figure 1b



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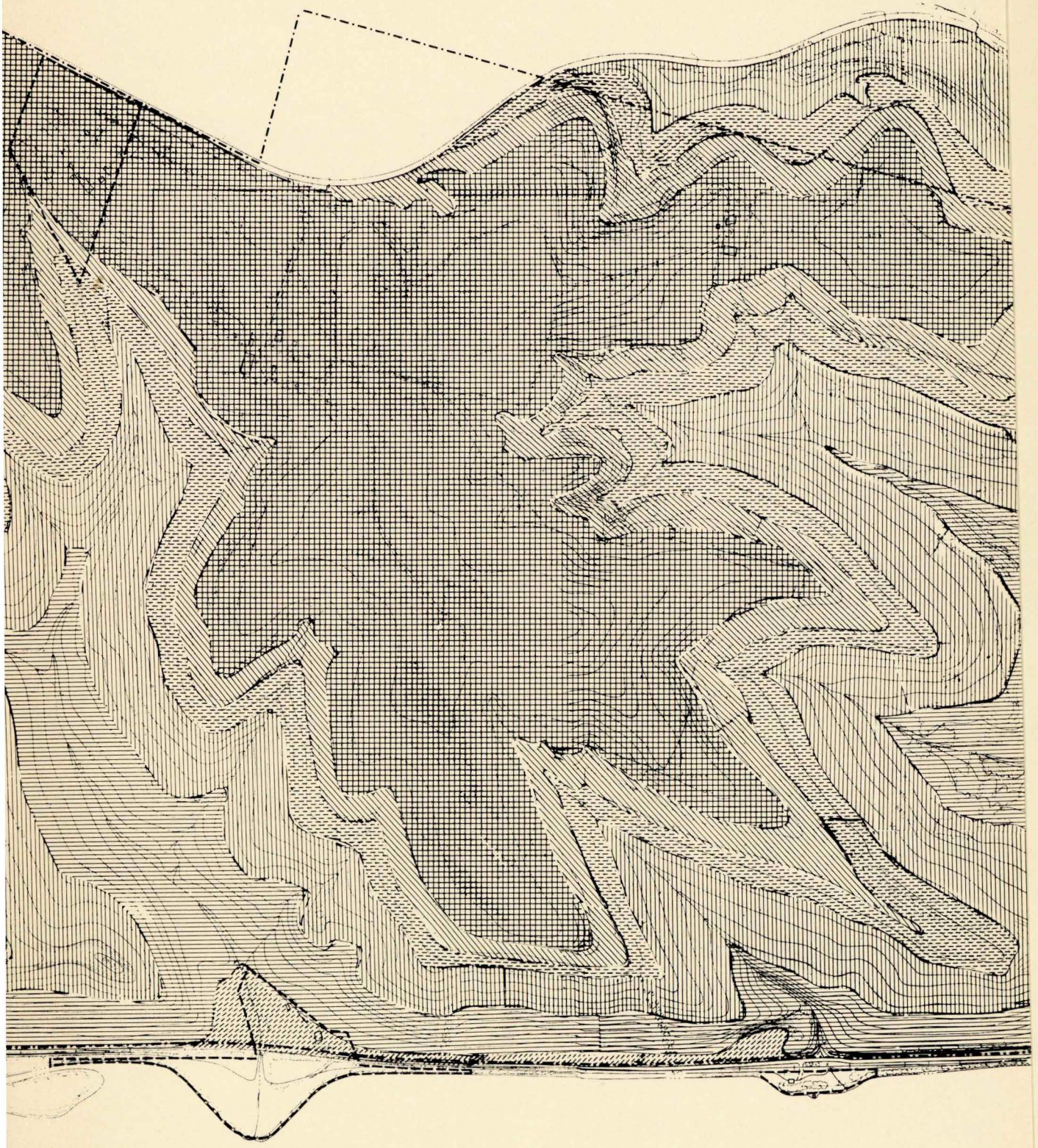

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Prepared by: Eugene Hinman

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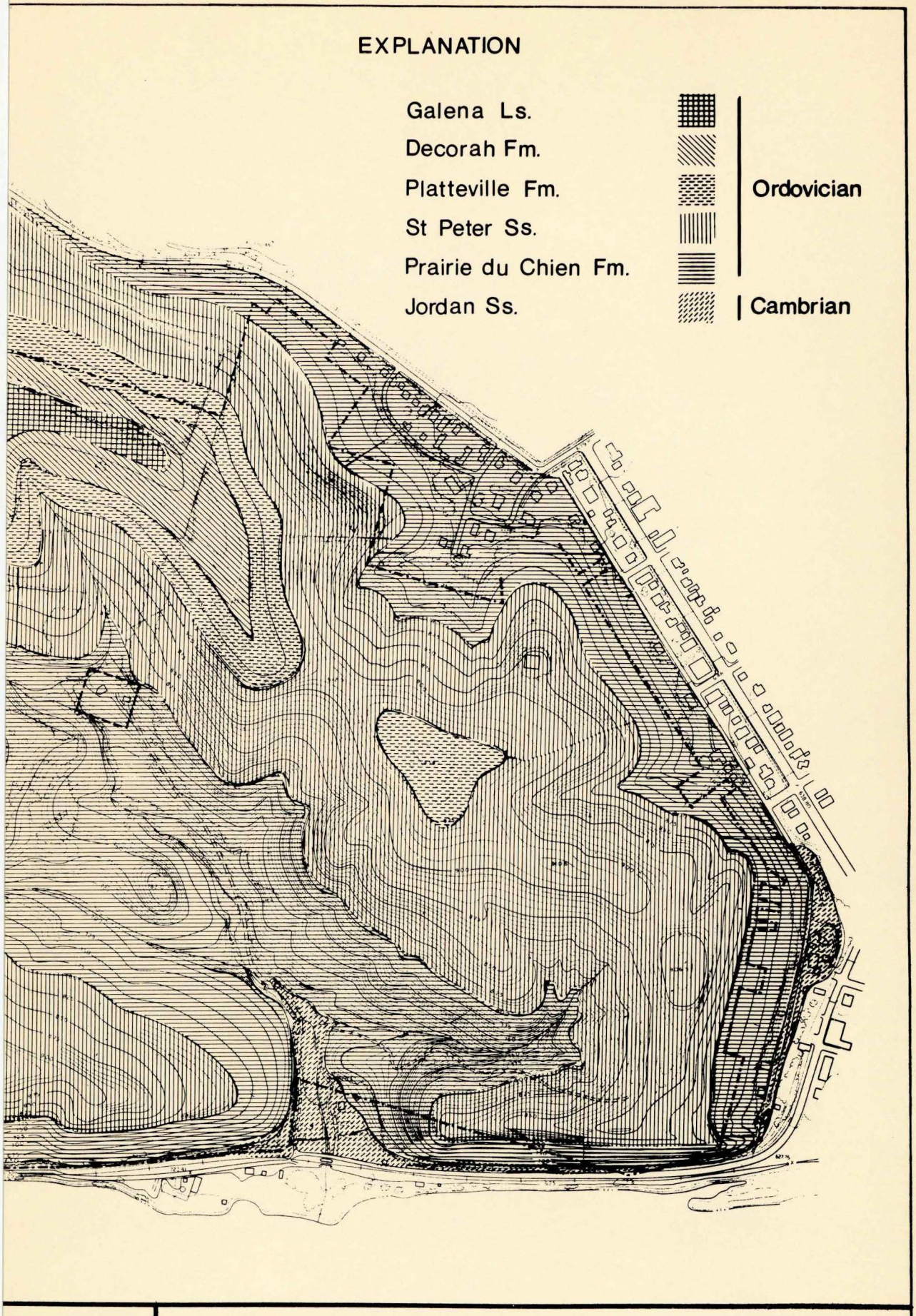

GEOLOGIC MAP

The following is a detailed description of the Pikes Peak trail system and a general description of the Pikes Peak to Point Ann and Point Ann trails.

Pikes Peak Loop.--The trail begins at the north edge of the picnic area in the vicinity of the Bear Mound./1 The trail leads north from here past a second, conical, mound. The trail is through Wisconsin loess and scattered outcrops of the Galena formation. Within approximately 75 feet of an overlook at the northern point of the bluff, the Galena is continuously exposed to form a series of irregular steps.

The Galena is a fine-grained light yellow to gray limestone which weathers to a knobby pitted surface. Individual beds are 2-6 inches thick, with the steps formed by the intersection of bedding planes and near-vertical joints. This unit is sparsely fossiliferous. None were observed in the trail, but one specimen of Receptaculites oweni was found in this unit along the five-mile trail to Point Ann.

At the overlook on the point the trail branches, with one segment proceeding northward beginning a steep descent; the other leads westward over a gentler slope./2

Proceeding northward over the Galena /3 the visitor encounters a series of natural steps, ranging from six to 24 inches in height, over a knobby, cream-colored outcrop. The base of the Galena is marked by a two and one-half foot ledge directly underlain by the Ion member of the

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/ This symbol represents points of interest which are further explained under Recommendations in this report.

Decorah formation./4a

The Ion is yellow-brown in color, weathering to gray, with undulating bedding planes formed in its thin limestone beds. These beds are separated by green shale partings. Because of its thin bedding and shale partings, the unit tends to break down more readily than the overlying Galena and produces a debris-littered trail. Despite the thin bedding, the trail through the unit consists of a series of one-two foot high bedrock steps. The basal contact of the Ion with the Guttenberg /b is picked at a color change. The top of the Guttenberg is marked by a series of thin brown limestone beds with brown shale partings. The middle portion of the unit is covered along the trail but about six feet of the lower portion of the unit is exposed. The basal three feet forms a single high step to the next unit. Both the Ion and Guttenberg are locally fossiliferous. Brachiopod-covered slaps of these units can be seen in and adjacent to the trail (see Fossil Faunal List, Appendix 1).

Beneath the Guttenberg is the Specht's Ferry member /c of the Decorah. This green shale unit is poorly exposed in scattered outcrops adjacent to the trail. Because of its rapid weathering and erosion, the steep slopes which marked the previous units are replaced by a much gentler slope. Despite its inconspicuous outcrop, the Specht's Ferry exerts an important control over the park and its trails. Because of its impervious nature, circulating underground water cannot penetrate this horizon and is forced to move along its surface, producing springs and seeps where it outcrops.

The next unit exposed down the trail is the McGregor limestone /5d member of the Platteville formation. It consists of thin irregular limestone beds gray to blue-gray in color with shaley partings, much like the Ion and Guttenberg above, and like the Ion and Guttenberg it is very fossiliferous. The trail segment traversing this unit consists of a series of high steps cut into the bedrock. The McGregor, because of less shale, is more resistant to erosion. Beds in the middle of this unit form the ledges for several waterfalls in the Park. At its base, the McGregor becomes increasingly thin-bedded and shaley and the contact with the underlying Pecatonica is picked at the first thick-bedded outcrop./e Some of the bedding plane surfaces have a knobby appearance reminiscent of the Galena above. Fossil borings and trails are present in some bedding plane surfaces. Beneath the Pecatonica is the Glenwood shale /f which erodes like the Specht's Ferry, producing a covered interval with a much gentler slope and like the Specht's Ferry produces springs and seeps along its outcrop.

/6 The next unit exposed, as the trail opens to a broad view of the Mississippi, is the St. Peter sandstone. The St. Peter is a massive-appearing unit, into which steps, names and initials have been carved. Iron staining produces a range of colors from white through green, orange, pink, red, and purple. On some exposures cross-stratifications are present. These parts of the trail in the St. Peter are the steepest in the Park. Through this unit there are a series of subsidiary trails which ultimately lead to the falls and the sand cave near its base. In the middle portion

of the St. Peter the trail enters a wooded area where the trail becomes gentler and is paved by loose sand. As the trail nears the falls, it steepens considerably and is formed by a series of wooden steps which are anchored in loose sand. At just about this elevation the stream forms a 20 foot cascade down the face of the St. Peter. The trail flattens, and across the stream valley (Lee's Pictured Rocks Glen) is a large cliff-like exposure of the unit. Here it displays a series of colored bands, mostly yellows and oranges and more cross stratification is in evidence.

The trail below the cascade, leading to the sand cave, /10 consists of a series of overhanging ledges along the stream bank displaying orange and red-stained St. Peter. The cave /11 itself is approximately 10 feet high, 18 feet wide and 25 feet deep. On its back wall are a series of contorted silicified sandstone beds which stand in relief. The base of the cave is very close to the contact with the underlying Prairie du Chien. Approximately 100 feet downstream and on the opposite bank from the cave is an outcrop of Prairie du Chien. Although it is stratigraphically below the St. Peter, this outcrop is at the same elevation as the sand cave because of irregularities in the Prairie du Chien's upper surface. This outcrop of gray dolomite displays beds ranging from two inches to two feet in thickness which are brecciated. This brecciation is attributed to cavern formation and collapse (karst) which also explains the irregular upper surface of the unit.

Returning to the main tail loop and continuing along, the path follows the east bank of the stream upward. The lower portion of the trail

is gentle where it crosses the St. Peter, but beyond the bridge the trail steepens appreciably and like its previously descended counterpart is formed by a series of wooden steps. We are once more at the top of the St. Peter, but this time on the west bank. From here the trail proceeds upward, switches back, parallels the stream and leads up to a series of high steps. This interval traverses the Glenwood and is marked by seeps and mud. The Pecatonica is not exposed along this segment of the trail, but it is reflected by a fairly flat reach of the stream. The basal McGregor is eroded away, but resistant ledges in the middle of the unit produce a steep overhang with a waterfall of approximately 10 feet in height. The trail branches at about this elevation; one segment leads under the overhang and falls to the opposite bank. The other segment switches back over a muddy interval which marks the Specht's Ferry, to cross the stream above the falls. /7 Beyond the falls these branches of the trail reunite. /8

Above the falls the trail branches with one part leading to Point Ann and the other returning to the lookout point from the west. The first leg of this part of the loop traverses Specht's Ferry for about 100 to 150 feet. As noted before, this horizon has many springs and seeps and the resulting mud renders this part of the trail very slippery and hazardous. The trail crosses a small tributary of the waterfall-producing stream, just above a series of cascades and falls similar to the ones produced by the main stream, but on a smaller scale. In fact, this falls and cascades sequence is duplicated wherever streams cross this

McGregor-St. Peter interval.

As the trail rises it traverses Upper McGregor and branches once more. One segment continues eastward towards lookout point; the other extends southward on the east bank of the tributary. It is moderately steep but smooth and gravel covered. No outcrops can be seen on the pathway but several scattered outcrops are visible in the stream valley below. As the path rises the valley broadens and outcrops disappear. The trail continues at a moderately steep grade paralleling the drainage until, near the crest, it swings to the east and emerges from the woods approximately 200 feet north of the shelter house in the picnic area.

The easterly (lookout point) segment of the trail continues for about 300 feet beyond the branching on a graveled gentle incline, with no outcrops visible, until it nears lookout point where outcrops of Galena are in evidence.

South Trail.--The southeast extreme of the Park can be reached by a trail loop which connects the picnic area and the campground. This gravelled trail enters the woods in the southeast corner of the picnic area. It is an easy path with no rock exposures, but scattered Galena "float." At a thinning of the trees there is a linear open woodland with a series of Indian mounds. The first is located where the trail branches, with one segment leading to the campground to the west. The other portion of the trail continues south past a total of five to eight conical mounds, approximately 25 feet in diameter and ranging from 36 to 45 feet apart.

These mounds form an arc near the edge of the bluff.

Along the open woodland there is a continuous view of the Mississippi River and its confluence with the Wisconsin.

At the southern edge of the open woodland there are two trails; one leads south along the ridge edge, apparently beyond the Park limits, and offers scattered views of the Mississippi through the trees. There are outcrops of Galena a few feet below the trail along the bluff. The second trail leads westerly. It is an open graveled path which leads to the campground. No outcrops are visible along this trail segment.

Point Ann Trail.--The Point Ann Trail, at its Pikes Peak origin, begins as a branch of the Bridal Veil Falls Loop, just above the falls on the west bank of the creek.

Here it is formed by a series of steep steps made of wood over a covered interval which traverses Upper McGregor and the Decorah formation. At the top of the trail, on the ridge crest, the woods thin in a mowed open woodland. Running the length of this meadow is a series of Indian mounds. The southernmost mound is linear, about 235 feet long. A second linear mound about 110 feet long is approximately 125 feet further north along the trail. The first conical mound, about 33 feet in diameter, is 200 feet further down the trail. Point Ann trail turns west at this point, but a series of seven conical mounds extends further along the ridge crest. These average 18 feet in diameter with spacing ranging from 16 to 20 feet between them.

At the north end of the open woodland there is another overview

of the Mississippi and its confluence with the Wisconsin. From this point a little used trail extends northward, through the woods past three vandalized conical mounds. Beyond the mounds the trail begins to drop steeply, passing through isolated outcrops. The top outcrop exposes the Galena-Decorah contact. A second outcrop further down the ridge displays basal Guttenberg, below which can be seen Pecatonica float in the trail and a small Pecatonica outcrop. The last outcrops are of St. Peter. Here the sandstone is essentially unmarked and displays a large sandstone column produced by vertical jointing and some mass wasting. The column is approximately 12 feet high and though not quite a balanced rock, it is worthy of observation and protection. /9

From the Indian mound open woodland the Point Ann trail continues as a jeep path. It swings southwest towards the southwest margins of the Park and passes close to the Ranger and Assistant Ranger residences. This trail passes through old field and several different forest types, allowing observation of a wide variety of plant life and a diversity of associated animals and birds. Just past the park rangers' residences the trail crosses a fill (probably part of an old logging trail). Beyond this fill the trail leads in and out of woods and along the edge of old field for about 800 feet before it enters the woods. Just after the trail enters the woods it passes a series of four conical mounds built on the ridge crest. Opposite the second mound the trail nears the edge of the bluff and the hiker has another chance to view the Mississippi River. From here, the trail stays at about the same level, but continues to

pass alternately through woods and grassy areas.

On a second point approximately 1,800 feet further down the trail from the last mounds is another series of linear and conical mounds, like the other along a ridge crest. There is a total of six mounds in this collection; the first is linear, followed by a conical and then two more linear mounds. The last two mounds are conical. Past these mounds the trail swings west and then north around the rim of the valley. The trail continues past the only outcrop of St. Peter in Point Ann Park to another overlook point with a collection of five conical mounds. Here the trail branches: a westerly segment which is a part of the loop trail and the northeast segment leading down to the parking lot.

Sampling and Collecting Areas

Since collecting is prohibited in the Park it seems appropriate to indicate areas outside the Park where rocks and fossils can be obtained.

Perhaps the handiest location is along the road leading from McGregor to Pikes Peak Park. This road cut exposes most of the section from the Prairie du Chien through the Decorah. Outcrops of Prairie du Chien are scattered and the Glenwood and Specht's Ferry shales are mostly covered, however.

Along this road just below the exposure of basal St. Peter sandstone is an unpaved road leading to a quarry-dump. Here the quarrying

operations have exposed a complete Decorah section. Each member is well displayed and fossil collecting is excellent. Near perfect vertical rectangular jointing gives these exposures a blocky "sawed off" appearance. Permission must be obtained before entering the quarry property.

A third opportunity to sample and collect occurs on Highway 18, one mile west of the McGregor city limits. Here, on the west side of the road, is a discontinuous section from the St. Peter through the Decorah.

Nearby in a gully east of the road is the "McGregor ravine" section (NE1/4, Sec. 29, T95N, R3W)--the type locality of the McGregor member of the Platteville formation. This ravine also exposes a relatively complete section from the St. Peter to the basal member of the Galena formation (Prosser).

The Jordan sandstone and the Prairie du Chien formation are best exposed on the road which runs along the Mississippi between the railroad tracks and the bluffs which form the east edge of Pikes Peak/Point Ann State Park. The Jordan is exposed at the north end of this road opposite the grain elevator-docking facilities. The contact of the Jordan with the overlying Prairie du Chien can be seen in the cliff about 35 feet above the road.

Because the bedrock dips to the southwest, this Jordan-Prairie du Chien contact is lower further south along the road. However, both units are mostly covered until a quarry, approximately 0.5 miles south of the Point Ann parking lot road, offers an extensive view of the Prairie du Chien.

VASCULAR PLANT INVENTORY

by Dr. Paul Christiansen

Introduction

The vegetation of Pikes Peak State Park ranges from formerly cultivated fields now in old field succession to sugar maple-basswood forest and all of the stages between. Soils range from shallow and rocky on some ridges and bluffs to deep alluvium in the lower creek bottoms. Both gentle and steep slopes face a variety of directions. Upon this variety of sites a diverse pattern of land use and abandonment produces a mosaic of plant communities. The entire area apparently was logged at one time since settlement, some areas more than once. Schade Glen was partially cleared and terraced and uplands in the more recently acquired land in the midsection of the park were cleared and cultivated and only recently removed from agricultural use. In this report the major plant communities are characterized and mapped, the successional status of each is outlined and fragile plant assemblages and endangered or threatened plant species are identified.

Methods

Plant communities were characterized by use of 20x20m (1/25 ha) plots (see appendix 4) placed in modal area of the most important forest communities; forest transects using quarter method (Cottam and Curtis, 1956) or random pairs method (Cottam and Curtis, 1949) to sample trees along with line intercept to sample the shrub layer and 20x50cm quadrats to sample

the herbaceous layer (see appendix 4); transects divided in 10 20m segments identifying leading and secondary species in canopy and understory, line intercept of the shrub layer in alternating 10m segments and notation of important herbaceous layer species and percent herbaceous layer cover. The latter transects were oriented across environmental gradients to determine community boundaries.

Areas dominated by herbaceous cover with only occasional trees were sampled with 20x50cm quadrat estimating cover of species encountered using a method devised by Daubenmire (1959). Total and relative cover were computed on samples of 20 to 40 quadrats.

Species lists for communities were compiled from all transects and plot data in addition to observations made at selected sites.

Plant Communities

Plant communities are identified on the basis of the leading dominants in the canopy in case of forests or the most important cover species in open areas. In addition the structure of the community, i.e., full canopy, scattered trees, etc. is also considered. In some cases cultural practices such as mowing or tree planting are also used.

In addition to the resume of each community which follows, a map of plant communities is given in figure 2 . Species lists for the plant communities are presented in appendix 3 . Data from permanent plots are given in appendix 4 .

Sugar Maple-Basswood

This community is developed only on steep north and east facing lower slopes, mostly on bluffs facing the Mississippi river.

Canopy trees are sugar maple, basswood, black walnut, hackberry, red oak and American elm. Kentucky coffee tree also occurs in this community. The understory trees are not abundant but include canopy species. Bladdernut is common in the sparse shrub layer along with saplings of canopy species. The herbaceous layer is extensive, often with fairly tall plants such as wood nettle, touch-me-not, leafcup and false Solomen's seal. Wild ginger, Hepatica, and several fern species are also common. Seedlings of canopy species, especially sugar maple, are also common.

Red Oak-Sugar Maple

This is the most extensive forest community in the park, developed on mid and lower slopes.

The canopy is equally dominated by red oak and sugar maple with basswood less important. Shagbark hickory and bigtooth aspen occur occasionally in the canopy.

The understory is dominated by sugar maple and ironwood. White ash and basswood are much less common. In most stands the understory shades 70%-80% of the ground surface.

The shrub layer is much less extensive in cover than the understory. Values range from 5% to 45% cover. The most common species are sugar maple and white ash saplings along with ironwood and basswood.

Prickly ash is common on drier and more disturbed sites while witchhazel is found on wetter and more protected sites.

The herbaceous layer is usually quite extensive, often covering 70 to 90% of the surface. Species typical of this community include blood root, pointed-leaf tick-trefoil and interrupted fern.

Red Oak-Sugar Maple-White Oak

In the watershed above Weir's Glen red oak, sugar maple and white oak occur as canopy dominants with some bigtooth aspen occasionally in the canopy. The principle understory trees are sugar maple and ironwood with white ash and other species occasionally present. The shrub layer is generally low in cover, below 25%, with species occurrence similar to that in the red oak-sugar maple community. Species present in the herb layer are mostly the same as those in the red oak-sugar maple community.

Oak-Hickory

The Oak-Hickory community occupies forested portions of the upper slopes and ridges of the park.

White oak, red oak and shagbark hickory are the leading dominants in this community. Occasionally basswood, sugar maple and big tooth aspen are also in the canopy.

The understory is completely dominated by sugar maple and ironwood. White ash and shagbark hickory are found occasionally. The understory cover ranges from 50 to 90%.

The shrub layer is quite diverse with many species present. Those

most likely to be encountered are sugar maple, white ash, basswood, black cherry and prickly ash. Cover values for the shrub layer average about 30%.

The herb layer has a wide variety of plants. Some of the most common are wild sarsaparilla, honewort and lopseed. Cover values vary between 30 and 60%.

Streamside

On the banks of the lower reaches of creeks draining the park a forest community develops dominated by basswood, red elm and black walnut. Where disturbance has occurred honey locust and black locust dominate.

The understory is red elm and basswood with coverage from 50% in undisturbed to 100% in disturbed areas. Red elm is especially prominent in the understory in disturbed sites.

The shrub layer is generally very sparse, 0 to 10% coverage, with red elm the major dominant. The herb layer is extensive, usually 100% coverage, and dominated by wood nettle and touch-me-not.

Flood Plain

The deltas projecting into Mississippi river on the east side of the park are the only areas developing the flood plain community. The leading canopy dominants are silver maple and willow along with cottonwood and black ash. Typically, very little understory develops. The shrub layer includes dogwood species, button bush, bladdernut and wild grape. Herbaceous species include horse nettle, wood nettle, touch-me-not

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and sedges.

Open Woodland

The open woodland community results from partial clearing of the original forest cover, usually for pasture or farm lots. Park picnic and camping areas and Indian mound sites are other examples of this community. Usually this community is on fairly level land. Upland sites are dominated by white and red oak and shagbark hickory. Lowland sites have red elm and black walnut.

Two phases of this community are recognized. The mowed phase consists of a partial canopy with no understory or shrub layer. The herbaceous layer is mostly Kentucky bluegrass.

The disturbed phase of the open woodland community has usually been pastured and is now in the process of reverting back to forest. Tree saplings include ironwood, sugar maple, white ash and yellow bud hickory. Shrub species include staghorn sumac, smooth sumac, prickly ash, black raspberry, black berry, gooseberry and wild grape. Herb layer species range from tame grasses such as Kentucky bluegrass and redtop to vigorous native species such as sweet cicely, white avens and Canada goldenrod.

Old Field

The abandonment of cultivated fields results in a diverse and dynamic plant community known as "old field." In Iowa the early stages are annual and short-lived perennials. After about ten years mostly perennial herbaceous plants dominate, both grasses and forbs (non-grassy

herbaceous plants). Also, by this time numerous saplings of sun loving tree and shrub species appear. As time passes the woody species increase in dominance and after perhaps 50 years the area is a young forest.

At Pikes Peak several stages of old field succession are evident. These have been classified as (1) grassy, (2) early woody, (3) advanced woody and (4) plantation. Most areas designated old field are upland sites on ridges and upper slopes.

Old Field-Grassy

This community is the most recently cultivated or otherwise disturbed and contains almost completely herbaceous growth. Rhizomatous perennials dominate, both grasses and forbs. Because of rhizomatous growth habit and being a relatively young community, dominance is often patchy with one species much more prominent than the others. The grasses most likely to dominate are Kentucky bluegrass, smooth bromegrass, quackgrass and red top. Two goldenrods, Canada goldenrod and late goldenrod are also very common.

A large number of other species, mostly weedy perennials and biennials, are also present but contribute little cover.

As yet tree saplings are not common but when observed the most frequent species are Siberian elm, boxelder and white mulberry.

Old Field-Early Woody

This community is very similar to the grassy old field community except the tree saplings are taller and well established even though they

are sometimes widely scattered. The herbaceous cover is similar to that in the grassy old field. The prominent tree species are Siberian elm, box elder and white mulberry.

Usually this community is located down slope from the grassy community. This more sloping land being more likely to erode was converted from cultivated crops to pasture or hayland sometime before abandonment.

Old Field-Advanced Woody

This community is dominated by young trees forming a complete canopy. The shrub layer is very extensive, often of prickly species. The herbaceous vegetation is principally vigorous forest species with remnants of species usually found in grassy communities.

The larger trees are boxelder, Siberian elm, American elm, white ash, black walnut, bitternut hickory and black cherry. White oak, red oak, sugar maple, basswood and ironwood are important in the understory.

In the shrub layer gooseberry, blackberry, black raspberry, prickly ash and dogwood are most common. The herbaceous layer is dominated by hog peanut, Virginia creeper, bedstraw, white avens, and honewort.

Old Field-Plantation

This community is a variant of the old field-grassy community with coniferous species planted into it. White pine, Scotch pine and Austrian pine are the most important species. Succession may regress due to mowing during establishment of the conifer planting. Development of this community will be toward a coniferous forest.

Prairie Opening

Prairie species are present in openings of two types. The largest are formerly cultivated areas, usually badly eroded west-facing slopes. Very limited openings are located on the spines of rocky ridges where soil development is minimal. Dominant grasses are little bluestem and big bluestem with numerous composites and other species typical of prairies. Tame pasture grasses such as Kentucky bluegrass and orchard grass also persist. The larger openings also have shrubs and pioneer tree species invading. Dogwood, red raspberry, blackberry and quaking aspen are common, especially along eroded gullies.

Powerline Right-of-Way

Vegetation associated with powerline rights-of-way is a mixture of shrub and tree saplings with limited areas dominated by grasses and forbs. Periodic mechanical or herbicide treatments keep this community from developing beyond shrub stature.

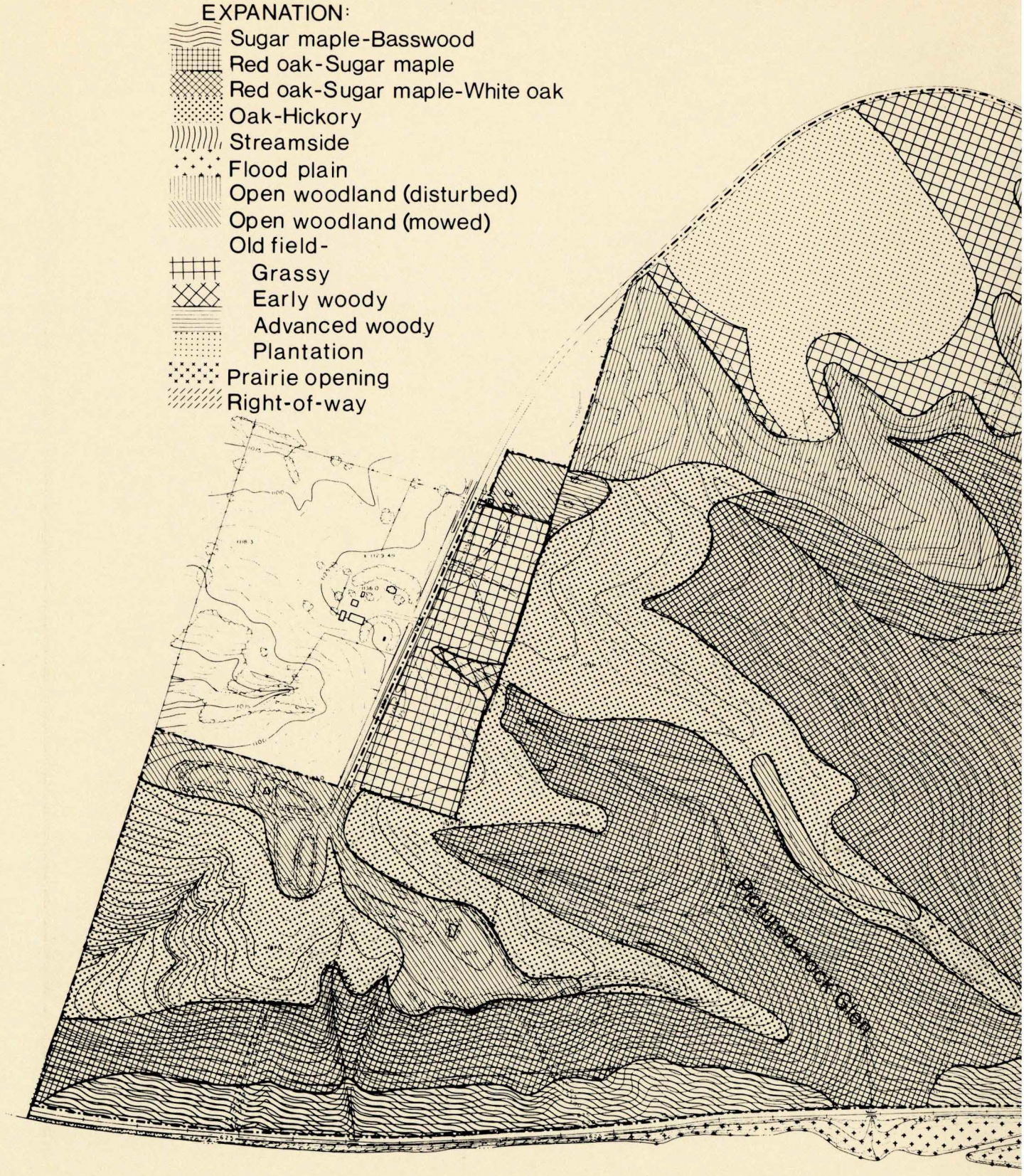
The dominant shrub-sapling species are blackberry, American elm, gray dogwood, white oak, red oak and shagbark hickory. Herbaceous vegetation is mostly Kentucky bluegrass, goldenrod and sunflower.

SUCCESSIONAL STATUS AND STABILITY OF PLANT COMMUNITIES

According to studies by Kuchler, (1964) and Oosting (1956) the climax vegetation in the north-eastern part of Iowa is sugar maple-basswood forest. Unless significant departures from the norm are evident in soil depth and type and aspect (slope direction) the vegetation which develops at Pikes Peak State Park will be sugar maple-basswood if sufficient time passes without disturbance (timbering, pasturing, mowing, etc.). The map of plant communities (fig. 2) indicates that only a very small portion of the park is presently designated as sugar maple-basswood forest. The remainder is in a variety of states from that which approaches climax very closely to some areas which are in the very early phases of succession.

The Grassy-Old Field community was abandoned about 10 years ago (1968) and is in the earliest successional stage. At the time of abandonment the cultivated fields were seeded down and mowed in the next two seasons. Since that time the Grassy-Old Field has not been disturbed. Perennial herbaceous vegetation, mostly bromegrass, quackgrass, bluegrass or goldenrod, presently dominates and woody species are beginning to be apparent but most trees are not more than 1 or 2 meters tall.

The Early Woody-Old Field was converted from cultivated cropland to pasture some years prior to abandonment. The herbaceous vegetation is very similar to that in the grassy old field but the development of the woody vegetation is much more advanced with trees very evident, some trees more than 4m tall. Younger trees are also appearing.



PIKES PEAK – POINT ANN STATE PARK

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NORTH

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Figure 2

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VEGETATION

The Advanced Woody Old Field communities development is well beyond the previous two communities having been abandoned thirty or more years ago. The structure of this community has been transformed to dominance by trees. Their height is not yet great and generally tree density is very high. Where trees were present but scattered at the time of release from agriculture they are presently emergent above the canopy. This community is very restrictive for human activity because of the density of trees and the abundance of prickly shrubs. Over the next 50 years oak, ash and maple will penetrate the canopy, the density of stems will decrease and the shrub layer will become more compatible with human uses.

The Old field-Plantation where pines and other coniferous species have been planted will be very much dominated by the planted trees in the near future. Presently, typical grassy old field plants are found between the rows but as the trees increase in size they will fill in and cover most of the area and exclude most of the present old field plants. Because of lack of light, thickness of the needle mat beneath the trees and other factors, very little species diversity will be present. Later, as lower branches of the conifers die and growing conditions on the ground improve, deciduous trees and shrubs and some vigorous herbaceous forest species will move in. Unless management techniques such as brush clearing or fire are used, eventually deciduous trees will overtop the conifers and finally a Sugar maple-Basswood community will result.

The old field communities represent difficult areas to manage and to develop. To suppress succession large inputs of energy in mowing or

less energy-demanding controlled burns are required. To allow succession to proceed means human mobility in the community will be restricted to trails and visibility will be low. However, many animal species will find the successional stages very desirable and contribute greatly to the overall diversity of the park.

The Open Woodland communities have developed from selected cutting of the forest trees and suppression of woody plant regeneration by mowing or grazing. The abandoned Open Woodland usually is found in lower slopes where cultivation was impractical but the land was suitable for pasture. The mowed Open Woodland is found on upland sites. Succession in the mowed Open Woodland is continually suppressed by mowing and little change in the vegetation would be expected. However, after many decades the aging trees will die out and no replacements will be available because of a lack of understory.

Succession in the abandoned Open Woodland will proceed similar to that in the old field and the herbaceous and shrub layers are presently mostly in the early woody stage. When a complete canopy has developed the larger trees now present will be emergents above the canopy.

The prairie openings also are likely to be converted to forest if no management procedures to suppress succession are employed. Presently, woody invasion is greatest where erosion has disrupted the prairie cover. This community is similar to grassy old field in its successional status except where prairie openings are maintained because of very shallow soil, such as along the bluff-top to the north of the main overlook.

The last community where dynamic succession is evident is the Power Line Right-of-Way. This community is periodically disrupted by herbicide treatment or brush cutting and reverts to an earlier successional stage after which it again begins to progress toward forest.

Succession in the forest communities of Pikes Peak State Park is a very slow process. Careful observations of the tree composition and size and knowledge of historical events can aid in understanding past events such as lumbering which have significantly altered the forest. The presence of big tooth aspen in the canopy is a good indicator of a former disturbance because it requires large amounts of light for growth. It is present in the Oak-Hickory, Red oak-Sugar maple and the Red oak-Sugar maple-White oak communities. On the drier sites, usually the ridges and upper slopes, Oak-Hickory is dominant but sugar maple is the most abundant understory tree and will probably replace the present dominants except where soils are thin. On the more moist lower slopes red oak and sugar maple have come in strongly after the big tooth aspen without an intervening white oak stage. In certain sites one can find a decadent big tooth aspen stand with red oak and sugar maple as codominants in the canopy and no white oak present. Study of the understory and shrub layers indicates that sugar maple will replace present canopy trees as they drop out. The presence of white oak along with red oak and sugar maple on the lower slopes of the watershed above Wier's Glen indicates either a more recent disturbance or a more open community than in the red oak-sugar maple.

FRAGILE SITES

The sites most susceptible to damage by human use are the steeper outcrops of the St. Peter Sandstone where they occur in forests. On these outcrops thick mats of Atrychium and other species of mosses as well as liverworts provide a precarious medium for a unique plant community characterized by polypodium fern, shining clubmoss, wild lily-of-the-valley, Arabis lyrata and woodrush. Where major upland drainages cut through the St. Peter Sandstone creating a deep "U" shaped stream bed, a more humid microclimate supports yellow birch. This microclimate is best expressed in the Pictured Rocks Glen and on the south fork of the creek feeding Weir's Glen.

Hiking off the trails on the steep lower slopes on the Prairie du Chien Formation should be discouraged. Footing is difficult and falls with attendant soil and plant disturbance are frequent. The bluff which faces the Mississippi River is especially susceptible in this regard. Sullivantia renifolia, on the Iowa endangered species list, is found under the falls which sometimes occur at the top of the Prairie du Chien formation where there is deep shade.

Pictured Rocks Glen is particularly noteworthy as a unique area where several of the endangered plants listed in the next section are found. The glen has a steep gradient and steep sides which produce a more moist and cool microclimate. It is unfortunate that the attractiveness of the sand cave brings many park visitors into the glen. Several ad hoc trails in the area provide the opportunity for damage to rare members of the flora by unknowing hikers.

ENDANGERED AND THREATENED PLANTS

Several species listed in Endangered and Threatened Iowa Vascular Plants (Roosa and Eilers, 1978) were observed during the field work for this report or have been previously reported (Hartley, 1962).

Lycopodium lucidulum, shining clubmoss, listed as threatened, is found only on the sandstone outcrops discussed in the previous section.

Oryzopsis pungens, rice grass listed as endangered, was reported by Hartley (1962). Its habitat is dry, sandy woods.

Sullivantia renifolia, listed as threatened, is found on moist, shaded limestone cliffs. The only observation made during field work was under a waterfall on the Mississippi bluff. Clearing of trees on the slope would admit additional light which would probably decimate the population.

Vaccinium angustifolium, low sweet blueberry and V. myrtilloides, velvet-leaf blueberry, both listed as endangered, were collected by R. Thorne and cited by Hartley (1962). Both these species are found in sandy, upland woods and on sandstone ledges. In the park they were collected in Pictured Rock Glen. During this project V. myrtilloides was observed there.

Vitis aestivalis, summer grape, listed as endangered, was collected by Hartley (1962). Its habitat, similar to most of the species listed above, is rocky, dry upland woods.

VERTEBRATE DIVERSITY AND DISTRIBUTION

by Dr. Harlo H. Hadow

Introduction

As part of the Iowa Conservation Commission's effort to learn about the flora and fauna residing within its lands, the following study was conducted between August 5, 1978 and August 6, 1979. Goals of the study were to measure vertebrate diversity, density, and distribution at the park in order to establish baseline information about vertebrate populations against which future changes could be monitored, and around which land-use development could be planned. Study techniques were to be standardized in order to permit repetition at various times in the future.

This report summarizes observations made by me and several assistants during 29 days of field work, and additional literature search. The time spent in field work was distributed as follows: 5 days in August, 1978; 3 days in September, 1978; 2 days in March, 1979; 3 days in April, 1979; 5 days in May, 1979; 9 days in June, 1979; and 2 days in early August, 1979. Specific techniques, and time distribution by hours of observation will be covered in the sections (birds, mammals, reptiles and amphibians) which follow.

Since any survey uncovers only a sampling of the actual organisms in an area, this work should be considered a beginning rather than the last word. Observations during the years to come will certainly add to the information included in this report. The list of reptiles is certainly the least complete, due to the secreteness of these animals in such a highly vegetated

place. Additional mammals will most likely be found, especially bats which were never systematically studied and members of the weasel family (Mustellidae) which are small enough to escape detection, yet are not taken by trapping methods which are successful with other mammals of similar size. The list of amphibians and breeding birds is most likely quite complete, because of the paucity of the former, and the distribution of observational time which favors encountering the latter. Migrant birds will be added to this list in abundance, as will some unusual wintering birds as future work is done at Pikes Peak. If land management patterns are altered, however, it is the visible species which change most conspicuously. This is the group of organisms covered most adequately in this report.

Birds

The author agreed to compile a species list of game and non-game birds, using standardized techniques to determine their presence on the study area; to add to this additional species from literature search, whose presence seems likely even though they were not detected during the study; to compile a list of actual or potentially threatened and endangered species of birds; and to write a short narrative describing the natural history of common or particularly interesting species as they relate to the zoobiogeography of Pikes Peak State Park. Those items will be covered in the following section.

Methods

I originally proposed both to walk line transects and establish an automobile survey route like those used in North American Breeding Bird Censuses along the road leading from McGregor, Iowa, to Pikes Peak State Park. The automobile census method proved infeasible, however, because the distance between McGregor and the park was too short to provide meaningful data (the Breeding Bird Census employs stops at mile intervals, and it is less than 3 miles from McGregor to the park). Also, narrow shoulders along the highway, steep curves, and fairly rapid and heavy automobile traffic made stopping dangerous. All systematically accumulated observations during this study, then, were made using a census technique called the "walk five--stand five" in which the observer alternately walks slowly through the habitat for five minutes, then stands five minutes, recording bird species and numbers of individuals seen or heard. This technique was chosen because observations were to be carried out throughout the year, thus ruling out methods like the spot mapping technique which was developed to survey territory holders during the breeding season (Franzreb, 1976), and one has a better chance of encountering shy or cryptic birds (like Ovenbirds, for instance) when one is standing than when one is moving.

In order to permit objectively calculating the relative abundance of birds seen during the breeding season, timed observations were made by half hour periods (the number of individuals of each species observed was recorded for each half hour of observation time). The percentage of the total number of half hour periods in which a species actually was observed (frequency of

occurrence) can be compared between species, or for the same species in different habitats or at different times, and thus gives a measure of its relative abundance.

Because habitat and behavioral characteristics make it easier to observe birds at some times than at others (you can see a bird much farther away in the wintery hardwood forest when trees are bare than when deciduous trees are leaved out, for instance), I needed some means of insuring that data collected during the winter were comparable to those collected at other times of the year. Birds were recorded either as seen within 50 meters of the observer, or seen or heard at greater distances, since it was usually possible to identify birds seen within 50 meters distance at any time of the year. The "within 50 meters, seen only" data are used to compare bird diversity in different seasons, all of the data are used when calculating frequency of occurrence or determining patterns of habitat usage during the breeding season when differences in "observability" are not a problem.

Since one of the objectives of this study was to establish methods of observation which could be repeated at times in the future in order to monitor changes in avian diversity, abundance, or distribution, two transects --the "Bridal Veil Falls-Point Ann," and the "Railroad"--were established as described below.

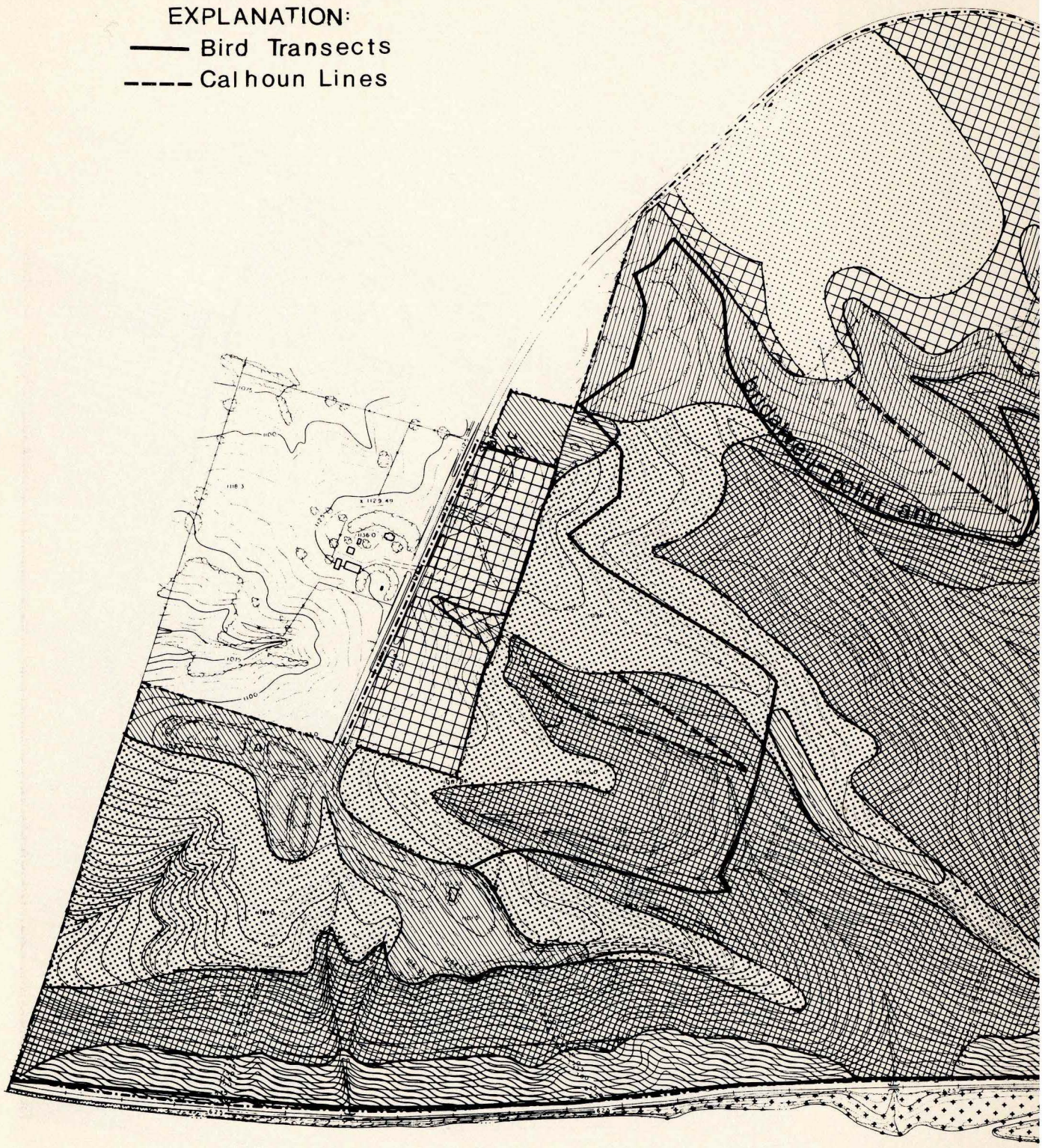
The "Railroad" transect began where the road leading to the Point Ann Trailhead turned off from the gravel road along the railroad tracks paralleling the Mississippi River, and continued to a point opposite where the Wisconsin River enters the Mississippi River. The railroad track makes a

conspicuous westward bend at this spot, described by local citizens as "Whistle Point," making it easy to locate the south end of the transect. This transect is located on the edge of Red Oak-Sugar Maple habitat covering the limestone bluffs along the eastern edge of the park (Figure 3), and it also provides access to the two small pieces of flood plain, a habitat found nowhere else in Pikes Peak State Park. This transect passes Weir's Glen, where large coniferous trees and second-growth brush developing in formerly-cleared areas provides unique breeding habitat for birds. The large, mature trees in the flood plain were suspected of providing roosting places for Bald Eagles (Haliaeetus leucocephalus) during the winter, especially if open water along the shoreline provided fishing spots for these Federally-endangered birds. The transect takes about 2 hours time to complete, using the "Walk Five-Stand Five" technique, and 28 half-hour segments of observing were carried out on the "Railroad Transect" during the study. The well-marked route and well-defined end points of this transect should make it possible for others to easily make observations comparable to mine in the future, and the diversity of habitats through which this transect passes provides an unusual richness of bird life within observing distance of the person walking the transect.

The second permanent Transect which I established is one which uses the mowed trail system of the park to insure repeatability, and passes through additional plant communities found within Pikes Peak State Park (as described by Paul Christiansen in another section of this report). Referred to in the rest of this report as the "Bridal Veil Falls-Point Ann"

Transect, this walk began at the sign announcing the trail to Bridle Veil Falls (north of the Visitor's Center), passes over the Bridle Veil Falls Trail past the falls and up to the Indian Mound Open Woodland, then follows the Point Ann Trail from where it leaves the mounds clearing, passes the houses of the Assistant Ranger and Ranger to the second mounds clearing near Point Ann. From here it doubles back, following a compass line toward the Ranger's house through the oldfields (at the present time there is a plowed survey line through this area which was made as part of the archeological portion of this study), and finally intersects with the Point Ann Trail where it enters the old fields just east of the Rangers house. This line should be easy to repeat in the future as long as the park staff continue to mow the trail and keep it open. It provides access to Red Oak-Sugar Maple, Oak-Hickory, Open Woodland, and Old field communities which are not sampled on the "Railroad" transect, as well as to "edge" communities which the two transects have in common. The complete transect requires about 5 hours to complete, and 60 half-hour observation periods were spent on this transect during the avian breeding season.

In addition to the standardized transects described in the preceding two paragraphs, additional transects were walked at various locations within the park. Some spots that we worked from time to time were the hardwood forest between the campground, the river overlooks, and the picnic area; the drainages running between the Point Ann Trail and Weir's Glen; the White Pine plantation north of the Assistant Ranger's house; the Point Ann Trail between the end of the standardized transect and the parking lot at the



PIKES PEAK – POINT ANN STATE PARK

NATURAL RESOURCES INVENTORY

IOWA CONSERVATION COMMISSION

Prepared by: Harlo Hadow

NORTH

0 20

Figure 3

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BIRD TRANSECTS AND CALHOUN LINES

trailhead; and the trail that leads from the Main Overlook to the Sand Cave (marked "hazardous trail" by a sign near the Main Overlook). We also used this technique in the flood plain forest along the railroad track when low water in the Mississippi River made those areas accessible. The plant community through which the transect was being walked (based upon Christiansen's plant-community map) was recorded each time that a new community was entered. Plant communities sampled for birds include Christiansen's Oak-Hickory, Oldfield, Open Woodland, Red-Oak-Sugar-Maple, and Flood Plain; I also included "edge" as a designation for places like the railroad tracks or habitat along the Point Ann Trail between the Assistant Ranger's clearing and the White-Pine stand where transects skirted the edge of named stand-types. The habitat preference of a given bird species was determined by calculating the percentage of times individuals of that species were observed in each stand type. The amount of observation time spent in the various habitats was equalized by dividing observations in a given habitat by the percentage of observation time actually spent in that habitat, then multiplying by 100. Birds seen at times other than when transects were being run were also noted and added to the species list of the park.

Results

Individuals of 113 bird species were seen or heard during the course of this study (Table 1). Twenty-two of these species were resident, being present on the study area throughout the year; 61 were not present

Table 1. Birds observed on the Pikes Peak/Point Ann study area. Inclusive dates are 5 August, 1978 to 6 August, 1979. If the bird was seen only once, a single date is listed. Continuous dates are indicated for residents, and two sets of continuous dates are given for migrants which were present on the study area both in 1978 and in 1979.

Family and Species (A.O.U. Sequence)	Dates Observed	Status
Podicipedidae		
1. Pied-billed Grebe *Podilymbus podiceps*	03-18-79	migrant
Anseridae		
2. Canada Goose *Branta canadensis*	03-18-79	migrant
3. Wood Duck *Aix sponsa*	04-29-79/05-19-79	summer resident
4. Common Goldeneye *Bucephala clangula*	03-18-79	migrant
5. Common merganser *Mergus merganser*	03-18-79	migrant
Cathartidae		
6. Turkey Vulture *Catharetes aura*	08-5-78/08-13-78 04-08-79/06-29-79	summer
Accipitriidae		
7. Cooper's Hawk *Accipiter cooperii*	08-12-78/09-23-78 04-08-79/08-6-79	resident
8. Sharp-shinned Hawk *Accipiter striatus*	09-23-79	migrant
9. Rough-legged Hawk *Buteo lagopus*	03-18-79	migrant
10. Red-tailed Hawk *Buteo jamicensis*	8-6-78/9-23-78 3-18-79/6-29-79	resident
11. Broad-winged Hawk *Buteo platypterus*	9-23-78/9-24-78 4-29-79/8-6-79	summer resident
12. Bald Eagle *Htaliaeetus leucocephalus*	3-11-79/3-18-79	winter resident
13. Sparrow Hawk *Falco sparverius*	4-8-79	transient
Tetraonidae		
14. Ruffed Grouse *Bonasa umbellus*	8-5-78/6-28-79	resident

Table 1 (cont.)

Family and Species	Dates Observed	Status
Phasianidae		
15. Ringed-necked Pheasant *Phasianus colchicus*	4-8-79/5-19-79	resident
Arceidae		
16. Great Blue Heron *Ardea herodias*	5-19-79/2-24-79	summer resident
Scopacidae		
17. Spotted Sandpiper *Actitis macularia*	5-19-79	summer resident
18. American Woodcock *Philohela minor*	4-18-79/6-24-79	summer resident
Laridae		
19. Herring Gull *Larus argentatus*	4-18-79	migrant
20. Ring-billed Gull *Larus delawarensis*	4-18-79	migrant
Columbidae		
21. Rock Dove *Columba livia*	continuous	resident
22. Mourning Dove *Zenaidura macroura*	8-5-78--8-13-78 4-8-79-8-5-79	summer resident
Cuculidae		
23. Yellow-billed Cuckoo *Coccyzus americanus*	5-24-79--8-5-79	summer resident
24. Black-billed Cuckoo *Coccyzus erythropthalmus*	5-19-79--8-5-79	summer resident
Strigidae		
25. Great-horned Owl *Bubo virginianus*	8-6-78--4-18-79	resident
26. Barred Owl *Strix varia*	4-18-79--8-5-79	resident
Caprimulgidae		
27. Whip-poor-will *Caprimulgus vociferus*	6-17-79	summer resident

Table 1 (cont.)

Family and Species	Dates Observed	Status
28. Common Nighthawk *Chordeiles minor*	5-22-79/5-23-79	summer resident
Apodidae		
29. Chimney Swift *Chaetura pelagica*	8-6-78--9-23-78 5-23-79--6-29-79	summer
Trochilidae		
30. Ruby-throated Hummingbird *Archilochus colubris*	8-5-78--8-13-78 5-19-79--6-29-79	summer resident
Alcedinidae		
31. Belted King Fisher *Megaceryle alcyon*	6-30-79	summer resident
Picidae		
32. Common Flicker *Colaptes auratus auratus*	8-5-78--9-24-78 4-8-79--8-6-79	summer resident
33. Pileated Woodpecker *Dryocopus pileatus*	8-12-78/6-30-79	resident
34. Red-bellied Woodpecker *Melanerpes carolinus*	8-5-78/8-6-79	resident
35. Red-headed Woodpecker *Melanerpes erythrocephalus*	8-5-78--9-24-78 5-19-79--8-6-79	summer resident
36. Yellow-bellied Sapsucker *Sphyrapicus varius*	8-6-78--8-12-78 4-8-79--6-30-79	summer resident
37. Hairy Woodpecker *Picoides villosus*	8-5-78--8-5-79	resident
38. Downy Woodpecker *Picoides pubescens*	8-5-78 8-6-79	resident
Tyrannidae		
39. Eastern Kingbird *Tyrannus tyrannus*	5-19-79--6-29-79	summer resident
40. Great Crested Flycatcher *Myiarchus crinitus*	8-5-78 5-19-79--6-30-79	summer resident
41. Eastern Phoebe *Sayornis phoebe*	8-6-78 3-18-79--8-6-79	summer resident
42. Acadian Flycatcher *Empidonax virescens*	5-23-79/5-24-79	summer resident
43. Traill's Flycatcher *Empidonax traillii*	8-6-78	summer resident

Table 1 (cont.)

Family and Species	Dates Observed	Status
44. Eastern Wood Pewee *Contopus virens*	8-5-78--8-13-78 5-19-79--6-30-79	summer resident
Alaudidae		
45. Horned Lark *Eremophila alpestris*	3-11-79	resident
Hirundinidae		
46. Barn Swallow *Hirundo rustica*	8-6-78--8-12-78 5-19-79--6-24-79	summer residnet
47. Tree Swallow *Iridoprocne bicolor*	5-24-79--6-29-79	summer resident
48. Bank swallow *Riparia riparia*	5-23-79	summer resident
49. Rough-winged Swallow *Stelgidopteryx ruficollis*	8-5-78 5-19-79--6-30-79	summer resident
50. Purple Martin *Progne subis*	8-13-79/4-28-79	summer resident
Corvidae		
51. Blue Jay *Cyanocitta cristata*	8-5-78--8-6-79	resident
52. Common Crow *Corvus brachyrhynchos*	8-5-79--8-6-79	resident
Paridae		
53. Black-capped Chickadee *Parus atricapillus*	8-5-78--8-6-79	resident
54. Tufted Titmouse *Parus bicolor*	8-5-78--5-23-79	resident
Sittidae		
55. White Breasted Nuthatch *Sitta carolinensis*	8-5-78--5-23-79	resident
Certhiidae		
56. Brown Creeper *Certhia familiarus*	4-18-79	winter/ migrant

Table 1 (cont.)

Family and Species	Dates Observed	Status
Troglodytidae		
57. House Wren	8-5-78--9-24-78	summer
Troglodytes aedon	4-18-79--8-6-79	resident
58. Winter Wren	6-30-79	summer
Troglodytes troglodytes		resident
Mimidae		
59. Catbird	8-5-78--9-24-78	summer
Dumetilla carolinensis	5-19-79--8-6-79	resident
60. Brown Thrasher	4-28-79--6-28-79	summer
Toxostoma rufum		resident
Turdidae		
61. Robin	8-5-78--9-24-78	summer
Turdus migratorius	4-18-79--8-6-79	resident
62. Wood Thrush	8-6-78	summer
Hylocichla mustelina	5-19-79--8-5-79	resident
63. Hermit Thrush	4-17-79	migrant
Hylocichla guttata		
64. Swainson's Thrush	9-23-78/9-24-78	migrant
Hylocichla ustulata	5-19-79--5-23-79	
Sylviidae		
65. Blue-gray Gnatcatcher	8-5-78/8-6-79	summer
Polioptila caprulea		resident
66. Golden-crowned Kinglet	4-18-79	migrant
Regulus satrapa		
67. Ruby-crowned Kinglet	4-29-79	migrant
Regulus calendula		
Bombycillidae		
68. Cedar Waxwing	9-23-78/	resident
Bombycilla cedrorum	6-24-79--8-5-79	
Sturnidae		
69. Starling	8-5-78--6-29-79	resident
Sturnus vulgaris		
Vireonidae		
70. Solitary vireo	5-19-79	migrant
Vireo solitarius		

Table 1 (cont.)

Family and Species	Dates Observed	Status
71. Bell's Vireo	8-5-78	summer
Vireo bellii		resident
72. Yellow-throated Vireo	8-5-78--8-13-78	summer
Vireo flavifrons	6-24-79--8-6-79	resident
73. Red-eyed Vireo	8-5-78--9-24-78	summer
Vireo olivaceus	5-19-79--8-6-79	resident
74. Warbling Vireo	8-6-78--8-12-78	summer
Vireo gilvus	5-19-79--6-30-79	resident
Parulidae		
75. Blue-winged Warbler	8-6-79	summer
Vermivora pinus		resident
76. Tennessee Warbler	5-28-79	migrant
Vermivora peregrina		
77. Yellow Warbler	8-6-78	summer
Dendroica petechia	5-19-79--8-6-79	resident
78. Yellow-rumped Warbler	9-23-78--9-24-78	migrant
Dendroica coronata coronata	4-29-79--5-19-79	
79. Cerulean Warbler	5-19-79--5-24-79	summer
Dendroica cerulea		resident
80. Yellow-trhoated Warbler	8-6-78/6-30-79	summer
Dendroica dominica		resident
81. Blackburnian Warbler	5-19-79	migrant
Dendroica fusca		
82. Chestnut-sided Warbler	5-28-79	migrant
Dendroica pennsylvanica		
83. Palm Warbler	9-23-78/9-24-78	migrant
Dendroica palmarum	4-29-79	
84. Oven Bird	8-6-78--5-19-79	summer
Seiurus aurocapillus		resident
85. Northern Waterthrush	5-24-79	migrant
Seiurus novebovacensis		
86. Louisiana Waterthrush	8-6-78/6-30-79	summer
Seiurus motacilla		resident
87. Yellow Throat		summer
Geothlypis trichas		resident
88. Kentucky Warbler	8-5-79	summer
Oporornis formosus		resident
89. Mourning Warbler	5-19-79--5-24-79	migrant
Oporornis philadelphia		
90. Connecticut Warbler	9-23-78/9-24-78	migrant
Oporornis agilis		

Table 1 (cont.)

Family and Species	Dates Observed	Status
91. Wilson's Warbler	5-19-79/5-23-79	migrant
Wilsonia pulsilla		
92. American Redstart	8-6-78--8-12-78	summer
Setophaga ruticilla	5-19-79--8-6-79	resident
Ploceidae		
93. House Sparrow	3-18-79--8-6-79	resident
Passer domesticus		
Icteridae		
94. Bobolink	5-19-79-5-23-79	summer
Dolichonyx oryzivorus		resident
95. Eastern Meadowlark	4-28-79/5-19-79	summer
Sturnella magna		resident
96. Red-winged Blackbird	8-5-78--9-24-78	summer
Agelaius phoeniceus	3-18-79--8-6-79	resident
97. Common Grackle	8-5-78/8-6-78	summer
Quiscalus quiscula	4-18-79/8-6-79	resident
98. Brown-headed Cowbird	4-29-79--6-30-79	summer
Molothrus ater		resident
99. Northern Oriole	8-5-78--9-24-78	summer
Icterus galbula	5-19-79--8-6-79	resident
Thraupidae		
100. Scarlet Tanager	8-5-78/8-13-78	summer
Piranga olivacea	5-19-79--6-29-79	resident
Fringillidae		
101. Cardinal	8-5-78/8-6-79	resident
Richmondena cardinalis		
102. Rose-brested Grosbeak	8-5-78--8-13-78	summer
Pheuticus ludovicianus	5-19-79--6-30-79	resident
103. Indigo Bunting	8-6-78--8-12-78	summer
Passerina cyanea	5-23-79--6-29-79	resident
104. Purple Finch	3-11-79--4-8-79	winter
Carpodacus purpureus		resident
105. American Goldfinch	8-5-78--8-6-79	resident
Spinus tristis		
106. Rufous-sided Towhee	5-19-79--6-29-79	summer
Pipilo erythropthalmus		resident
107. Dark-eyed Junco	3-11-79--4-8-79	winter
Junco hyemalis hyemalis		resident

Table 1 (cont.)

Family and Species	Dates Observed	Status
108. Tree Sparrow *Spizella arborea*	3-18-79	winter resident
109. Chipping Sparrow *Spizella passerina*	5-23-79/5-24-79	summer resident
110. Field Sparrow *Spizella pusilla*	8-5-78/8-6-78 4-29-79--6-29-79	summer resident
111. White-throated Sparrow *Zonotrichia albicollis*	4-28-79	migrant
112. Fox Sparrow *Passerella iliaca*	4-18-79	migrant
113. Song Sparrow *Melospiza melodia*	8-5-78--8-13-78 4-8-79--8-16-79	summer resident

during the winter, and were thus designated "summer residents"; 5 were present only during the winter and were termed "winter residents"; and an additional 25 species were designated "migrants" because they passed through only during spring and fall migrations. Because I was interested mainly in terrestrial birds, I made no effort to census shore birds or water birds which used the Mississippi as habitat. Canada geese, Common Goldeneyes, Common Mergansers, Pied-billed Grebes, Herring Gulls, and Ringed-billed Gulls were included in table 1 only because they used the flood plain forest and the open shoreline of the Mississippi early in the spring before ice had gone off the main part of the River. The grebe, gulls, and those ducks and geese were termed "migrants," even though they might breed locally, because they did not use the shores of Pikes Peak as nesting habitat. The Spotted Sandpiper used flood plain forest as foraging habitat somewhat later in the season (Table 1). The Wood Ducks nested in terrestrial habitats within the park, as will be described in later sections of this report; and the Bald Eagle's use of the flood plain forest and open water along the river's edge will also be described later in the report. The Great Blue Heron was a species that nested on flooded islands in the Mississippi River, and would not have been included in the species list of the park if it had not foraged in terrestrial communities. Twice, I saw these birds foraging in the old fields north of the Ranger's house, and for this reason they are included in the species list. Although migrants passing through an area are interesting to birders, their contribution to the ecology of a community is of far less importance than is that of birds which stay for

extended periods of time. For this reason, habitat preference and frequency of occurrence were calculated only for breeding birds which used terrestrial habitats within the park during the course of the study.

The status of birds in an area is often designated by such terms as "rare," "common," "casual" in descriptions of an avifauna (e.g., Anderson, 1907). Such terms are useful, but difficult to define objectively. Since they mean different things to different observers, subjective descriptive terms are best replaced by frequency of occurrence data if population densities are to be compared.

Sixty-eight species of birds were observed on the Railroad and Bridal Veil-Point Ann transects during transects run on August 5 and 6, 1978, and June 17 through August 6, 1979, and thus appear in frequency calculations (Table 2). Birds in the park during those time periods could safely be considered breeding birds, since spring migrants had passed through and fall migrants had not yet arrived. This is not a complete breeding list for the area, since it reports the frequency only of birds seen on the Permanent Transects during the breeding season. The combined number of resident and summer resident birds in Table 1 is 83, 15 more than in Table 2. These fifteen birds belong mainly to three groups: those active during the evening when transects were not run (e.g., whip-poor-wills and nighthawks), birds which had completed nesting by June 17 (e.g., Wood ducks), and species which did not use the habitats sampled by the transects (e.g., Belted Kingfishers, Great Blue Herons, Horned Larks, and Meadow Larks). Frequency data measure conspicuousness as well as abundance, since birds are recorded

Table 2. Frequency with which breeding birds occur on the Railroad and Bridal Veil Fall-Point Ann Transects at Pikes Peak State Park. Frequency is the number of ½ hour observation periods out of 28 (Railroad) and 60 (Bridal Veil Falls- Point Ann) that members of a given species were observed.

Family and Species	Railroad	Bridle Veil-Point Ann
Cathartidae		
1. Turkey Vulture *Cathartes aura*	0.107	0.017
Accipitriidae		
2. Cooper's Hawk *Accipiter cooperii*	0.107	0.017
3. Red-tailed Hawk *Buteo jamaicensis*	0.036	0.179
4. Broad-winged Hawk *Buteo platypterus*	0.036	0.017
Tetraonidae		
5. Ruffed Grouse *Bonasa umbellus*	0.000	0.017
Scopacidae		
6. American Woodcock *Philohela minor*	0.000	0.017
Columbidae		
7. Mourning Dove *Zenaidura macroura*	0.536	0.267
Cuculidae		
8. Yellow-billed Cuckoo *Coccyzus americanus*	0.071	0.083
9. Black-billed Cuckoo *Coccyzus erxthropthalmus*	0.179	0.067
Strigidae		
10. Great-horned Owl *Bubo virginianus*	0.036	0.017
11. Barred Owl *Strix varia*	0.000	0.017
Apodidae		
12. Chimney Swift *Chaetura pelagica*	0.000	0.033

Table 2 (cont.)

Family and Species	Railroad	Bridle Veil-Point Ann
Trochilidae		
13. Ruby-throated Hummingbird *Archilochus colubris*	0.214	0.050
Picidae		
14. Common Flicker *Colaptes auratus auratus*	0.321	0.467
15. Pileated Woodpecker *Dryocopus pileatus*	0.071	0.033
16. Red-bellied Woodpecker *Melanerpes carolinus*	0.393	0.300
17. Red-headed Woodpecker *Melanerpes erythrocephalus*	0.214	0.217
18. Yellow-bellied Sapsucker *Sphyrapicus varius*	0.107	0.050
19. Hairy Woodpecker *Picoides villosus*	0.071	0.017
20. Downy Woodpecker *Picoides pubescens*	0.143	0.133
Tyrannidae		
21. Eastern Kingbird *Tyrannus tyrannus*	0.000	0.017
22. Great Creasted Flycatcher *Myiarchus crinitus*	0.143	0.050
23. Eastern Phoebe *Sayornis phoebe*	0.071	0.000
24. *Empidonax* spp. of uncertain identity	0.179	0.017
25. Traill's Flycatcher *Empidonax traillii*	0.036	0.017
26. Eastern Wood Pewee *Contopus virens*	0.250	0.100
Hirundinidae		
27. Barn Swallow *Hirundo rustica*	0.071	0.017
28. Tree Swallow *Iridoprocne bicolor*	0.036	0.033
29. Rough-winged Swallow *Stelgidopteryx ruficollis*	0.429	0.017

Table 2 (cont.)

Family and Species	Railroad	Bridle Veil-Point Ann
30. Purple Martin *Progne subis*	0.000	0.017
Corvidae		
31. Blue Jay *Cyanocitta cristata*	0.571	0.717
32. Common Crow *Corvus brachyrhynchos*	0.214	0.033
Paridae		
33. Black-capped Chickadee *Parus atricapillus*	0.143	0.167
34. Tufted Titmouse *Parus bicolor*	0.000	0.050
Sittidae		
35. White Breasted Nuthatch *Sitta carolinis*	0.393	0.367
Troglodytidae		
36. House Wren *Troglodytes aedon*	0.500	0.300
37. Winter Wren *Troglodytes troglodytes*	0.036	0.000
Mimidae		
38. Catbird *Dumetella carolinensis*	0.786	0.400
39. Brown Thrasher *Toxostoma rufum*	0.000	0.033
Turdidae		
40. Robin *Turdus migratorius*	0.321	0.383
41. Wood Thrush *Hylocichla mustelina*	0.000	0.150
Sylvidae		
42. Blue-gray Gnatcatcher *Polioptila caerulea*	0.071	0.000

Table 2 (cont.)

Family and Species	Railroad	Bridle Veil-Point Ann
Bombycillidae		
43. Cedar Waxwing *Bombycilla cedrorum*	0.000	0.083
Sturnidae		
44. Starling *Sturnus vulgaris*	0.107	0.100
Vireonidae		
45. Yellow-throated Vireo *Vireo flavifrons*	0.107	0.067
46. Red-eyed Vireo *Vireo olivaceus*	0.179	0.133
47. Warbling Vireo *Vireo gilvus*	0.357	0.033
Parulidae		
48. Blue-winged Warbler *Vermivora pinus*	0.036	0.000
49. Yellow Warbler *Dendroica petechia*	0.071	0.033
50. Yellow-throated Warbler *Dendroica dominica*	0.036	0.000
51. OvenBird *Seiurus aurocapillus*	0.000	0.017
52. Louisiana Waterthrush *Seiurus motacilla*	0.000	0.017
53. Yellow Throat *Geothlypis trichas*	0.000	0.200
54. Kentucky Warbler *Oporornis formosus*	0.000	0.017
55. American Redstart *Setophaga ruticilla*	0.643	0.167
Ploceidae		
56. House Sparrow *Passer domesticus*	0.000	0.017
Ioteridae		
57. Red-winged Blackbird *Agelaius phoeniceus*	0.607	0.217

Table 2 (cont.)

Family and Species	Railroad	Bridle Veil-Point Ann
58. Common Grackle *Quiscalus quiscula*	0.500	0.217
59. Brown-headed Cowbird *Molothrus ater*	0.179	0.067
60. Northern Oriole *Icterus galbula*	0.679	0.200
Thraupidae		
61. Scarlet Tanager *Piranga olivacea*	0.036	0.083
Fringillidae		
62. Cardinal *Richmondena cardinalis*	0.786	0.283
63. Rose-breasted Grosbeak *Pheuticus ludovicianus*	0.500	0.283
64. Indigo Bunting *Passerina cyanea*	0.107	0.50
65. American Goldfinch *Spinus tristis*	0.393	0.200
66. Rufous-sided Towhee *Pipilo erythropthalmus*	0.000	0.017
67. Chipping Sparrow *Spizella passerina*	0.036	0.000
68. Field Sparrow *Spizella pusilla*	0.000	0.067
69. Song Sparrow *Melospiza melodia*	0.321	0.100

only if they are seen or heard. Frequency data are useful in determining population trends, though, because conspicuousness should not change whether populations are increasing or decreasing, and changes in frequency distribution may be attributed to changing population density if these same transects are run at the same time of the year in coming years.

The habitat preferences of 65 bird species is shown in Table 3. Habitat preference is demonstrated in this table by the relative abundance of observations for birds of a particular species in each of the six habitats listed. The number of observations (N) is a decimal because the number of observations was corrected for the amount of observation time spent in each habitat (please see methods section for a description of this technique). Correcting N led to some apparent anomalies in this table. Only two Winter Wrens were observed during the study, for example, while House Wrens were very abundant on both transects (Table 2). Because the Winter Wrens were seen only in flood plain, though, and flood plain was not sampled as much as Edge or Open Woodland (preferred habitat of House Wrens), the Winter Wren's corrected N is large even though these birds must be considered very rare breeders at Pikes Peak at the present time. The correct N has no information about relative abundance of birds on the study area, then, and frequencies of occurrence in Table 2 must be consulted for such information.

An examination of Table 3 shows that while many of the species which have the greatest frequency of occurrence are found in all or most of the plant communities (e.g. White-breasted Nuthatches, Red-bellied Woodpeckers, Blue Jays, and Robins), other species are more specialized in their requirements.

Table 3. Habitat preference of breeding birds at Pikes Peak State Park. Percent of total observations for a species within each habitat type. Figures adjusted to equal-time basis for each habitat.

Family and Species	N	Edge	O-H	OF	Wl	RO-SM	FP[1]
Cathartidae							
1. Turkey Vulture *Carthartes aura*	18.6	40.9	--	59.1	--	--	--
Accipitriidae							
2. Cooper's Hawk *Accipiter cooperii*	7.61	100	--	--	--	--	--
3. Red-tailed Hawk *Buteo jamaicensis*	61.71	4.1	--	89.0	6.8	--	--
4. Broad-winged Hawk *Buteo platypterus*	10.98	23.1	--	--	76.9	--	--
Tetraonidae							
5. Ruffed Grouse *Bonasa umbellus*	19.47	78.3	--	--	21.7	--	--
Scopacidae							
6. American Woodcock *Philohela minor*		--	--	--	100	--	--
Columbidae							
7. Mourning Dove *Zenaidura macroura*	291.12	41.8	--	37.7	1.4	9.5	9.5
Cuculidae							
8. Yellow-billed Cuckoo *Coccyzus americanus*	127.88	7.9	6.4	17.2	3.3	--	65.2
9. Black-billed Cuckoo *Coccyzus erythropthalmus*	130.42	9.7	6.3	16.9	3.2	--	63.9
Strigidae							
10. Great-horned Owl *Bubo virginianus*	9.44	26.9	--	--	73.1	--	--
11. Barred Owl *Strix varia*	28.88	--	--	76.1	--	23.9	--

1/ O-H=Oak-Hickory, OF=Old Field, Wl=Woodland, RO-SM=Red Oak-Sugar Maple, FP=Floodplain

Table 3 (cont.)

Family and Species	N	Edge	O-H	OF	WL	RO-SM	FP
Apodidae							
12. Chimney Swift *Chaetura pelagica*	35.58	69.1	--	30.9	--	--	--
Trochilidae							
13. Ruby-throated Hummingbird *Archilochus colubris*	31.42	64.6	--	--	13.4	22.0	--
Picidae							
14. Common Flicker *Colaptes auratus auratus*	237.64	18.2	13.8	18.5	40.8	8.7	--
15. Pileated Woodpecker *Dryocopus pileatus*	28.87	17.6	--	--	58.5	23.9	--
16. Red-bellied Woodpecker *Melanerpes carolinus*	168.53	24.1	24.3	13.0	22.2	16.4	
17. Red-headed Woodpecker *Melanerpes erythrocephalus*	255.31	19.8	6.4	12.9	14.6	13.5	32.6
18. Yellow-bellied Sapsucker *Sphyrapicus varius*	63.36	24.0	51.8	--	13.3	10.9	--
19. Hairy Woodpecker *Picoides villosus*	55.96	9.1	29.3	--	--	61.6	--
20. Downy Woodpecker *Picoides pubescens*	151.11	8.4	5.4	14.5	2.8	13.7	55.1
Tyrannidae							
21. Eastern Kingvird *Tyrannus tyrannus*	254	100	--	--	--	--	--
22. Great Creasted Flycatcher *Myiarchus crinitus*	30.44	50.0	--	36.1	13.9	--	--
23. Eastern Phoebe *Sayornis phoebe*	11.98	42.4	--	--	--	57.6	--
24. Traill's Flycatcher *Empidonax traillii*	6.76	37.6	--	--	62.4	--	--
25. Eastern Wood Pewee *Contopus virens*	67.37	56.5	12.2	--	31.3	--	--
Hirundinidae							
26. Barn Swallow *Hirundo rustica*	33.88	67.6	--	32.4	--	--	--
27. Tree Swallow *Eridoprocne bicolor*	24.52	10.4	--	89.6	--	--	--

Table 3 (cont.)

Family and Species	N	Edge	O-H	OF	WL	RO-SM	FP
28. Rough-winged Swallow *Stelgidopteryx ruficollis*	295.25	96.3	--	3.7	--	--	--
Corvidae							
29. Blue Jay *Cyanocitta cristata*	975.58	17.4	16.0	13.5	9.9	18.4	25.6
30. Common Crow *Corvus brachyrhynchos*	56.67	53.7	14.5	--	7.4	24.3	--
Paridae							
31. Black-capped Chickadee *Parus atricapillus*	220.83	33.3	14.8	5.0	--	46.8	--
32. Tufted Titmouse *Parus bicolor*	50.21	15.2	49.0	--	8.4	27.5	--
Sittidae							
33. White-breasted Nuthatch *Sitta carolinensis*	231.76	30.7	14.1	4.7	23.7	26.8	--
Troglodytidae							
34. House Wren *Troglodytes aedon*	152.25	68.3	5.4	14.4	2.8	9.1	--
35. Winter Wren *Troglodytes troglodytes*	166.67	--	--	--	--	--	100
Mimidae							
36. Catbird *Dumetella carolinensis*	300.56	70.1	5.6	14.6	9.8	--	--
37. Brown Thrush *Hylocichla mustelina*	5.08	100	--	--	--	--	--
Turdidae							
38. Robin *Turdus migratorius*	344.58	39.0	14.3	12.8	15.9	18.0	--
39. Wood Thrush *Hylocichla mustelina*	98.31	--	41.7	11.2	12.1	35.1	--
Sylviidae							
40. Blue-gray Gnatcatcher *Polioptila caprulea*	5.08	100	--	--	--	--	--

Table 3 (cont.)

Family and Species	N	Edge	O-H	OF	WL	RO-SM	FP
Bombycillidae							
41. Cedar Waxwing *Bombycilla cedrorum*	25.38	100	--	--	--	--	--
Sturnidae							
42. Starling *Sturnus vulgaris*	240.1	23.3	--	73.2	3.5	--	--
Vireonidae							
43. Yellow-throated Vireo *Vireo flavifrons*	32.01	39.6	25.6	--	13.2	21.6	--
44. Red-eyed Vireo *Vireo olivaceus*	103.47	17.2	31.7	--	24.5	26.7	--
45. Warbling Vireo *Vireo gilvus*	147.23	27.6	11.1	--	--	4.7	56.6
Parolidae							
46. Blue-winged Warbler *Vermivora pinus*	5.08	100	--	--	--	--	--
47. Yellow Warbler *Dendroica petechia*	12.69	100	--	--	--	--	--
48. Yellow-throated Warbler *Dendroica dominica*	13.52	37.6	--	62.4	--	--	--
49. Overbird *Seiurus avrocapillus*	5.08	100	--	--	--	--	--
50. Louisiana Water Thrush *Seiurus motacilla*	83.3	--	--	--	--	--	100
51. Yellow Throat *Geothlypis trichas*	213.61	3.6	3.8	92.6	--	--	--
52. Kentucky Warbler *Oporornis formosus*	2.54	100	--	--	--	--	--
53. American Redstart *Setophaga ruticilla*	119.29	100	--	--	--	--	--
Ploceidae							
54. House Sparrow *Passer domesticus*	6.76	37.6	--	--	62.4	--	--
Icteridae							
55. Red-winged Blackbird *Agelaius phoenicaus*	722.08	64.7	--	22.8	--	0.9	11.5
56. Common Grackle *Quiscalus quiscula*	609.94	63.7	--	9.0	--	--	27.3

Table 3 (cont.)

Family and Species	N	Edge	O-H	OF	WI	RO-SM	FP
57. Brown-headed Cowbird *Molothrus ator*	91.73	41.5	--	35.9	--	22.6	--
58. Northern Oriole *Icterus galbula*	505.75	32.6	24.6	8.7	1.7	2.7	49.4
Thraupidae							
59. Scarlet Tanager *Piranga olivacea*	31.15	24.4	26.3	--	27.1	21.2	--
Fringillidae							
60. Cardinal *Richmondena cardinalis*	290.54	44.6	8.5	3.8	42.2	--	28.7
61. Rose-breasted Grosbeak *Pheuticus ludovicianus*	247.44	39.0	9.9	17.8	22.2	11.2	--
62. Indigo Bunting *Passerina cyanea*	23.43	65.0	35.0	--	--	--	--
63. American Goldfinch *Spinus tristis*	225.77	50.6	--	43.8	5.6	--	--
64. Rufous-sided Towhee *Pipilo erythropthalmus*	10.99	--	--	100	--	--	--
65. Chipping Sparrow *Spizella passerina*	5.08	100	--	--	--	--	--
66. Field Sparrow *Spizella pusilla*	32.96	7.7	--	66.7	25.6	--	--

Wood Thrushes, Hairy Woodpeckers, and Pileated Woodpeckers were seen most often in dense Red oak-Sugar maple and Oak-Hickory forests, often along the intermittent streams that flowed from the Point Ann Trail toward the Mississippi River. Chimney Swifts and Tree Swallows used the open air above the old fields for flycatching, while Yellowthroats and Red-winged Blackbirds used it as nesting cover. A Bobolink male and several Eastern Meadowlarks sang and displayed in the oldfields during May transects and most likely nested there even though they did not show up in June and August transects. Brown Thrashers, Catbirds, Ruffed Grouse, and a variety of warblers might best be classified as "edge specialists," because they were seen most of the time at the interface between forested and more open plant communities along the railroad tracks and at the edge of the oldfields. It is not surprising that the "specialists" in Table 3 tend to occur in lower frequencies in Table 2, because the more generalized the nesting requirements, the more habitat is available for nesting and the more widespread the distribution. Birds of widespread distribution would occur in a greater percentage of observation periods, especially if they were also present in large numbers and conspicuous.

Natural History of Some Representative Pikes Peak Birds

Perhaps the most interesting aspect of a study such as this is to examine the status of birds which are considered endangered or threatened on either a regional or national level. Since such birds are typically narrowly-adapted specialists in habitat requirements, this section will deal

with their natural history at Pikes Peak. Only one endangered bird on the Federal Endangered Species List (the Bald Eagle) was observed on the study area during the past year. Breeding populations of an additional 6 species on the Iowa list (Roosa, 1977) were located during the study, as well as 6 more on the American Birds Blue List for 1979 (Arbib, 1978). Finally, I have good documentation of a Winter Wren nesting, an event which may only have been reported twice before for the State of Iowa. I shall finish by discussing the natural histories of a few species which are particularly interesting to me, but which are not on any of the listings mentioned previously.

Bald Eagle.--Since the Mississippi River is well-known for its winter populations of Bald Eagles, and the flood plain forests along the eastern edge of Pikes Peak State Park have the large trees which typically provide roosting perches for these large birds, I expected that fair numbers of these birds might be present during the winter. When I visited the study site on 11 March, however, I found that all of the river which could be seen from the Main Overlook was completely frozen. The only open water that could be seen was close to Prairie du Chien, on the Wisconsin side of the river. There was no open water along the park's edge until 18 March, when a patch of open water over 300 meters long and about 75 meters wide at its widest point opened up between "Whistle Point" and "Weir's Glen." No Bald Eagles were seen on the Iowa side on 11 March, although I could positively identify a mature bird fishing over the open water near Prairie du Chien, Wisconsin. A mature eagle was seen hunting low over the open

water on the Iowa side during transects run on 18 March, and a second observation was made of an eagle riding rising thermals along the bluff-faces next to the railroad tracks on the same day. No Bald Eagles were seen after March 18, 1979, so they did not nest either on the park or in adjacent flood plain islands in 1979. Most likely the eastern edge of the park is used for fishing and perching sites so long as open water is available in the winter, and after open water developes in the spring, but it is most likely not good winter habitat in mid to late winter.

Cooper's Hawk.--Roosa (1977) considered this bird to be "threatened" because of "its position on the top of its food chain, persecution by man, and general loss of deep forest habitat." Cooper's Hawks were seen on the study are both in 1978 and 1979 (Table 1) and probably nested both years. In 1978, two adults were seen hunting together about 100 meters south of Weir's Glen along the railroad tracks during the August 12 transect, and on September 23 a juvenile was seen perched on dead branches just below the lip of the overlook south of the picnic area. The juvenile was definitely a fledgling from the 1978 breeding season, and because of its location close to where the adult Cooper's Hawks had been seen five weeks before I believe it was their fledgling. The nest was probably quite close to where the fledgling was seen, perhaps in the dense forest along the bluffs at that point, or in the drainage west of Weir's Glen. Cooper's Hawks were seen in the same general area on April 18, May 23 and 24, and August 6, 1979, so most likely the birds nested again in 1979.

Broad-winged hawk, Sharp-shinned and Sparrow hawks.--Broad-winged Hawks are most conspicuous on the Pikes Peak study area during spring and fall migrations, but at least one pair of birds has been observed each year during the breeding season. Migrant Broad-winged Hawks were conspicuous on August 23 and 24, 1979 as groups of up to 6 birds circled high over the oldfields along the Point Ann Trail. They were also conspicuous in the same area on April 29, 1979. An adult was heard calling from the dense forest along the drainage leading to Weir's Glen as I walked a Permanent Transect on the Point Ann Trail on August 6, 1978, and adults were seen circling over the same area on May 22 and June 30, 1979, and riding updrafts on the bluff-faces near Weir's Glen on May 24, and August 6, 1979. At least one pair of these hawks most likely nested in Pike's Peak State Park both summers.

Sparrow Hawks and Sharp-shinned hawks were both observed on the study area, but neither were seen but once (Table 1), and both were considered as migrants to the park or transients passing through.

Yellow-billed and Black-billed cuckoos.--Concern for these birds seems to be widespread among ornithologists, since both species appear on Arbib's Blue List for 1979(1978) and the Black-billed Cuckoo appears on the "unknown status" portion of Roosa's (1977) list. Both species were seen on the study area from May 22-24 through the end of the study (Table 1), and they seemed to have similar habitat preferences (Table 3), appearing on both Permanent Transects with intermediate frequencies (Table 2). Although they are somber in color, and often sit quietly in the canopy as

the student passes on a transect, their vocalizations make them conspicuous in brush and small trees along the railroad tracks and in brushy seral communities at the edge of the old fields along the Point Ann Trail. A pair of Black-billed Cuckoos nested where the Point Ann Trail enters edge habitat adjacent to the White Pine plantation, and a Yellow-billed Cuckoo nested in a grassy hollow north of the Ranger's house. Although these large birds appear clumsy as they glean slowly through small trees, I was very impressed one day in June to see a Yellow-billed Cuckoo fly out of a small bush along the Mississippi River and catch a dragonfly in flight. The two species were observed on five days (Yellow-billed) and on 7 days (Black-billed), appeared to be very similar in habitat preference, and appeared to have solid breeding populations in the park.

Bell's Vireo, Blue-winged and Yellow warblers.--All three of these species appear on Roosa's list (1977) as having "unknown" or "threatened" (Blue-winged Warbler only) status, and Bell's Vireo and Yellow Warblers are both on Arbib's list (1978). All three are surface gleaners, foraging by working on the surface of small branches and leaves, searching out surface insects which are located there. Only one Bell's Vireo was seen on the study area, and that bird was singing at the edge of the campground one morning in early July, 1978, when I did a preliminary recognizance of the area. It was not observed on transects run within park boundaries either in 1978 or 1979, and thus does not appear in either Table 2 or 3. It certainly is not common in the park, even though plenty of brushy habitat (listed as preferred nesting habitat by Anderson, 1907) seems to exist there.

Yellow Warblers were seen on both Permanent Transects (Table 2), but in brushy "edge" habitats in each case. At least one pair nested in tall bushes close to the White Pine plantation along the Point Ann Trail, and another pair nested either in the conifers next to Weir's house or across the railroad tracks at the edge of the flood plain forest. These birds were seen on 7 days in 1979, the earliest date being 19 May.

Blue-winged Warblers were seen only once during the study, on August 6, 1979 although their presence had been reported earlier by Dr. Peter Wickham. Wickham (a very accomplished birder who is a member of the Coe College Department of Chemistry) heard a Blue-winged Warbler singing in the red cedar stand along the Point Ann Trail where it re-enters open woodland after passing close to the White Pine plantation (see Christiansen's vegetation map), and believed that the bird was nesting there in late May. I did not actually see a Blue-winged Warbler there--all the little yellow warblers turned out to be Yellow Warblers on close examination--but did see two male Blue-wings at Weir's Glen on August 6, 1979. One male foraged in the conifers there, and the other foraged in low bushes along the drainage south of Weir's garden. Identification was positive, with barred blue-gray wings conspicuous in good light.

Red-headed Woodpecker.--Although appearing on Arbib's Blue Lists from 1976 through 1979, Red-headed Woodpeckers are thought by many contributers from the midwestern states to be misplaced there (Arbib, 1978). Koenig (1977) found Red-headed Woodpeckers to be the third most common winter woodpecker in Audubon Christmas Counts from Iowa, and commented that they

certainly did not belong on the Blue List. Red-headed Woodpeckers were present on all days from August 5 through September 24, 1978 but were not seen until 19 May, 1979, and I feel certain that they did not winter at Pikes Peak last winter. They appeared at intermediate frequencies on both Permanent Transects, and were observed in all habitats (Table 2, Table 3). Red-headed Woodpeckers are interesting species because they are very opportunistic, wintering in the northern United States when mast production is high, and acorns are available for winter storage (Kilham, 1958), but migrating elsewhere when winter food supplies are limited. Thus their winter populations fluctuate widely from year to year, and may be used as a predicter of acorn abundance. Most likely the reason for their absence from the study area in the winter of 1979 was a poor acorn crop during the preceding fall. They are conspicuous in summer because of their habit of flycatching from open perches, and I often saw them spiralling up into the air after a flying insect, then returning to the same perch in typical woodpecker dipping flight. Because of adaptations for flycatching (Bock, 1970), these woodpeckers are poorly adapted for excavating (Spring, 1965), and they require long-dead branches or tree trunks for nest excavation (Jackson, 1976). Although these birds were common in the Indian Mound Open Woodland during the summer of 1978, no Red-headed Woodpeckers were seen there in 1979 after many dead, but standing trees were cut for firewood. This species nested in many other parts of the park during 1979, notably in camp grounds, picnic area, around Weir's house and in the flood plains along the railroad, and they are not in any danger at this time. Their dependence

upon long-dead trees for nesting sites and fly catching perches, and open habitat where flycatching is possible (Jackson, 1976) make them vulnerable where the cutting of dead, standing trees occurs. I will discuss this further in the recommendations section at the end of this report.

Hairy Woodpecker, Common Night Hawk, Purple Martin, Ruby-throated Hummingbird, and Warbling Vireo.--These five species appear on Arbib's Blue List for 1979 (1978), but do not appear on Roosa's (1977) list, or appear to be in any particular danger on the Pikes Peak Study Area. There is little suitable nesting habitat there for Purple Martins, and if they nested there either year they probably nested at the Assistant Ranger's home. I did observe them flycatching over old fields along the Bridal-Veil Falls-Point Ann Transect (Table 3). Large numbers of Common Night Hawks were seen flycatching over old fields north of the Ranger's house on May 22 and 23, but they only began hunting in the evening after I had completed Permanent Transects. For this reason they appear on neither Table 2 or 3. The open fields around housing for park personnel are important for both of these species, as is the oldfield complex, and good foraging habitat will be present in the park so long as those areas are maintained in their present state.

Hairy Woodpeckers were the least common woodpeckers on both of the Permanent Transects (Table 2), and seemed to prefer mature forests for breeding habitat (Table 3). I found a nest of Hairy Woodpeckers in a long-dead elm, standing in bottom of the drainage leading to Weir's Glen, about three-fourths mile west of Weir's home in 1979, and saw pairs of Hairys

courting in the woods east of the campground and adjacent to the Bridal Veil Falls Trail during March and April of 1979, so they probably nested in those areas as well. I saw Hairy Woodpeckers on 11 days, and hardly think that they are in any danger of extirpation within the park boundaries. They are more specialized as wood-excavators than are other midwestern woodpeckers (Spring, 1965) but are not specialized enough to remove tightly-adhering bark from dead trees (Koplin, 1969; Koplin and Baldwin, 1970). Dead tree removal is apt to have an adverse effect upon their populations, just as it is for other hole-nesting birds, and any developmental activity which leads to the destruction of mature forest in the park would reduce their breeding numbers.

Warbling vireos and Ruby-throated Hummingbirds were both quite common along the railroad tracks, but much less common along the Bridal Veil Falls-Point Ann transect (Table 2). The conspicuous singing of the vireos made them easy to locate during late May and June transects along the railroad tracks, although they are so cryptic that the birds themselves were not often seen. They were not common in mature forests, where Red-eyed Vireos were abundant (Table 2) and this habitat preference difference is apparent from Table 3. The hummingbirds seem unpredictable in habitat preference (Table 3), being found in mature forest as well as in seral vegetation. Flowers on which they feed are abundant in edge communities, which is what probably brings them to such sites. Although both of these species appear to be abundant at the present time, at least along the railroad tracks, their relative uncommonness on the Bridal Veil Falls-Point

Ann Transect suggests that they might become vulnerable within park boundaries if the conditions along the railroad tracks were altered by brush removal. Spraying by the railroad can hardly be beneficial to either species, and the proposed barge staging area could be disastrous.

Winter Wren.--A most unusual observation during this study was the successful nesting of a pair of Winter Wrens, birds which usually nest farther north (see range maps in Robbins, et al., 1966). Anderson (1907) doubted that they bred within the State of Iowa, but Koenig (1976) found a dummy nest of a Winter Wren in the Yellow River Forest, and he also mentioned nesting reports of this species at Wyalusing State Park across the Mississippi River in Wisconsin, and one other report for Iowa in 1975. Peter Wickham reported to me that he had heard a Winter Wren singing in the canyon between Sand Cave and the Mississippi River during his visit to the park 4th of July weekend, and suggested that because of the lateness of this observation it might be breeding there. On June 30, 1979, I saw one juvenile and one adult Winter Wren in the flood plain forest at the mouth of Pictured Rock Glen (see Christiansen's vegetation map). The light was good, I could clearly see the dark banding on the belly, the short tail, inconspicuous eyeline, bobbing tail, and small size which are diagnostic of these birds. The juvenile pursued the adult through piles of limbs which had been dropped by receding waters in the flood plain forest, begging for food with wing fluttering of the sort which is typical of begging fledglings. The close proximity of these Winter Wrens to Wickham's singing male strongly suggests that the successful nesting took place within the flood plain.

This is an unusual nesting record for Iowa, and is on the southern edge of the range of this bird.

Ruffed Grouse and Other Gallinaceous Game Birds.--Ruffed Grouse have high, stable populations in northeastern Iowa, even though the range of these birds shrank drastically in Iowa from the turn of the century until about 1930 (Klonglan and Hlavka, 1969). In Pikes Peak I saw or heard these birds on 8 days. Drumming was not heard on March 18, 1979, but was heard from April 8 through May 22. I flushed a hen with well-feathered brood at the base of Weir's Glen, only 30 meters or so from where the drainage passes under the railroad tracks, on 28 June, and jumped birds at other times during the fall of 1978. The greatest density of birds was found in edge vegetation near the White Pine Plantation, although drumming birds were found scattered throughout the hardwood forest east of the camp ground, near the Indian Mounds Open Woodland, and around the oldfields. Extensive searching on snowshoes on March 11 and 18 revealed birds only in edge habitat adjacent to the Point Ann Trail near the White Pine Plantation, and on the top of the bluff overlooking the Mississippi River in the extreme southeast corner of the hardwood forest east of the campground. Eleven birds were jumped near the White Pine Plantation, and one very large bird was jumped at the second location (near the overlook). Edge is obviously very important to these birds, both for food and cover, and damage to this habitat would have adverse effects upon grouse numbers in the park.

Other galliform birds were not common within the park. Although turkeys stocked in the Yellow River Forest were reported by Wigal and

Haugen (1968) to be spreading through adjacent Clayton County, no feathers, tracks, sightings, or other signs of these birds were found in Pikes Peak State Park during the study. Since their tracks are conspicuous in snow, and the gobblers are quite obvious during courtship when they vocalize and display, I doubt that these birds inhabit the park. Quail, likewise, were not seen or heard during the study, although they could be more easily overlooked. Pheasants were jumped on several occasions around the White Pine Plantation, and cocks were heard crowing in that area during April and May. A hen with several very small chicks crossed Highway 340 in front of me on June 29, 1979, from brushy habitat on the Pikes Peak side to wooded habitat across the road. My impression was that pheasants were not abundant in the park, probably because most of the habitat is not really excellent for pheasant nesting. They definitely breed in the oldfield habitat within the park, however.

Wood Ducks and Wood Cock.--Two more Iowa game birds were observed nesting on the study area during my work there. Woodcock were observed late enough in the season to appear in Tables 2 and 3, but the several nests of Wood Ducks had already left the park by June 22 transects.

Anderson (1907) called the American Woodcock a "rare breeding bird" throughout the State of Iowa, and Hodges (1949) claimed his nesting record in Scott County was the first published record of the nesting of that bird within the state since 1906. I first encountered a Woodcock on April 18, 1979, when I jumped one several times along the Point Ann Trail where the trail enters woodland north of the White Pine Plantation. The bird scurried

around under the red cedars at that location, and only jumped when he was approached closely. On June 24, 1979, an adult bird with two juveniles was jumped north of that spot, where the Point Ann Trail is crossed by the main stream draining into Weir's Glen. The babies could only flutter a short sistance--less than 15 m. when jumped, and the adult bird feigned a broken wing, leading us down the stream bed a short distance before flying away. The poor flying ability of the fledglings indicated that they must have hatched nearby, and the moist mature woodland in the area would seem to be perfectly suitable as nesting habitat for this well-camouflaged species.

Female Wood Ducks were seen entering nest holes at two locations within the park on April 24, and May 19, 1979. One nest hole was low in the south side of an aspen on the south edge of the picnic area, and the other was in a large, dead oak within 50 m of where the foot trail leading from the visitor's center intersects with the Point Ann Trail. Hein (1965) reported that several clutches of wood duck eggs he examined were started in late March, and resident populations were completed by mid April. The two hens that I saw flew into their nests at dusk, and were probably incubating. The travel of little wood ducklings between nest cavities so far from the Mississippi River, the nearest suitable habitat for growth and development, must be hazardous indeed!

Kentucky Warbler and Yellow-bellied Sapsucker.--Anderson (1907) described the range of the Kentucky Warbler as limited to the southeastern part of the state, where the opinions of local observers rated it from common to rare. Koenig (1976), however, reported a nest of this species

at Effigy Mounds up the Mississippi River from Pikes Peak State Park, so they at least occasionally breed as far north as the study area. On August 5, 1979 Kentucky Warblers were seen for the first time in the Park. A male and a female responded to my squeeking noises by excitedly hopping around in bushes next to the Point Ann Trail where the trail first enters the oldfields north of the Assistant Ranger's house. The birds stayed in the same general area, an old, brushy area containing apple trees and dense brush cover at least 30 feet high, and acted as though they were feeding young (they carried insect larvae in their bills as they hopped around on the branches, in and out of my sight). Although Pikes Peak is beyond the northern extent of their usual breeding range, I believe that these birds were nesting. The habitat appeared similar to that described by Anderson (1907) as typical breeding habitat for this species.

Although Anderson (1907) considered the Yellow-bellied Sapsucker to be a tolerably common breeding bird throughout the State of Iowa, especially in the northern parts of the state, Koenig (1976) listed a nest he found at Effigy Mounds among "unusual nest discoveries." Yellow-bellied Sapsuckers nested both seasons at Pikes Peak (Table 1) and appeared on both Permanent Transects (Table 2) in a variety of wooded habitats (Table 3). An adult with three or four fledglings was seen foraging 100 meters south of Weir's Glen in August, 1978, the young birds being old enough to forage by themselves but the family group remaining intact as is common with woodpeckers (Hadow 1976). The conspicuous and unique drumming of this species was first heard on April 18, 1979, and visual and audible records of this species were

recorded on four more occasions between April 18 and August 6. Since drumming is only done on the breeding territory, and I heard drumming coming from points along the drainage leading to Weir's Glen and islands in the Mississippi River, at least several pairs of these birds had breeding territories in the park in 1979. If these turn out to be an unusual nesting records for the state, it will point up one more reason for considering the state's land holdings in northeastern Iowa as essential for preserving Iowa wildlife.

Mammals

Mammals are much more difficult to locate than birds are, because mammals tend to be more active at night, and because they tend to rely upon chemical communication for advertising territories and locating mates and thus are less obvious to humans who are visually and auditorially oriented. The fact that mammals are difficult to observe, coupled with the related fact that few people who are not professional mammalogists attempt to survey and report the observation of mammals, leads to a less complete picture of the dynamics of Iowa's mammal fauna than of its birds. Bowles recent (1975) publication does an excellent job of summarizing current knowledge of Iowa's mammal fauna, as well as pointing out gaps in that knowledge. His work is the basis for much of this study.

The type of information that I sought for mammals was very much the same sort that I sought for birds. I attempted to assess the current population status of the mammals at Pikes Peak, using quantitative techniques

for small mammals, and qualitative methods for intermediate and larger species. I also attempted to enlarge this list from literature records, and provide information about endangered species.

Methods

Small mammals (insectivores and rodents between the size of Microsorex hoyi and chipmunks) were sampled, using a standard technique developed by John Calhoun for the North American Census of Small Mammals (Calhoun and Casby, 1958). Commonly known as a Calhoun line, this technique employs snap traps set 3 per station, with stations located 50 feet apart. Traps are baited with peanut butter, checked daily, and run for three consecutive nights. Then the line is moved at least 100 feet before trapping is continued. I followed this method in my trapping, using one Museum Special and two regular mouse traps at each station. Tremendous populations of crickets, ants, and other peanut butter-loving arthropods in the area readily ate peanut butter off the baited traps, so I found that I had to check my traps early in the morning to remove the catch before it spoiled, then rebait the traps in the evening. No attempt was made to keep the traps baited and set during the day, so diurnal mammals like chipmunks were caught only by accident and their population densities are not reflected by their frequency in the traps.

A relative measure of the population densities of nocturnal small mammals was derived by calculating the frequency with which they were caught. This decimal, the "trap night index," is calculated by multiplying

the number of traps set by the number of nights that they were set (100 traps set for 3 nights would total 300 trap nights of data) and then dividing this number into the catch. The Trap Night Index does not provide an actual count of the small mammals present at a given time, but is a relative measure. Changes in Trap Night Indexes for a given area at different times, or in different areas are assumed to reflect different population densities, and thus provide a comparison of animal abundances.

No comparable census techniques exist for mammals too large to capture in traps, so assessment of their populations was done subjectively by noting the location of tracks, scats, and visual observations. Tracking snow covered the whole park on March 11 and March 18, 1979, snow which ranged from 18 inches to several feet deep. On those dates, wearing snowshoes, I very thoroughly covered the wood lot east of the campground, the Bridal-Veil Falls-Point Ann Transect, the oldfields in this transect, and wooded habitat on both sides of the trail searching for tracks and noting vegetative communities in which mammals were active. Similar data were recorded for tracks found in mud during the rest of the year, and for scats, tunnels, and other records of mammalian activity.

Results

Because Bowles (1975) range maps may well provide a more reliable estimate of the presence of mammals on the study site than my data does, Table 4 is based upon his maps. In the left column are those species occurring in Clayton County according to Bowles' range maps. If Bowles

Table 4. Iowa mammals which could or do occur in Pikes Peak State Park. Based upon range maps in Bowles (1975 and upon this study.

Family and Species	Spec[1]	Obsv[2]	Evidence	Status and Preferred Habitat
Didelphidae				
Didelphis virginiana	yes	yes	tracks	present
Soricidae				
Sorex cinereus	no	yes	trapped	common in Red oak-Sugar maple forests
U[3] *Cryototis parva*	no	no		may be present in small numbers
Blarina brevicauda	no	yes	trapped	common in certain brushy areas
Talpidae				
Scalopus aquaticus	no	yes	tunnels	common in moist woods and edge
Vespertilionidae				
T[3] *Myotis keeni*	no	no		may be present
myotis licifugus	yes	no		probably common
Lasionycteris noctivagans	no	no		may be present
Pipistrellus subflavus	yes	no		may be present
Eptesicus fuscus	yes	no		probably common
Lasiurus borealis	no	no		may be present
L. cinereus	no	no		may be present
Leporidae				
Sylvilagus floridanus	yes	yes	seen	uncommon, seen along railroad
Lepus townsendii	yes	no		probably not present, certainly not common
Sciuridae				
Tamias striatus	yes	yes	trapped seen	common

Table 4 (cont.)

Family and Species	Spec	Obsv	Evidence	Status and Preferred Habitat
Marmota monax	yes	yes	seen	common along railroad, present in woodlands
Spermophilus franklinii	no	no		probably not present, certainly not common
S. tridecemlineatus	yes	yes	seen	present along Highway 340
Sciurus carolenensis	yes	yes	seen	common throughout park in woodland
S. niger	yes	yes	seen	not so common as gray squirrels, but present
Glaucomys volans	no	yes	seen	present, uncommon
Geomyidae				
Geomys bursarius	yes	yes	burrows	present
Castoridae				
Castor canadensis	no	yes	gnawings	present along Mississippi
Cricetidae				
Reithrodontomys megalotis	no	no		presence is likely
Peromyscus leucopus	yes	yes	trapped	most common small mammal
P. maniculatus	no	no		presence is likely
E3 *Microtus pinetorum*	no	no		presence possible but unlikely
Synaptomys cooperi	no	no		presence possible but unlikely
Microtus ochrogaster	no	yes	trapped	present in Old Field-Plantation
Ondatra zibethicus	yes	no		probably present
Microtus pennsylvanicus	no	no		probably present
Zapus hudsonius	no	yes	trapped	present in most habitats

Table 4 (cont.)

Family and Species	Spec	Obsv	Evidence	Status and Preferred Habitat
Canidae				
Canis latrans	no	no		may be present at times
Vulpes fulva	no	yes	tracks	common
Urocyon cinereoargenteus	no	yes	tracks	less common than red fox
Procyonidae				
Procyon lotor	no	yes	tracks carcasses	common
Mustelidae				
U *Mustela erminea*	no	no		presence is likely
M. frenata	no	yes	tracks	present
M. nivalis	yes	no		presence is likely
M. vison	no	yes	tracks	present
Taxidae taxus	yes	no		presence likely, not common
U *Spiligale putorius*	no	no		presence likely, but not common
Mephitis mephitis	yes	yes	seen carcass	present in a variety of habitats
T *Lutra canadensis*	no	no		possibly present as a transient
Felidae				
E *Lynx rufus*	yes	no		presence possible, but not likely
Cervidae				
Odocoileus virginianus	yes	yes	seen tracks	common, typically in brushy areas and Old Field

Table 4 (cont.)

Family and Species	Spec	Obsv	Evidence	Status and Preferred Habitat
Muriidae				
Mus musculus	no	no		not common, certainly
Rattus norvegicus	no	no		presence is likely, probably not common

1/ Museum specimens of these species were located by Bowles (1975).

2/ Evidence that these mammals currently exist at Pikes Peak State Park was discovered during the study. The type of evidence is listed in the next column.

3/ E=Endangered, T=Threatned, U=Undetermined status; Roosa (1977).

(1975) indicated the presence in museums of specimens of that species from Clayton County, this was noted in the "Spec." column. Columns to the right indicate whether or not the species was actually observed by me on the study area ("Obs."), the type of evidence, and the observed or likely status of this species on the study area.

Twenty-three of the 48 species which could occur on the study area were actually observed during the study (Table 4). This number could most likely be increased considerably if the bat and weasel families were systematically studied. Large numbers of bats were conspicuous as they hunted over the railroad tracks near Weir's Glen evenings in late June and August, bats which most likely included Myotis lucifugus and Eptesicus fuscus, the Little and Big brown bats respectively, but Pipistrellus has been collected in Clayton County, and the other species listed might well occur there also. It would be nice to interest some graduate student in doing some mist netting systematically within the park, especially since Myotis sodalis has been reported wintering in Dubuque County (Muir and Polder, 1960) and might be present in limited numbers farther north. Some of the smaller weasels might also be present, since Mustela rixosa (=nivalis) were reported by Poulder (1968) to "most likely be present in every cultivated section of northeast Iowa."

It is frustrating to interpret negative data of the sort which is so abundant in this section on mammals and will be even more prevalent in the section on amphibians and reptiles, since it would only take one observation to prove the existence of a species in the park, but an infinite number of

negative observations to disprove their presence. I feel that Franklin ground squirrels (Spermophilus franklini were most likely not on any of the sites that I observed, even though Polder (1965) found them somewhere in Clayton County, and felt that they were most likely present in all counties within the state. These animals have conspicuous burrows with soil mounded at the entrance (Poulder, 1965), and these were seen nowhere in the park. The animals are also quite conspicuous and diurnal, and I would most likely have seen them if they were present. Since they prefer the interface between low, wet soils under Spartina and soils formed under Andropogon (Poulder, 1965) or hay fields, oat fields, or adjacent weedy fence rows the habitat is most likely too advanced in succession to support these animals in the oldfield habitats within Pikes Peak State Park. Likewise, 13-lined ground squirrels (Spermophilus tridecimlineatus), common along mowed roadsides and areas that are overgrazed, would most likely find the oldfield habitat too advanced for their needs even though they do occur along Highway 340 on the western edge of the park (Table 1). The lack of these mammals in the park could make the habitat unfavorable for several mustellids. Badgers (Taxidea taxus) prey upon ground squirrels, using them as a major prey source (Nugent and Choate, 1970) and Spotted Skunks (Spilogale putorius) and Long-tailed Weasels (Mustela frenata) use Franklin ground squirrel burrows as preferred den sites (Poulder, 1968). While I did see Long-tailed Weasel tracks in the snow at several points, I found no evidence of the presence of Spotted Skunks. I spent enough time in the old fields in late afternoon and evening so that I should have seen them if

they were numerous.

Coyotes (Canis latrans) and Bobcats (Lynx rufus) undoubtedly inhabit heavily wooded areas of Clayton County close to the park, and they may even use the park as part of their extensive home ranges at times. I am certain that I did not see the tracks of either species during my snow shoe surveys in March, and I never heard coyotes howling during the study. The presence of such concentrated human activity as exists on the Mississippi River during the summer, and in the camping and picnicking areas within Pikes Peak may discourage these shy animals, especially since there are no large concentrations of ground squirrels or cottontails within the park boundaries to attract them.

I had hoped to take Least Shrews (Cryptotis parva) in the park, since it is on Roosa's "undetermined status" list (1977) and it would be interesting to know more about this mammal in Iowa. I trapped rather extensively in suitable habitat ("grassy, weedy, and brushy fields in the northern part of its range," Whitaker Jr., 1974) but found no individuals of this species. Whitaker Jr. points out (1974) that these shrews turn up more abundantly in owl pellets and carnivore scats than their limited occurrence in traps would predict, which suggests that they might be less trap prone than other shrews. Several of the Masked Shrews (Sorex cinereus) that I took were captured by their tails only, and it is easy to believe that the shorter-tailed Least Shrews might be more often missed by traps than would the longer-tailed Masked Shrews. Owl pellets should be examined if they are found within the park, since they might provide a better

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documentation of these shrews than would trapping data. Suitable habitat appears to exist, these shrews may well be present within the park's oldfields.

It was also surprising not to take Reithrodontomys megalotis and Microtus pennsylvanicus since these mammals are widespread in distribution, are taken by standard trapping methods, and suitable habitat for them appears to be present in the edge communities and oldfields along the Point Ann Trail. Bowles (1975) considers M. pennsylvanicus to be more common than M. ochrogaster in northern Iowa. He did discuss one location where M. ochrogaster was more prevalent than M. pennsylvanicus in northern Iowa earlier in this century, but their status reversed between then and now. Miller (1954) reported Reithrodontomys restricted to old fields and short grass where the soil surface is exposed over much of the area, and Sloan (1964) took 7 out of 8 Reithrodontomys from grassy areas along railroads. Precisely this sort of habitat is not found on the study area, and this might explain the lack of these harvest mice in my trapping data. I suspect that both M. pennsylvanicus and R. megalotis are present within the park, and that more trapping in a greater variety of habitats would reveal their presence.

Peromyscus maniculatus prefers weedy oldfield habitats (Hoslett, 1961; Sloan, 1964), and their descriptions of sites where these deer mice were abundant seems to match habitats that I trapped on my oldfield trap-lines. Yet I took no individuals of either Peromyscus species during my oldfield trapping (Table 5). All individuals of Peromyscus taken along

Table 5. Frequency (catch per trap night) of six small mammal species at Pikes Peak State Park in six plant communities.

Habitat Types[1]	# trap nights	Peromyscus leucopus	Microtus ochrogaster	Blarina brevicauda	Sorex cinereus	Zapus hudsonius
Edge (east side of railroad tracks)	490	0.071	0.002	0.018	--	--
Woodland	90	0.100	--	--	--	--
Oak-Hickory	63	0.016	--	--	--	--
Red Oak-Sugar Maple	701	0.043	--	0.003	0.007	0.003
Old Field	422	--	0.005	--	--	0.005
Edge (White pine plantation)	15	--	0.133	--	--	--
Totals	1781	0.037	0.003	0.006	0.003	0.002

1/ Follows Christiansen's designation in other parts of this report.

White-tailed Deer (Odocoileus virginianus).--Protection from hunting, and oldfields succeeding have made portions of the park marvelous deer habitat, and there are large numbers of deer within the park's boundaries. Deer were seen at many locations while walking the Bridal Veil Falls-Point Ann Transect, browsing around the edges of the oldfields in the evening, and they sometimes were seen crossing Highway 340 while I was driving to the park from McGregor. Tracks in the soft dirt of the trail indicated that deer used virtually all of the park as range during the summer, spring, and fall; but track walking in early March, when the snow was still very deep, suggested that the deer had concentrated in open oldfield habitats and on the east-facing bluffs overlooking the Mississippi River where snow melts early. On March 18 I found no tracks of deer in the woodlot between the camp ground and the Mississippi River, or crossing the Bridal Veil Falls-Point Ann Trail, until I reached the drainage leading to Weir's Glen. There I found deep trails leading from the brushy woodland out to the oldfields south of the Ranger's home. Deer tracks were abundant in the oldfields north of the Ranger's home. Deer tracks were abundant in the oldfields north of the Ranger's home, and deep trails entered these oldfields from the Oak-Hickory woods on their eastern and northern edges. There were also deep trails cut in snow on the bluffs facing the Mississippi River, and I once saw a herd of 15 deer browsing on the bluff directly west of Commodore's Roost. Fresh tracks in melting snow indicated that deer used the trails just described while I was walking my bird transects of 18 March. Generally the range seems to be in good shape, and there were few signs of overbrowsing.

Browsing damage was conspicuous on little mulberry trees populating the eastern edge of the oldfields along the Point Ann Trail. Here branches up to 1/8 inch diameter had been eaten during the winter. These mulberry trees, because of this heavy browsing, formed tight, compact bushes of only 3 or 4 feet height. Buck rubs in sumacs at the edge of those same oldfields, many sightings of deer in that area, and many beds indicated that this was important deer habitat throughout the year, and especially during winter. I am not suggesting that there is a problem of overpopulation at this time, but those wintering areas might be watched for greater sign of overbrowsing in the future. The importance of these locations as winter habitat suggests that any development which would alter the successional nature of the old-field edges would impact upon the deer herd in the park.

Fox, gray, flying, and red squirrels (Sciurus niger, S. carolinensis, Glaucomys volens, and Tamiasciurus hudsonicus)--Unlike much of Iowa where I have observed squirrels, Gray squirrels are the dominant species in the park. I saw Gray Squirrels often while walking bird transects: in the hardwood forests between the camp grounds and the Mississippi River, in woodlands along the Point Ann Trail, and in virtually all forested areas that I studied. I only saw Fox squirrels in one location: in the woodland adjacent to the clearing surrounding the Ranger's house. The forest is quite open on those ridges, and some very large, old oaks and maples filled with holes provide denning spots for the squirrels at that location. Since gray squirrels favor denser, more mature forest, while fox squirrels prefer the edge and fence rows or other more open habitat, these findings are not

surprising.

I found no evidence of Red Squirrels during my study, even though I looked for middens, nests, and tracks in the snow. These provide conspicuous evidence where red squirrels are abundant. Lynch and Folk Jr. (1968) sought these squirrels unsuccessfully in the Yellow River Forest of Allamakee County to the north, and in Dubuque County to the south, and Bowles (1975) felt that they were limited to portions of the state more western and southern than Allamakee and Clayton counties.

Nests of flying squirrels (Glaucomys volans) were encountered at several locations within the park: in old woodpecker holes southwest of the campground, in a woodduck nest box in flood plain forest, and in hardwood forest north of the Visitor's Center. These crepuscular and nocturnal animals are less conspicuous than the diurnal squirrels, and other nests most likely escaped detection during the study.

Racoon (Procyon lotor).--Although we tend to take large populations of racoons pretty much for granted, Sanderson (1951) depicted a major increase in racoon population densities that was not caused by reduced hunting pressure during the 2nd World War or by declining fur prices at that time. Racoon tracks were abundant along the drainages and within flood plain forests in the park, and large numbers of these animals are present. The abundance of frogs and toads, as well as mulberries, chokecherries and apples along the Point Ann Trail are components of good racoon habitat. Many old, dead hardwoods with hollow cores provide den sites for these animals, and tracks in the snow on 18 March indicated a den close to where

the foot trail and Point Ann Trail intersect. On 29 June I surprised two dogs, one a blue tick hound with a brown right ear, and the other a whiteish animal of mixed breed worrying the carcasses of two small racoon cubs close to that spot. The cubs were still warm, and had not yet stiffened, so undoubtedly the dogs had killed them just before my arrival. I saw little evidence of free-running dogs during my study, but this incident illustrates the damage that such animals can do to wildlife.

Woodchuck (Marmota monax).--Woodchucks were quite common in the park, and at one time or another I saw these animals along the railroad tracks, at the eastern edge of the mowed clearing surrounding the Assistant Ranger's house, and in woodland just east of the Ranger's house. Young were observed at all these locations either in 1978 or 1979, and since Trump (1950) found that the longest dimension of a young woodchuck's home range averaged only 96 yards, they surely bred in dens at those spots.

Short-tailed Shrews, Masked Shrews, and Microtus ochrogaster.--Platt and Blakely (1979) described an interesting interaction between populations of Blarina, S. cinereus, and M. ochrogaster, which my trapping observations seem to reveal also. They found that Sorex numbers were large only if Blarina numbers were small, and found that these two insectivore species fed upon many of the same medium to large-sized invertebrates. These observations suggested that Blarina dominated Sorex in competitive interactions, and the larger short-tailed shrews held the smaller masked shrew's populations in check. After Microtus populations crashed near the Lakeside

Laboratory, Blarina populations crashed also, and Sorex numbers increased. Platt and Blakely suggested (1979) that the Blarina decline was caused by the vole population crash, since short-tailed shrews are known to kill and eat voles (e.g. Martinsen, 1969). I only once took both shrew species in the same area, taking a Blarina one night in the drainage adjacent to Weir's Glen, and a Sorex cinereus in the same trap the following night. This was an area advanced in succession, with elms and locusts of 30-40 feet height covering a dense touch-me-not and nettle under story. Otherwise, I found Blarina only in brushy habitats, and Sorex in mature forest with little or no understory (Table 4). These habitat-preference descriptions are supported by the observations of Dueser and Shugart (1979) as well. I took no voles from areas in which I trapped Blarina either, except along the railroad tracks. There I took Blarina but not Microtus in 1978, and Microtus but not Blarina in 1979. The samples were too small to feel very confident about the results, but they may suggest that the fate of Blarina populations affect populations of the other two species at Pikes Peak, just as has been suggested in these other studies.

REPTILES AND AMPHIBIANS

This part of my study is least complete because these animals are less conspicuous than birds or mammals; the habitat is very dense within the park, which makes for difficult observation; and there were no standardized sampling methods which seemed appropriate for the park's habitat. This left observations of these "herptiles" pretty much to chance.

Habitats within the park are not as favorable to large herptile diversity as they are for birds or mammals. There are no intermittent ponds of the sort favored by breeding amphibians of Hylidae, Ambystomadae, or Salamandridae, and pools along the intermittent drainages in the woodlands within the park were not found to hold tadpoles when these were studied throughout the summer. This left the Mississippi River as the only amphibian breeding habitat, and limits most of the park to summer range for these animals. Terrestrial habitats in the park do not contain marshy or swampy areas, and there are no sandy prairie spots either, so the reptilian fauna is most likely limited to turtles and snakes which favor big water, or snakes and lizards which are either woodland forms or tolerant of a wide range of habitats. Even with these restrictions, however, the reptiles and amphibians were not sampled sufficiently to reveal a number of species which are most likely there, and observations in the future will most likely add greatly to the findings of this study.

Results and Discussion

Table 6 was compiled from those species of reptiles and amphibians whose ranges were shown by Conant and Conant (1975) to include Clayton County, and since the discriminating ability of range maps is not sufficient to reveal habitat preferences within a geographical area, this list is probably too large. The discrimination of Table 6 is improved by the right-hand column which lists appropriate habitats for all species, and the likelihood that species which I did not find there actually occur at Pikes Peak

Table 6. Reptiles and Amphibians potentially or actually present at Pikes Peak State Park, based upon range maps in Conant and Conant (1975) and upon this study.

Family and Species	Obsv[1]	Habitat
Chelydridae		
Common Snapping Turtle *Chelydra serpentina*	no	likely present, any permanent water
Emydidae		
False Map Turtle *Graptemys pseudogeographica pseudogeographica*	no	likely present, large rivers
Quachita *Graptemys pseudogeographica quachitensis*	no	likely present, large rivers
Map Turtle *Graptemys geographica*	no	likely present, large rivers
Western Painted Turtle *Chrysemys picta belli*	yes	common in mud-bottomed waters
Blanding's Turtle	no	unlikely; lakes, bogs, marsh, stream
Box Turtle *Terrapene ornata*	no	very unlikely, sand areas
Trionychidae		
Smooth Softshell Turtle *Trionyx muticus*	no	likely present, rivers and streams
Spiny Softshell Turtle *T. spiniferus*	no	likely; rivers, but also in lakes less commonly
Scincidae		
Five-lined Skink *Eumeces fasciatus*	no	may be present, damp woodland with rotting stumps
Teiida		
Six-lined Racerunner *Chemidophorus sexlineatus*	no	may be present; fields, open woods with loose soil
Anguidae		
Western Slender Grass Snake *Ophisaurus altenuatus*	no	very, unlikely, dry grassland and woods

Table 6 (cont.)

Family and Species	Obsv	Habitat
Colubridae		
Northern Water Snake *Natrix sipedon*	yes	river shoreline
Eastern Garter Snake *Thamnophis sirtalis*	no	likely present; meadows, marshes, woodlands, streams
Plains Garter Snake *T. radix*	no	likely present; river valleys, near prairie ponds
Western Ribbon Snake *T. proximus proximus*	no	likely present; semi-aquatic, remains close to streams, ditches
Northern Red Bellied Snake *Storeria occipitomaculata occipitomaculata*	no	Likely present; open woods, sphagnum bogs
Midland Brown Snake *S. dekayi wrightrum*	no	likely present; widespread woods, marshes, swamps
Texas Brown Snake *S. dekayi texana*	no	Widespread woods, marshes, swamps
Eastern Hognose Snake *Heterodon platyrhinos*	no	may be present; sandy areas with an abundance of frogs
Prairie Ringneck Snake *Diadophis punctatus*	yes	rocky woodland, along bluffs on eastern edge of park
Western Green Snake *Opheodrys vernalis blanchardi*	no	wide habitat range preference; grassy, moist meadows
Blue Racer *Coluber constrictor foxi*		prairies, open woods, open habitat
Bull Snake *Pituophis melanoleucus sayi*	no	likely present; woods, stream valleys, farmlands
Western Fox Snake *Elaphe vulpina vulpina*	no	may be present; various, woodland to plains
Black Rat Snake *E. obsoleta*	no	may be present; various, woodland to plains
Eastern Milk Snake *Lampropeltis triangulum triangulum*	no	lilely present; fields, woodlands, open hillsides, river bottoms
Crotalidae		
Eastern Massasauga *Sistrurus catenatus*	no	unlikely, wet prairie marsh
Timber Rattlesnake *Crotalus horridus horridus*	no	likely present; brushy second-growth timber, rocky ledges

Table 6 (cont.)

Family and Species	Obsv	Habitat
Necturidae		
Mudpuppy *Necturus maculosus*	no	likely present; muddy, weed-choked water
Salamandridae		
Central Newt *Notophthalmus viridescens*	no	unlikely; woodland ponds, river bottom
Ambystomidae		
Eastern Tiger Salamander *Ambystoma tigrinum tigrinum*	no	likely present; permanent water, ponds
Bufonidae		
American toad *Bufo americanus americanus*	yes	all habitats, abundant
Hylidae		
Northern Spring Peeper *Hyla crucifer*	yes	moist woodland, pond
Gray Tree Frog *H. versicolor*	no	may be present in wooded areas, summer
Western Chorus Frog *Pseudocris triseriata triseriata*	no	may be present in summer; agricultural lands, prairies
Northern Cricket Frog *Acris crepitans crepitans*	no	may be present in summer; upland frog
Ranidae		
Green Frog *Rana clamitans melanota*	no	likely present; small streams, brooks
Bull Frog *R. catesbeiana*	yes	heard along river edge
Northern Leopard Frog *Rana pipiens*	yes	captured in woods
Pickeral Frog *R. palustris*	no	may be present; rocky ravines, grassy fields

1/ no=not observed, yes=observed or captured during field work

State Park at the present time.

Of the 41 species whose range maps include Clayton County (Conant and Conant 1975) only 7 were actually encountered from August 5, 1978 through August 6, 1979. With only one exception, these were species which could be considered common in the area. This one exception was a large, male Northern Spring Peeper which blundered into a snap trap, and thus found its way into the Coe College collection. This animal was taken in Red Oak-Sugar Maple habitat east of the foot trail near its intersection with the Point Ann Trail. There was very little ground cover under a dense canopy at this site, making this area fit the "moist woodland" described as this species' summer habitat. I doubt that this, the only threatened or endangered herptile (Roosa, 1977) found during this study, actually breeds within park boundaries because of the dirth of ponds inside the park.

Northern leopard frogs and American toads were very abundant throughout the area in summer, being found in all habitats from the Mississippi River flood plain to the old fields along the Point Ann Trail. Toads were often caught in snap traps set along the railroad tracks, and were caught in Red Oak-Sugar Maple forest as well. The rapid increase in Leopard frog numbers in the woodland during July seem similar to the emigrations described by Bovbjerg and Bovbjerg (1964) at Lakeside Laboratories in northwestern Iowa.

Timber rattlesnakes and Five-lined Skinks.--Of the herptile species which could likely occur on the study area but were not located during this study, these two deserve comment: the first because of its importance to

hikers using the parks trails, and the second because of its endangered status and its preference for moist woodlands of the sort abundant within park boundaries.

Timber rattlesnakes almost certainly are present within the park, since its limestone cliffs and wooded habitats would seem perfect habitat for these reptiles. None-the-less, extensive searching along the bluffs throughout the summer specifically for timber rattlesnakes failed to reveal a single individual, as did much wandering throughout the park while walking bird transects or trapping mammals. Newspaper clippings from the Prairie du Chien newspaper indicated that residents of that community were alarmed at the increase in timber rattlesnake numbers during spring and summer 1979, brought about, they said, because people were reluctant to kill rattlesnakes for fear of killing the endangered Eastern Massasauga. I would be surprised if there are no timber rattlesnakes within park boundaries, but their numbers are apparently so small that they constitute no threat at this time.

Five-lined Skinks, were particularly sought because of their inclusion on Roosa's (1977) threatened list, and because they are noted by Conant and Conant (1975) as occurring in moist woodlands with rotted stumps along the Mississippi River in northeastern Iowa. Although many stumps and logs were turned over searching for this species, no individuals were found. The habitat certainly seems suitable for these animals, and hopefully they are present within the park's boundaries.

ENDANGERED VERTEBRATES AT PIKES PEAK

Vertebrates on Roosa's list (1977) for Iowa, the Federal Endangered Species List, and the American Birds Blue Lists have been discussed at length in preceding sections of this report, and will only be briefly summarized here. Only one Federally-endangered species was located during this study (the Bald Eagle); but 6 additional bird species on Roosa's (1977) listing for Iowa were found (Cooper's Hawk, Broad-winged Hawk, Black-billed Cuckoo, Bell's Vireo, Blue-winged Warbler, and Yellow-warbler). Red-headed and Hairy woodpeckers, Yellow-billed Cuckoos, Warbling Vireos, Ruby-throated Hummingbirds, Purple Martins, and Common Night Hawks all are summer residents at Pikes Peak and on Arbib's Blue List for 1979(1978). The status of these birds was discussed in the bird section of this report. The only mammal actually found in the park which appears on Roosa's (1977) list was the long-tailed weasel, but least shrews, Indiana bats, pine voles, ermine, spotted skunks, river otters, and bobcats may be present but undetected. Spring peepers were the only herptiles on Roosa's (1977) Iowa list actually found in the park, but five-lined skinks may well be there. Hopefully reports of the presence of some of these other species will accumulate, as interested visitors walk the park's trails in years to come.

LITERATURE CITED

Anderson, R. E. 1907. The birds of Iowa. Proc. Iowa Acad. Sci. 11:125-147

Aribib, R. 1978. The blue list for 1979. American Birds 32:1106-1113.

Bock, C. E. 1970. The ecology and behavior of the Lewis woodpecker (Asyndesmus lewis). Univ Cal. Pub. Zool. 92:1-100.

Bovbjerg, R. V. and A. M. Bovbjerg. 1964. Summer emigrations of the frog Rana pipiens in northwestern Iowa. Proc. Iowa Acad. Sci. 71:511-518

Bowies, V. B. 1979. Distribution and biogeography of mammals of Iowa. Special Publication no. 9. The Museum, Texas Tech. Press, Lubbock, TX.

Calhoun, J. B. and J. V. Casby. 1958. Calculation of home range and density of small mammals. Public Health Monograph no. 55. U. S. Dept. of Health, Education and Welfare, Washington D.C. 24p.

Conat, R. and I. H. Conat. 1975. A field guide to reptiles and amphibians of Eastern and Central North America, 2nd Ed. Houghton Mifflin Co., Boston. 429 p.

Cottam, G. and J. T. Curtis. 1949. A method for making rapid surveys of woodlands by means of pairs of randomly selected trees. Ecology 30: 101-104.

_____. 1956. The use of distance measures in phytosociological sampling. Ecology 37:451-460.

Daubenmire, R. 1959. A canopy-coverage method of vegetational analysis. Northw. Sci. 33:43-64.

Davis

Dueser, R. D. and H. H. Shurart, Jr. 1979. Niche pattern in a forest-floor small-mammal fauna. Ecology 60 (1):108-118.

Franzreb, K. E. 1976. Comparison of variable strip transect and spotmap methods for censusing avian populations in mixed coniferous forests. Condor 78:260-262.

Hadow, H. H. 1976. Growth and development of nestling Downy woodpeckers. North Am. Bird Bander 1:155-164.

Hartley, T. 1962. The flora of the "Driftless Area". Ph.D. Dissertation,

Hartley, T. 1962. The flora of the "Dristless Area". Ph. D. Dissertation, University of Iowa Libraries, Iowa City Iowa.

Hein, D. 1965. Spring wood duck population of the Mississippi River pool 10. Proc. Iowa Acad. Sci. 72:218-223.

Hodges, J. 1949. Notes on the bird life in the Mississippi valley. Proc. Iowa Acad. Sci. 56:343-345.

Hosielt, S. A. 1961. Effects of floods on ammmal distribution. Proc. Iowa Acad. Sci. 68:260-270.

Jackson, J. A. 1976. A comparison of some aspects of the breeding ecology of Red-headed and Red-bellied Woodpeckers in Kansas. Condor 78: 67-76.

Kilham, L. 1958. Sealed-in winter sources of Red-headed Woodpeckers. Wilson Bulletin 70:107-113.

Kilham, L. 1979. Three week vs. 4-week nestling periods in Picaides and other woodpeckers. Wilson Bulletin 91:335-338.

Koch, D. L., J. C. Prior and S. J. Tuthill. 1973. Geology of Pikes Peak State Park. Unpublished Report of Iowa Geological Survey, 16 June, 1973.

Koenig, D. 1976. Some unusual nest discoveries. Iowa Bird Life 46(1): 19-20.

Koenig, D. 1977. Winter population trends of woodpeckers in Iowa. Iowa Bird life 47:75-92.

Klonglan, E. D. and G. Hlauka. 1969. Recent status of Ruffed Grouse in Iowa. Proc. Iowa Acad. Sci. 76:231-240.

Koplin, J. R. 1969. The numerical response of woodpeckers to insect prey in a subalpine forest in Colorado. Condor 71(4):436-437.

Koplin, J. R. and P. H. Baldwin. 1970. Woodpecker predation on an endemic population of engelmann spruce beetles. Am. Midland Naturalist. 83(2):510-515.

Kopp, R. A. and Willis. 1974. Paleozoic rocks of the Eau Claire Area. In Myers, P. E., Guidebook for 38th Annual Tri-state Geological Field Conference. University of Wisconsin-Eau Claire, Eau Claire, Wisc.

Kuchler, A. 1964. Potential natural vegetation of the counterminous United States. Special Publication #36, American Geographical Society, New York.

Lees, J. H. 1933. Northeastern Iowa. Iowa Journal of History and Politics. January. State Historical Society, Iowa City, Iowa

Lynch, G. R. And G. E. Folk, Jr. 1968. Distribution and habitat of the red Squirrel Tamiascirurs hudsonicus, in the North Central States. Proc. Iowa Acad. Sci. 75:463-466.

Martin, L. 1932. The physical geography of Wisconsin. Washington Geological and Natural History Bulletin 36, pp.69-79.

Martinsen, D. L. 1969. Energetics and activity patterns of short-tailed shrews (Blarina) on restricted diets. Ecology 50(3):505-510.

Miller, L. S. 1954. The present status of systematic mammalogy in Iowa with some notes on recent mammal collecting within the state. Proc. Iowa Acad. Sci. 61:556-560.

Muir, T. J. and E. Polder. 1960. Notes on hibernating bats in Dubuque County caves. Proc. Iowa Acad. Sci. 67:602-607.

Nugent, R. F. and J. R. Choate. 1970. Eastward dispersal of the badger, Taxidae taxus, into the Northeastern United States. J. Mammal. 51: 626-627.

Oosting, H. 1956. The study of plant communities, 2nd ed. W. H. Freeman and Co. San Francisco, CA. 440p.

Pettijohn, F. J. 1975. Sedimentary rocks, 3rd ed. Harper and Row.

Plah, W. V. and N. R. Blakley. 1979. Short term effects of shrew predation upon invertebrate prey. Proc. Iowa Acad. Sci. 80:60-66

Polder, E. 1953. A check list of mammals of present occurrence in Iowa with notes on new additions and distribution since 1937. Proc. Iowa Acad. Sci. 60:716-724.

Polder, E. 1965. Vertebrate coactions with the Franklin Ground Aquirrel. Proc. Iowa Acad. Sci. 72:202-206.

Polder, E. 1968. Spotted Skunk and weasel populations den and cover usage by northeast Iowa. Proc. Iowa Acad. Sci. 75:142-146.

Prior, J. C. 1976. A regional guide to Iowa landforms. Iowa Geological Survey Educational Series 3. Iowa Geological Survey, Iowa City.

Robbins, C. S., B. Brown and H. S. Zim. 1966. Birds of North America. Golden Press, New York, 340 p.

Roosa, D. M. 1977. Endangered Iowa amphibians and reptiles. Special Report no. 3, Iowa Preserves Advisory Board, Wallace Building, Des Moines, Iowa.

_____. 1977. Endangered Iowa birds. Special Report No. 1, Iowa Preserves Advisory Board, Wallace Building, Des Moines, Iowa.

_____. 1977. Endangered Iowa Mammals. Special Report No. 2, Iowa Preserves Advisory Board, Wallace Building, Des Moines, Iowa.

Roosa, D. M. and L. Eilers. 1978. Endangered and threatned Iowa vascular plants. Special Report No. 5, Iowa Preserves Advisory Board, Wallace Building, Des Moines, Iowa.

Sanderson, G. C. 1951. The status of the raccoon in Iowa for the past twenty years as revealed by fur reports. Proc. Iowa Acad. Sci. 58:527-531.

Ruhe, R. V. 1969. Quaternery landscapes of Iowa. Iowa State University Press, Ames, Iowa. 252 p.

Sloan, R. L. 1964. A study of the small rodents of Black Hawk County, Iowa (1961-1962). Proc. Iowa Acad. Sci. 71:519-525.

Spring, L. W. 1965. Climbing and perching adaptations in some North American woodpeckers. Condor 67:457-488.

Steinhiller, W. L., O. J. Van Eck and A. J. Ferlner. 1961. Geology and ground water resouvoirs of Clayton County, Iowa. Iowa Geological Survey Water Supply Bulletin No. 7. Iowa Geological Survey, Iowa City 142 p.

Trump, R. G. 1950. Home range of the Southern Woodchuck. Proc. Iowa Acad. Sci. 57:537-540.

Whitaker, J. O. Jr. 1974. Crytotis parva. Mammalian Species 43:1-8.

Wigal, D. D. and A. O. Haugen. 1968. Survival, reproductive success, and spread of introduced Rio Grande trukeys in Northeast Iowa. Proc. Iowa Acad. Sci. 75:130-141.

Witzbe, B. 1979. Personal communication.

APPENDIX 1.

Life Modes and Habitats of Pikes Peak/Point Ann State Park Fossils

The fossils present in the lithologies exposed in the park represent a typical series of marine associations and present a taxonomic problem.

The problem has to do with the affinities of the genus Receptaculites. At one time or another, this form has been placed with the corals, the sponges, the Pleosponges, "forms with uncertain affinities", and presently with the algae. Although its taxonomic position is problematic, its habitat has been established. Its marine life-environment has been determined by virtue of its fossil and lithologic associations.

The corals, represented in all of the fossiliferous units in the park, are also marine forms. The modern corals are typical of warm, clear, and fairly shallow normal marine environments. The more massive forms require a firm substrate to establish themselves, but the smaller forms can live on mud bottoms. It is assumed that their ancient counterparts indicate similar habitats.

The Brachiopods, probably the most abundant phylum represented in the park, are likewise marine, benthic forms. The diversity of forms preserved in the park indicates a broad range of depth, energy, salinity and bottom conditions.

The gastropods are a highly diverse group found in marine, freshwater, and terrestrial habitats. The forms collected in the park, however, are marine.

The crinoids are exclusively marine ranging from shallow, moderate-to-high energy environments (eg. reefs), to deeper and/or quieter water. The sessile suspension feeders require clear water and at least enough wave or current activity to supply them with the food and oxygen they require.

The trilobites were marine, benthic forms which lived in a broad range of energy levels, depths and bottom types.

The Bryozoans are another diverse phylum with fresh water as well as marine representatives. The forms found in the park are marine types associated with the corals and are assumed to have preferred the same shallow, clear, warm seas.

APPENDIX 2

List of Specimens Collected and Identified by Formation and Mmeber

Galena fm.
- Prosser mbr.
  - Affinities unknown
    - *Receptaculites* sp.

Dechora fm.
- Ion mbr.
  - Corals
    - *Streptelasma corniculum*
  - Brachiopods
    - *Prionodenia minnesotensis*
    - *Prionodenia subaequata*
    - *Plectorthis plicata minnesotensis*
    - *Hesperorthis tricenaria*
    - *Strophomena* sp.
    - *Dinorthis pectinella*
    - *Glyptorthis bellarugosa*
  - Gastropoda
    - *Hormotoma trentonensis*
  - Bryozoa
    - *Prasopora* sp.
- Guttenberg mbr.
  - Corals
    - *Streptelasma corniculum*
  - Brachiopoda
    - *Doleroides pervetus*
    - *Hesperorthis tricernaria*
    - *Rafinesquina trentonensis*
    - *Rhynchotrema minnesotensis*
    - *Sowerbyella punctostriata*
    - *Strophomena vicina*
  - Bryozoa
    - *Homotrypa minnesotensis*

Appendix 1 (cont.)

Echinoderms
Crinoid columnals

Trilobites
Ceraurus pleurexanthemus

Spechst's Ferry mbr.
Brachiopods
Homotrypa minnesotensis
Pionodenia subaequata
Rafinesquina alternata
Strophomena sp.

Gastropods
Hormotoma sp.
Lophospira sp.

Platteville fm.

Brachiopods
Doleroides pervatus
Hesperorthis tricenaria
Prionodema subaequata
P. minnesotensis
Rafinesquina alternata
Rhynchotrema incrobescens minnesotensis

Gastropods
Bellerophon troosti
Loxoplocus bowdeni

Bryozoa
Homotrypa minnesotensis

Echinoderms
Crinoid columnals

Trilobites
Calliops callicephala
Ceraurus pleurexanthemus
Isotelus gigas

APPENDIX 3

A Listing of the Vascular Flora Observed

Table A3. Species List

x= present

*=not native

	PLANT COMMUNITIES[1]													
	SM-Bw	RO-SM	RO-SM WO	O-H	St S	Fl P	O Wl dist	O Wl mow	OF-G	OF-E	OF-A	OF-P	Pr O	RoW
LYCOPHYTA														
Lycopodiaceae														
Lycopodium lucidulum shining clubmoss		x	x											
ARTHROPHYTA														
Equisetaceae														
Equisetum arvense horsetail									x	x	x			
E. hyemale scouring rush	x								x	x	x			
PTEROPHYTA														
Ophioglossaceae														
Botrychium virginianum rattlesnake fern		x	x	x	x									
Osmundaceae														
Osmunda claytoniana interrupted fern				x										x
Osmunda regalis royal fern				x										
Polypodiaceae														
Adiantum pedatum maidenhair fern	x	x	x	x										
Athyrium felix-femina lady fern	x	x	x	x	x	x								
A. thelyptroides				x		x								

1/ Plant Community Key: SM-Bw=Sugar Maple-Basswood; RO-SM=Red Oak, Sugar Maple; RO-SM-WO= Red Oak, Sugar Maple, White Oak; O-H= Oak-Hickory; St S= Streamside; Fl P=Floodplain; O Wl-dist=Open Woodland-disturbed; O Wl-mow=Open Woodland-Mowed; OF-G=Old Field-Grassy; OF-E= Old Field-Early; OF-A=Old Field-Advanced; OF-P=Old Field-Plantation; Pr O= Prairie Opening; ROW= Right-of-Way

Table A3 (cont.)

	SM-Bw	RO-SM	RO-SM WO	O-H	St S	Fl P	O WL dist	O WL mow	OF-G	OF-E	OF-A	OF-P	Pr O	RoW
Cystopteris bulbifera bladder-fern	x	x	x											
C. fragilis fragile fern					x									
Polypodium vulgare polypody			x											
Pteridium aqualinum bracken fern											x			
Woodsia obtusa large woodsia	x	x	x											
CONIFEROPHYTA														
Cupressaceae														
Juniperus virginiana eastern red-cedar										x	x		x	
Pinaceae														
Pinus nigra Austrian pine												x		
P. strobus white pine				x								x		
Taxaceae														
Taxus canadensis Canadian yew		x												
ARTHROPHYTA														
Monocotyledonae														
Araceae														
Arisema triphyllum Jack-in-the-pulpit	x	x	x	x	x	x								
Cyperaceae														
Carex sp. sedge	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Carex albursina		x	x											

Table A3 (cont.)

	SM-Bw	RO-SM	RO-SM WO	O-H	St S	Fl P	O WL dist.	O WL mow	OF-G	OF-E	OF-A	OF-P	Pr O	RoW
Commelinaceae														
Tradescantia sp. spiderwort													x	
Dioscoreaceae														
Dioscorea villosa wild yam		x												x
Gramineae														
Agropyron repens* quackgrass									x	x				
Agrostis alba * redtop							x		x	x	x	x	x	x
Andropogon gerardi big bluestem													x	
A. scoparius little bluestem													x	
Brachyelytrum erectrum		x	x											
Bromus inermis * smooth bromegrass									x	x	x	x		
B. kalmii	x	x												
Dactylis glomerata * orchard grass													x	
Danthonia spicata poverty oat-grass		x												
Elymus canadensis Canada wildrye													x	
E. virginicus Virginia wildrye						x								
Festuca arundinacea * alta fescue									x	x		x		

Table A3 (cont.)

	SM-Bw	RO-SM	RO-SM WO	O-H	St S	FL P	O WL dist	O WL mow	OF-G	OF-E	OF-A	OF-P	Pr O	RoW
Festuca obtusa fescue		x					x							
Hystrix patula bottlebrush grass	x	x	x											
Orysopsis racemosa		x	x											
Panicum latifolium		x	x											
Panicum virgatum switchgrass													x	
Phalaris arundinacea reed canary grass														x
Phleum pratense * timothy							x		x	x	x	x	x	
Poa compressa * Canada bluegrass							x		x	x	x	x	x	
P. pratensis * Kentucky bluegrass							x		x	x	x	x	x	x
Sorghastrum nutans Indian grass													x	
Juncaceae														
Juncus tenuis path rush			x					x	x					
Luzula acuminata woodrush		x	x											
Liliaceae														
Asparagus officinalis * asparagus													x	
Hemerocallis fulva * day-lily					x	x	x							
Maianthemum canadense wild lily-of-the-valley		x	x											

Table A3 (cont.)

	SM-Bw	RO-SM	RO-SM WO	O-H	St S	Fl P	O WL dist	O WL mow	OF-G	OF-E	OF-A	OF-P	Pr O	RoW
Smilax herbacea carrion flower	x	x	x	x		x								
S. hispida cat briar	x	x	x	x	x									
Smilacina racemosa false Solomon's-seal	x	x	x	x			x						x	x
Trillium cernuum nodding trillium		x	x											
T. sessile sessile trillium		x												
Uvularia grandiflora large-flowered bellwort	x	x	x	x										
Orchidaceae														
Goodyera pubescens rattlesnake plantain		x	x								x			
Dicotyledonae														
Aceraceae														
Acer negundo boxelder				x	x	x	x		x					
A. saccharinum silver maple						x								
A. saccharum sugar maple	x	x	x	x	x	x	x	x			x			x
Anacardiaceae														
Rhus glabra smooth sumac				x			x		x		x		x	
R. typhina staghorn sumac							x		x				x	x
Toxicodendron radicans poison ivy		x	x	x		x								

Table A3 (cont.)

	SM-Bw	RO-SM	RO-SM WO	O-H	St S	FL P	O WL dist	O WL mow	OF-G	OF-E	OF-A	OF-P	Pr O	RoW
Apocynaceae														
Apocynum sibericum dogbane									x	x				
Araliaceae														
Aralia nudicaulis wild sarsaparilla		x	x	x										
A. racemosa spikenard		x	x	x										
Panax quinquefolius ginseng		x	x	x										
Aristolochiaceae														
Asarum canadense wild ginger	x	x	x											
Asclepiadaceae														
Asclepias speciosa (?)				x										
A. syriaca common milkweed							x		x	x	x	x		x
A. verticillata whorled milkweed													x	
Balsaminaceae														
Impatiens pallida pale touch-me-not	x	x	x		x	x								
Berberidaceae														
Caulophyllum thalictroides blue cohosh		x	x	x										
Podophyllum peltatum Mayapple		x	x	x			x							
Betulaceae														
Betula lutea yellow birch		x	x											

Table A3 (cont.)

	SM-Bw	RO-SM	RO-SM WO	O-H	St S	FL P	O WL dist	O WL mow	OF-G	OF-E	OF-A	OF-P	Pr O	RoW
Betula papyrifera paper birch				x							x			
Carpinus caroliniana blue beech	x	x	x	x										
Corylus americana American hazel		x												
Ostrya virginiana ironwood	x	x	x	x			x							
Campanulaceae														
Campanula americana tall bellflower	x	x	x		x		x				x			
C. rotundifolia harebell													x	
Caprifoliaceae														
Lonicera dioica wild honeysuckle		x	x											
L. tatarica * Tatarian honeysuckle							x							
Viburnum lentago nannyberry		x	x											
Caryophyllaceae														
Lychnis alba * white campion										x	x			
Silene antirrhina sleepy catchfly										x	x			
Celastraceae														
Celastrus scandens bittersweet													x	
Compositae														
Achillea millefolium yarrow									x	x	x	x	x	

Table A3 (cont.)

	SM-Bw	RO-SM	RO-SM WO	O-H	St S	FL P	O WL dist	O WL mow	OF-G	OF-E	OF-A	OF-P	Pr O	RoW
Ambrosia artimisiifolia little ragweed									x	x	x	x	x	
A. trifida giant ragweed									x	x	x	x	x	
Antennaria neglecta field pussytoes			x					x						
Arctium minus * burdock														
Aster azureus azure aster		x	x	x									x	
A. ericoides heath aster										x				
A. laevis smooth aster				x									x	
A. sagittifolius arrow-leaved aster		x	x	x					x	x				
A. simplex panicled aster				x										
A. shortii				x										
Cirsium altissimum tall thistle													x	
C. discolor field thistle							x		x	x			x	
C. vulgare * bull thistle									x					
Coreopsis palmata stiff coreopsis													x	
Echinacea pallida pale purple coneflower													x	
Erigeron annuus daisy fleabane							x		x	x	x			

Table A3 (cont.)

	SM-Bw	RO-SM	RO-SM WO	O-H	St S	FL P	O WL dist	O WL mow	OF-G	OF-E	OF-A	OF-P	Pr O	RoW
Erigeron strigosus daisy fleabane													x	
Eupatorium purpureum sweet Joe-pye-weed				x										x
E. rugosum white snake root	x	x	x											
Helianthus sp. sunflower		x		x									x	
H. tuberosus Jerusalem artichoke													x	x
Hieracium scabrum rough hawkweed													x	
Heliopsis helianthoides ox-eye													x	
Lactuca canadensis wild lettuce									x				x	x
Liatris aspera rough blazing-star													x	
Polymnia canadensis leafcup	x	x				x								
Ratibida pinnata gray-headed coneflower													x	
Rudbeckia hirta black-eyed Susan													x	x
Solidago canadensis Canada goldenrod	x			x			x		x	x	x	x	x	x
S. flexicaulis broad-leaved goldenrod	x	x	x	x										
S. gigantea late goldenrod							x		x	x				
S. nemoralis gray goldenrod													x	

Table A3 (cont.)

	SM-Bw	RO-SM	RO-SM WO	O-H	St S	FL P	O WL dist	O WL mow	OF-G	OF-E	OF-A	OF-P	Pr O	RoW
Solidago rigida hard-leaved goldenrod													x	
S. sciaphilia goldenrod													x	
S. speciosa showy goldenrod													x	
S. ulmifolia elm-leaved goldenrod		x	x	x							x			
Taraxacum officinale * common dandelion							x	x	x	x	x	x	x	x
Convolvulaceae														
Convolvulus sepium hedge bindweed							x		x	x				x
Cornaceae														
Cornus alternifolia pagoda dogwood		x	x	x	x	x								
C. racemosa gray dogwood	x	x	x	x	x						x		x	x
C. rugosa round-leaved dogwood		x	x	x	x	x								
C. stolonifera red osier			x											
Cruciferae														
Arabis lyrata		x	x											
Barbarea vulgaris * wintercress				x			x		x	x				
Dentaria laciniata toothwort		x	x											
Ericaceae														
Monotropa uniflora Indian-pipe				x										

Table A3 (cont.)

	SM-Bw	RO-SM	RO-SM WO	O-H	St S	FL P	O Wl dist	O Wl mow	OF-G	OF-E	OF-A	OF-P	Pr O	RoW
Vaccinium myrtilloides blueberry		x												
Euphorbiaceae														
Euphorbia corollata flowering spurge													x	
Fagaceae														
Quercus alba white oak	x	x	x	x			x	x	x	x	x			x
Q. muhlenbergii chinquapin oak				x		x								
Q. rubra red oak	x	x	x	x		x	x	x			x			x
Fumariaceae														
Dicentra cucullaria Dutchman's breeches	x	x	x	x										
Gentianaceae														
Gentiana quinquifolia stiff gentian				x										
Gentiana sp. gentian													x	
Geraniaceae														
Geranium maculatum wild geranium		x	x	x			x							
Hamamelidaceae														
Hamamelis virginiana witch hazel		x	x											
Hydrophyllaceae														
Hydrophyllum virginianum Virginia waterleaf		x	x		x	x								
Hypericaceae														
Hypericum puncatatum spotted St. Johnswort									x	x		x	x	

Table A3 (cont.)

	SM-Bw	RO-SM	RO-SM WO	O-H	St S	FL P	O WL dist	O WL mow	OF-G	OF-E	OF-A	OF-P	Pr O	RoW
Juglandaceae														
Carya cordiformis bitternut hickory	x	x	x	x	x		x				x			x
C. ovata shagbark hickory		x	x	x										x
Juglans cinerea butternut	x	x	x	x	x	x	x							
J. nigra black walnut	x			x	x	x	x				x			
Labiatae														
Monarda fistulosa wild bergamot							x		x	x		x	x	x
Nepeta cataria * catnip										x				
Prunella vulgaris selfheal									x				x	
Teucrium canadense germander									x					
Leguminosae														
Amorpha canescens leadplant													x	
Amphicarpa bracteata hog-peanut	x	x	x	x			x					x	x	
Desmodium canadense showy tick-trefoil														x
D. glutinosum pointed-leaved tick-trefoil		x	x	x		x					x		x	x
D. nudiflorum naked-flowered tick-trefoil		x	x	x										
Gleditsia triacanthos honey locust					x	x								
Gymnocladus dioica Kentucky coffee-tree	x					x								

Table A3 (cont.)

	SM-Bw	RO-SM	RO-SM WO	O-H	St S	FL P	O WL dist	O WL mow	OF-G	OF-E	OF-A	OF-P	Pr O	RoW
Lespedeza capitata round-headed bush-clover													x	x
Medicago lupulina * black medick									x					
M. sativa * alfalfa													x	
Melilotus alba * white sweet clover									x				x	
M. officinalis * yellow sweet clover													x	
Robinia pseudacacia * black locust					x									
Trifolium hybridum * alsike clover							x							
T. pratense * red clover									x				x	
T. repens * white clover									x				x	
Vicia angustifolia * vetch													x	
Minispermaceae														
Minispermum canadense moonseed	x	x		x	x	x								
Moraceae														
Morus alba * white mulberry						x		x		x	x	x	x	
Oleaceae														
Fraxinus americana white ash	x	x		x	x	x	x		x	x	x			x
F. pennsylvanica green ash		x		x		x								

Table A3 (cont.)

	SM-Bw	RO-SM	RO-SM WO	O-H	St S	Fl P	O WL dist	O WL mow	OF-G	OF-E	OF-A	OF-P	Pr O	RoW
Onagraceae														
Circaea quadrisulcata enchanter's nightshade		x	x	x		x								
Oenothera biennis common evening primrose													x	
Oxalidaceae														
Oxalis stricta yellow wood sorrel									x					
Papaveraceae														
Sanguinaria canadensis bloodroot	x	x	x	x	x			x						
Phrymaceae														
Phryma leptostachya lopseed		x	x	x		x								
Plantaginaceae														
Plantago lanceolata * buckhorn							x							
P. rugelii pale plantain		x						x	x					
Polygolaceae														
Polygala senega senaca snakeroot													x	
Polygonaceae														
Polygonum virginiana jumpseed				x	x	x								
Rumex altissimus smooth dock									x	x				
R. crispus * curly dock									x	x				
Primulaceae														
Dodecatheon meadia shooting star		x												

Table A3 (cont.)

	SM-Bw	RO-SM	RO-SM WO	O-H	St S	FL P	O WL dist	O WL mow	OF-G	OF-E	OF-A	OF-P	Pr O	RoW
Ranunculaceae														
Actaea rubra red baneberry	x	x	x	x	x									
Aquilegia canadensis columbine	x	x	x	x										
Anemone canadnesis Canada anemone						x			x					
A. cylindrica long-headed thimbleweed				x		x							x	
A. quinquefolia wood anemone	x	x	x					x						
Anemonella thalictroides rue anemone	x	x	x	x										
Clematis virginiana virgin's bower						x	x		x	x	x			
Hepatica acutiloba sharp-lobed hepatica	x	x	x	x	x									
Isopyrum biternatum false rue anemone		x	x											
Ranunculus abortivus small-flowered crowfoot		x		x				x						
Ranunculus septentrionalis buttercup		x												
Thalictrum dioicum meadow rue						x								
Rhamnaceae														
Ceanothus americanus New Jersey tea													x	
Rosaceae														
Crataegus sp. hawthorn							x		x	x	x	x	x	

Table A3 (cont.)

	SM-Bw	RO-SM	RO-SM WO	O-H	St S	FL P	O WL dist	O WL mow	OF-G	OF-E	OF-A	OF-P	Pr O	RoW
Fragaria virginiana common strawberry								x					x	
Agrimonia striata agrimony													x	
Geum canadense white avens					x	x	x	x						
Physocarpus opulifolius ninebark		x	x											
Potentilla norvegica rough cinquefoil									x					
Prunus americana wild plum														x
P. serotina black cherry	x	x	x	x	x	x	x		x	x	x			
Pyrus ioensis prairie crab					x						x		x	
P. malus * apple											x			
Rosa suffulta wild rose													x	
Rubus sp. (subgenus eubatus) blackberry		x	x		x		x				x	x		x
R. occidentalis black raspberry		x	x				x		x	x	x	x	x	
Rubiaceae														
Cephalanthus occidentalis button-bush						x								
Galium boreale northern bedstraw													x	
G. circazans white wild licorice				x									x	
G. conciunum bedstraw		x			x									

Table A3 (cont.)

	SM-Bw	RO-SM	RO-SM WO	O-H	St S	FL P	O WL dist	O WL mow	OF-G	OF-E	OF-A	OF-P	Pr O	RoW
Galium triflorum fragrant bedstraw		x	x			x			x	x	x			
Rutaceae														
Zanthoxylum americanum prickly ash		x	x	x	x	x	x						x	x
Salicaceae														
Populus deltoides cottonwood						x								
P. grandidentata bigtooth aspen		x	x	x							x		x	x
P. tremuloides quaking aspen											x		x	x
Salix sp. willow						x								
Santalaceae														
Commandra umbellata bastard-toadflax													x	
Saxifragaceae														
Heuchera richardsonii alumroot													x	
Mitella diphylla miterwort	x	x	x		x									
Ribes cynosbati prickly gooseberry		x												
R. missouriense gooseberry	x	x	x	x	x	x	x		x	x	x	x	x	x
Sullivantia renifolia sullivantia	x													
Scrophulariaceae														
Pedicularis canadensis lousewort				x									x	
Scrophularia marilandica figwort	x													

Table A3 (cont.)

	SM-Pw	RO-SM	RO-SM WO	O-H	St S	FL P	O WL dist	O WL mow	OF-G	OF-E	OF-A	OF-P	Pr O	RoW
Verbascum thapsus * common mullein							x		x	x	x		x	
Veronicastrum virginicum Culver's root													x	x
Solanaceae														
Physalis heterophylla clammy ground-cherry									x					
P. virginiana Virginiana ground-cherry									x	x				
Staphylaceae														
Staphylea trifolia bladdernut	x	x	x	x	x									
Tiliaceae														
Tilia americana basswood	x	x	x	x	x		x				x			
Ulmaceae														
Celtis occidentalis hackberry	x			x	x	x								
Ulmus americana American elm	x			x					x	x	x	x	x	x
U. pumila * Siberian elm							x		x	x	x	x		
U. rubra red elm	z	z	z		z	z				z				
Umbelliferae														
Cryptotaenia canadensis honewort		x		x	x									
Daucus carota * Queen Anne's lace									x					
Osmorphiza claytoni sweet cicely	x	x			x	x	x							
Pastinaca sativa * wild parsnip									x					

Table A3 (cont.)

	SM-Bw	RO-SM	RO-SM WO	O-H	St S	FL P	O WL dist	O WL mow	OF-G	OF-E	OF-A	OF-P	Pr O	RoW
Sanicula sp. black snakeroot					x									
S. canadensis black snakeroot				x										
S. gregaria black snakeroot		x												
S. marilandica black snakeroot		x												
S. trifoliata black snakeroot		x												
Zizia aurea golden alexanders				x									x	
Urticaceae														
Laportea canadensis wood nettle	x	x	x	x	x	x								
Pilea pumila clearweed	x				x									
Urtica dioica stinging nettle	x				x	x								
Verbenaceae														
Verbena hastata blue vervain									x					
V. urticifolia white vervain									x					
Violaceae														
Viola sp. violet	x				x									
V. pensylvanica smooth yellow violet		x		x										
V. sororia wooly blue violet		x		x				x					x	

Table A3 (cont.)

	SM-Bw	RO-SM	RO-SM WO	O-H	St S	Fl P	O WL dist	O WL mow	OF-G	OF-E	OF-A	OF-P	Pr O	RoW
Vitaceae														
<u>Parthenocissus</u> <u>quinquefolia</u> Virginia creeper	x	x	x	x	x	x			x				x	
<u>Vitis</u> <u>riparia</u> riverbank grape	x			x		x	x		x				x	x

APPENDIX 4

Vegetation Plots and Transects

The following tables present data on three permanent forest plots, four permanent grassland transects and two forest transects. The permanent plots and transects are marked with steel fence posts and directions for locating the plots are given on the tables and on the map (figure A1).

Table A4-1. Sugar Maple-Basswood Permanent Plot[1]

Canopy-Overstory Trees (20x20m plot)

Species	Number of Trees	Basal Area (cm^2)	Relative Basal Area (%)
sugar maple	15	6669.4	89.8
red oak	1	452.4	6.1
basswood	5	271.0	3.6
hackberry	6	24.9	0.3
American elm	1	9.6	0.1
Totals	28	7427.3	99.9
Trees/ha	700	185682.5 cm^2/ha	

Shrub Layer Cover (80m, plot perimeter)

Species	Total Intercept (m)	% Cover	% Relative Cover
hackberry	6.4	8.0	49.8
basswood	2.4	3.0	18.5
bitternut hickory	2.4	3.0	18.5
sugar maple	1.7	2.1	13.1
Totals	12.9	16.1	99.9

Herbaceous Layer Cover (20-20x50cm plots, west boundry of plot, plots on east side of line.)

Species	% Cover	% Relative Cover
jack-in-the-pulpit	16.0	29.3
pale touch-me-not	9.4	17.2
broad-leaved goldenrod	7.2	13.2
white snakeroot	6.9	12.6
Virginia creeper	5.3	9.7
leafcup	3.1	5.7
moonseed	2.6	4.8
bladder-fern	0.8	1.5
bloodroot	0.8	1.5
false Solomon's seal	0.8	1.5
sugar maple (seedlings)	0.8	1.5
violet	0.8	1.5
large-flowered bellwort	0.1	0.2
sharp-lobed hepatica	0.1	0.2
Totals	54.7	100.4

Table A4-1 (cont.)

Other Species Not Sampled:

bladdernut
bottlebrush grass
Bromus kalmii
Canada goldenrod
carrion flower
cat briar
gooseberry
riverbank grape
sweet cicely
tall bellflower
white ash
wild ginger

1/ Location: On the bluff overlooking the Missisippi River about 300m south of the entrance to the Point Ann parking lot. At the top of the bluff proceed south 120m from the sharp bend in the Point Ann trail and then 60m east down the bluff in a minor wash. Northwest corner of the 20x20m plot is adjacent to a large outcrop and is marked by a steel fence post. The southwest corner is also marked by a steel fence post.

Table A4-2. Red Oak-Sugar Maple Permanent Plot[1]

Canopy-Understory Trees (20x20m plot)

Species	Number of Trees	Basal Area (cm^2)	Relative Basal Area(%)
sugar maple	16	5020.5	45.3
red elm	2	2068.9	18.7
red oak	2	1876.3	16.9
basswood	2	1736.7	15.7
shagbark hickory	1	380.1	3.4
Totals	23	11082.5	100.0
Trees/ha	575	277062.5 cm^2/ha	

Shrub Layer Cover (40m, east and west sides of plot)

Species	Total Intercept (m)	% Cover	% Relative Cover
bladdernut	3.5	8.75	100.0

Herbaceous Layer Cover (20-20x50cm plots, parallel to and 7m east of west plot border, plots on east side of transect.)

Species	% Cover	% Relative Cover
Virginia creeper	14.1	26.8
wooly blue violet	9.6	18.3
sweet cicely	6.2	11.8
jack-in-the-pulpit	3.9	7.4
bloodroot	3.6	6.8
broad-leaved goldenrod	3.1	5.9
Virginia waterleaf	2.0	3.8
bladdernut	1.9	3.6
sugar maple	1.9	3.6
false Soloman's seal	1.6	3.0
lopseed	1.5	2.9
sedge	0.9	1.7
azure aster	0.8	1.5
tall bellflower	0.8	1.5
sharp-lobed hepatica	0.4	0.8
black snakeroot (Sanicula gregaria)	0.1	0.2
enchanter's nightshade	0.1	0.2
large-flowered bellwort	0.1	0.2
Totals	52.6	100.0

Table A4-2 (cont.)

Other Species Present but not Sampled

bitternut hickory
black snakeroot (Sanicula marilandica)
blue cohosh
bottlebrush grass
Brachelytrum erectrum
buttercup
carrion flower
elm-leaved goldenrod
fescue
fragrent bedstraw
gingseng
gooseberry
hog-peanut
honewort
maidenhair fern
moonseed
poison ivy
rattlesnake fern
red baneberry
smooth yellow violet
white snakeroot

1/ Location: On the west slope above the south fork of the creek which drains into Weir's glen; 120m at 240° from the ¼ corner between sections 34 and 35, T-95N, R3W; 120m south of the sharp turn in the trail and 7.5m east of the trail to the northwest corner of the plot. The northwest and southwest corners marked with steel fence posts.

Table A4-3. Oak-Hickory Permanent Plot[1]

Canopy-Overstory Trees (20x20m plot)

Species	Number of Trees	Basal Area (cm^2)	Relative Basal Area (%)
white oak	4	4256.9	44.0
shagbark hickory	2	1625.0	16.8
ironwood	28	1259.8	13.0
basswood	4	1062.1	11.0
sugar maple	13	565.3	5.8
white ash	1	530.9	5.5
black cherry	2	311.4	3.2
American elm	1	53.8	0.6
Totals	58	9665.2	100.7
Trees/ha	1400	241630 cm^2/ha	

Dominance Based upon Tree Size

	Over 20cm DBH			Under 20cm DBH		
Species	Number of Trees	Basal Area (cm^2)	Relative Basal Area (%)	Number of Trees	Basal Area (cm^2)	Relative Basal Area (%)
white oak	4	4256.9	59.8	0	-	-
shagbark hickory	2	1625.0	22.8	0	-	-
basswood	1	706.9	9.9	3	355.2	14.0
white ash	1	530.9	7.5	0	-	-
ironwood	0	-	-	28	1259.8	49.5
sugar maple	0	-	-	13	565.3	22.2
black cherry	0	-	-	2	311.4	12.2
American elm	0	-	-	4	53.8	2.1
Totals	8	7119.7	100.0	50	2545.5	100.0

Shrub Layer Cover (80m, plot perimeter)

Species	Total Intercept (m)	% Cover	% Relative Cover
sugar maple	4.15	5.2	28.0
white ash	4.04	5.1	27.4
basswood	2.75	3.4	18.3
bitternut hickory	1.50	1.9	10.2
ironwood	0.95	1.2	6.4
black cherry	0.85	1.1	5.9
gooseberry	0.60	0.7	3.8
	14.85	18.6	100.0

Table A4-3 (cont.)

Herbaceous Layer Cover (20-20x50cm plots, east boundry of plot, plots on west side of line)

Species	% Cover	% Relative Cover
Virginia creeper	12.5	27.1
white ash	5.9	12.8
broad-leaved goldenrod	4.9	10.6
shagbark hickory	3.4	7.4
wild geranium	3.2	6.9
jack-in-the-pulpit	2.6	5.6
sweet cicely	2.2	4.8
mayapple	2.0	4.3
bitternut hickory	1.9	4.1
sugar maple	1.9	4.1
enchanter's nightshade	1.6	3.5
basswood	0.8	1.7
bloodroot	0.8	1.7
lopseed	0.8	1.7
pointed-leaved tick-trefoil	0.8	1.7
red oak	0.8	1.7
blue cohosh	0.1	0.2
Totals	53.4	99.9

Other Species Not Sampled:

black snakeroot (Sanicula canadensis)
black walnut (seedling)
boxelder (seedling)
Brachyelytrum erectrum
carrion flower
elm-leaved goldenrod
gingseng
hackberry (seedling)
honewort
jumpseed
lady fern
large-flowered bellwort
maindehair fern
milkweed
moonseed
nacked-flowered tick-trefoil
pagoda dogwood
red baneberry
rattlesnake fern
riverbank grape
sedge
false Solomon's seal
white avens
wild sarsaparilla

1/ Location: At the highest point on the west side of Point Ann, 185m at 115° from the McGregor City Water Storage Tank atop the bluff above the city. The plot's east edge is oriented 020°-200°. Southeast and northeast corners of the plot are marked by steel fence posts.

Table A4-4 (cont.)

Canopy Cover

Species	% of Plots
basswood	17.5
white ash	12.5
white oak	2.5

Understory-Shrub Cover

Species	% of Plots
smooth sumac	15.0
apple	7.5
American hazel	2.5
gray dogwood	2.5
prickly gooseberry	2.5
sugar maple	2.5
white ash	2.5

1/ Location: 215m south of high-tension power line at top of the ridge on the west edge of the park. This power line crosses highway 340 425m from its northern origin at the Catholic Church in McGregor, Iowa. The transect runs east-west with one steel fence post set 20m east of the sumac border and another set at the border.

Table A4-5. Old Field-Open Woodland Edge Permanet Transect[1]

Herbaceous Cover

Species	% Cover	% Relative Cover
Kentucky bluegrass	47.1	38.3
Canada goldenrod	20.9	17.0
redtop	13.5	11.0
smooth bromegrass	12.0	9.8
Virginia creeper	8.9	7.2
red clover	4.4	3.6
white ash	2.5	2.0
staghorn sumac	1.9	1.5
bucknorn plantain	1.7	1.4
little ragweed	1.6	1.3
wild bergamot	1.3	1.1
sugar maple (seedlings)	1.0	0.8
panicled aster	0.8	0.7
Daisy fleabane (Erigeron annuus)	0.7	0.6
selfheal	0.6	0.5
black medick	0.5	0.4
quackgrass	0.5	0.4
azure aster	0.4	0.3
timothy	0.4	0.3
white ash (seedlings)	0.4	0.3
wild lettuce	0.4	0.3
common milkweed	0.1	0.1
Indian tobacco	0.1	0.1
alsike clover	0.06	0.05
butternut	0.06	0.05
clammy ground-cherry	0.06	0.05
hedge bindweed	0.06	0.05
honewort	0.06	0.05
Queen Anne's lace	0.06	0.05
Totals	123.0	100.0

Table A4-5 (cont.)

Shrub Layer Cover

Species	% Frequency
white ash	35.0
ironwood	7.5
staghorn sumac	5.0
butternut	2.5

1/ Location: 6m north of old fence line and 335m at 015° from Chief Ranger's house. Transect extends 40m at 290° from a steel fence post. A second steel fence post is at the 20m mark. Plots are on the south side of the transect.

Table A4-6. Permanent Prairie Transects[1]

Transect #1

Herbaceous Cover

Species	% Cover	% Relative Cover
little bluestem	57.5	45.5
hog-peanut	9.6	7.6
raspberry	7.6	6.0
common strawberry	7.4	5.8
Canada goldenrod	5.6	4.4
pointed-leaved tick-trefoil	5.0	4.0
aster	3.8	3.1
field pusseytoes	3.6	2.8
black raspberry	3.4	2.7
wild lettuce	3.4	2.7
hard-leaved goldenrod	3.2	2.5
smooth aster	3.1	2.5
gray goldenrod	3.1	2.5
yarrow	2.0	1.6
black-eyed Susan	1.7	1.3
dandelion	1.5	1.2
Kentucky bluegrass	1.0	0.8
wild bergamot	1.0	0.8
agrimony	0.7	0.6
bigtooth aspen	0.7	0.6
bittersweet	0.7	0.6
hawthorn	0.7	0.6
round-headed bush-clover	0.2	0.2
Totals	126.5	100.4

Shrub Layer Cover

Species	Intercept (20m)	% Cover	% Relative Cover
raspberry	2.15	10.75	48.3
bigtooth aspen	1.0	5.0	22.5
smooth sumac	0.8	4.0	18.8
staghorn sumac	0.5	2.5	11.2
Totals	4.45	22.25	100.0

Table A4-6 (cont.)

Transect #2

Herbaceous Cover

Species	% Cover	% Relative Cover
orchard grass	14.5	21.5
Kentucky bluegrass	10.1	15.0
gray goldenrod	8.1	12.0
Canada goldenrod	6.4	9.5
Jerusalem artichoke	3.1	4.6
little bluestem	2.7	4.0
red clover	2.5	3.7
alfalfa	2.4	3.6
field pusseytoes	2.4	3.6
Canada bluegrass	2.2	3.3
pointed-leaved tick-trefoil	1.9	2.8
raspberry	1.9	2.8
hard-leaved goldenrod	1.5	2.2
common strawberry	1.0	1.5
little ragweed	0.9	1.3
wild bergamot	0.9	1.3
wild lettuce	0.9	1.3
black raspberry	0.7	1.0
dandelion	0.7	1.0
redtop	0.7	1.0
Virginia creeper	0.7	1.0
yarrow	0.4	0.6
smooth aster	0.2	0.3
alsike clover	0.1	0.1
azure aster	0.1	0.1
black-eyed Susan	0.1	0.1
round-headed bush-clover	0.1	0.1
sweet clover	0.1	0.1
Totals	67.3	99.3

Shrub Layer Cover

Species	Intercept (20m)	% Cover	% Relative Cover
paper birch	0.6	3.0	46.2
staghorn sumac	0.4	2.0	30.8
raspberry	0.3	1.5	23.1
Totals	1.3	6.5	100.0

Table A4-6 (cont.)

Additional Species

asparagus
Canada wildrye
common mullein
Culver;s root
Daisy fleabane (Erigeron strigosus)
field thistle
gentian
gray dogwood
hawthorn
long-headed thimbleweed
prickly ash
rough hawkweed
selfheal
spotted St. John's wort
switchgrass
tall thistle
timothy
white sweet clover
white wild licorice

1/ Location: Transects are located about 470m south of the Point Ann parking lot and about 25m upslope to the east from the creek which drains into Schade Glen. The lower end of transect #1 is 25m at 110° from the trail switchback where the trail leaves the creek. The transect extends 20m at 090°. Transect #2 is located 22m up the trail from the switchback and extends uphill 20m. Both ends of each transect are marked with steel fence posts.

Table A4-7. Red Oak-Sugar Maple Transect[1]

Trees

Species	Importance Value[2] Transect 1	Transect 2	Transect 3	Total
red oak	91.2	120.4	147.6	359.2
sugar maple	100.2	106.5	37.0	243.7
ironwood	43.7	27.7	74.1	145.5
white oak	17.0	0.0	17.6	34.6
basswood	22.6	8.1	0.0	30.7
shagbark hickory	5.5	7.9	16.1	29.5
chinquapin oak	0.0	28.5	0.0	28.5
bigtooth aspen	8.9	0.0	0.0	8.9
blue beech	0.0	0.0	7.5	7.5
bitternut hickory	6.0	0.0	0.0	6.0
black cherry	2.1	0.0	0.0	2.1
Totals	297.2	299.1	299.9	896.2

Shrub Layer Cover (160m transect)

Species	Absolute Cover (%)	Relative Cover (%)
sugar maple	18.0	33.8
witch hazel	15.9	30.0
ironwood	12.8	24.0
white ash	1.9	3.6
blue beech	1.6	2.9
basswood	1.2	2.3
nannyberry	0.8	1.4
pagoda dogwood	0.4	0.7
bladdernut	0.4	0.7
gooseberry	0.2	0.4
American elm	0.1	0.1
round-leaved dogwood	0.1	0.1
shagbark hickory	0.1	0.1
Totals	53.4	100.1

1/ Location: 900m of transect were measured on the slopes above Bridal Veil Falls and on the upper slope west of the Indian Mounds.

2/ After Cottam and Curtis (1956). Trees were sampled using the quarter method (Cottam and Curtis 1956). Fifty points were sampled.

Table A4-7 (cont.)

Herbaceous Layer Cover, Transect A (120-20x50cm plots)

Species	% Cover	% Relative Cover
wild ginger	5.9	11.4
bladder fern	4.6	8.9
Virginia creeper	4.4	8.5
broad-leaved goldenrod	4.2	8.3
maidenhair fern	3.7	7.2
wood nettle	3.7	7.2
hog peanut	2.6	5.0
arrow-leaved aster	2.5	4.9
black snakeroot (Sanicula gregaria)	1.8	3.5
lady fern	1.3	2.5
pointed-leaved tick-trefoil	1.3	2.5
sugar maple	1.2	2.3
sharp-lobed hepatica	1.2	2.3
miterwort	1.2	2.3
bedstraw (Galium concinnum)	1.0	1.9
lopseed	1.0	1.0
spring beauty	0.9	1.7
elm-leaved goldenrod	0.9	1.7
poison ivy	0.9	1.7
sweet cicely	0.7	1.4
white ash	0.6	1.2
wild geranium	0.6	1.2
black snakeroot (Sanicula marilandica)	0.6	1.2
columbine	0.5	1.0
naked-flowered tick-trefoil	0.5	1.0
wild honeysuckle	0.5	1.0
moonseed	0.5	1.0
bloodroot	0.5	1.0
leafcup	0.4	0.8
false Solomon's seal	0.4	0.8
large-flowered bellwort	0.4	0.8
sessile trillium	0.3	0.6
round-leaved dogwood	0.2	0.4
fragrent bedstraw	0.2	0.4
ironwood	0.2	0.4
violet	0.2	0.4
pale touch-me-not	0.1	0.2
Panicum latifolium	0.1	0.2
small-flowered crowfoot	0.1	0.2
Totals	51.5	100.1

Table A4-8. Oak-Hickory Transect[1]

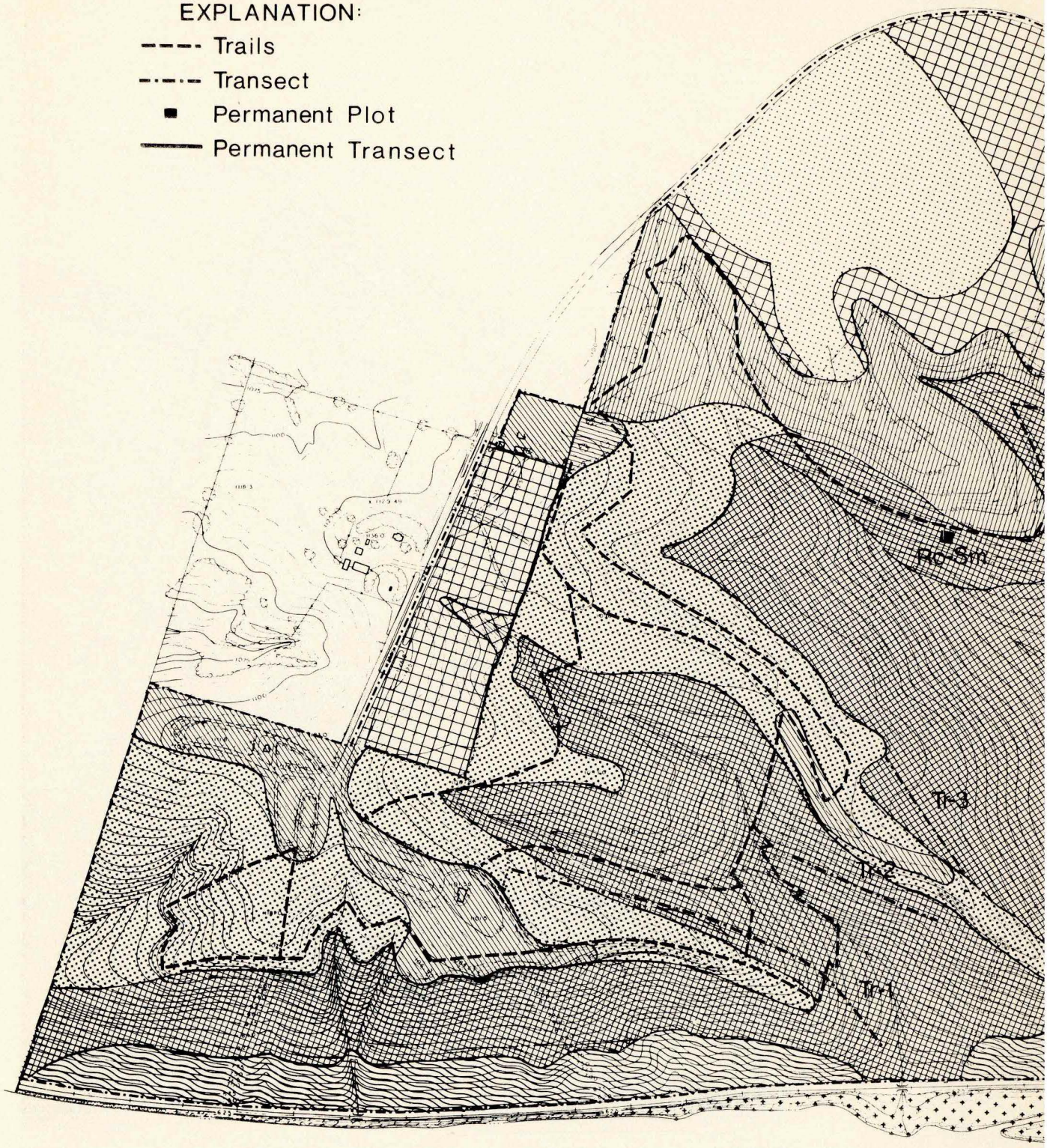
Species	Importance Value[2] Trees From 5-20cm DBH	Trees Larger Than 20cm DBH	Nearest Pair
white oak	0.0	162.5	78.8
sugar maple	157.3	36.0	87.8
ironwood	80.8	0.0	50.9
basswood	33.3	30.6	33.3
bitternut hickory	8.4	8.3	22.8
black cherry	20.1	0.0	13.6
shagbark hickory	0.0	34.0	13.2
white ash	0.0	8.0	0.0
red oak	0.0	12.1	0.0
bigtooth aspen	0.0	7.0	0.0
Totals	299.9	298.5	299.8

1/ Location: On the east-facing slope in Point Ann below the trail to Schade Glen.

2/ After Cottam and Curtis (1956). Trees were sampled using the random-pairs method (Cottam and Curtis 1949). Stratification of the sample into large and small trees seperates older canopy trees from younger understory trees.

Appendix 5. Plant Common Name Index

Common Name	Scientific Name
agrimony	*Agrimonia striata*
alfalfa	*Midicago sativa*
alsike clover	*Tryfolium hybridum*
alta descue	*Festuca arudinacea*
alumroot	*Heuchera richardsonii*
American elm	*Ulmus americana*
American hazel	*Corylus americana*
apple	*Pyrus malus*
arrow-leaved aster	*Aster sagittifolius*
asparagus	*Asparagus officinalis*
aster	*Aster sp.*
Austrian pine	*Pinus nigra*
azure aster	*Aster azureus*
bastard-toadflax	*Commandra umbellata*
basswood	*Tilia americana*
bedstraw	*Galium conciunum*
big bluestem	*Andropogon gerardi*
bigtooth aspen	*Populus grandidentata*
bitternut hickory	*Carya cordiformis*
bittersweet	*Celastrus scandens*
black ash	*Fraxinus nigra*
black cherry	*Prunus serotina*
black locust	*Robinia pseudoacacia*
black medick	*Medicago lupulina*
black raspberry	*Rubus occidentalis*
black snakeroot	*Sanicula sp.*
black snakeroot	*Sanicula cadensis*
black snakeroot	*Sanicula gregaria*
black snakeroot	*Sanicula marilandica*
black snakeroot	*Sanicula trifoliata*
black walnut	*Juglans nigra*
black-eyed Susan	*Rudbeckia hirta*
blackberry	*Rubus sp.* (*subgenus eubatus*)
bladder fern	*Cystopteris bulbifera*
bladdernut	*Staphylea trifoliata*
bloodroot	*Sanguinaria canadensis*
blue beech	*Carpinus caroliniana*
blueberry	*Vaccinium myrtiloides*
blue cohosh	*Caulophyllum thalictroides*
blue vervain	*Verbena hastata*
bottlebrush grass	*Hystrix patula*



PIKES PEAK – POINT ANN STATE PARK

NATURAL RESOURCES INVENTORY

IOWA CONSERVATION COMMISSION

Prepared by: Paul Christiansen

NORTH

0 20

Figure 4

TRANSECTS AND PERMANENT PLOTS

Appendix 5 (cont.)

Common Name	Scientific Name
boxelder	Acer negundo
bracken fern	Pteridim aquilinum
broad-leaved goldenrod	Solidago flexicaulis
buckhorn plantain	Plantago lanceolata
bull thistle	Cirsium vulgare
burdock	Arctium minus
buttercup	Ranunculas septentrionalis
butternut	Juglans cinerea
button-bush	Cephalanthus occidentalis
Canada anemone	Anemone canadensis
Canada bluegrass	Poa pratensis
Canada goldenrod	Solidago canadensis
Canada wildrye	Elymus canadensis
Canadian yew	Taxus canadensis
carrion flower	Smilax herbacea
cat briar	Smilax hispida
catnip	Nepeta cataria
chinquapin oak	Quercus muhlenbergii
clearweed	Pilea pumila
columbine	Aquilegia canadensis
common dandelion	Tataxacum officinale
common evening primrose	Oenothera biennis
common milkweed	Asclepias syriaca
common mulein	Verbascum thapsus
common strawberry	Fragaria virginiana
cottonwood	Populus deltoides
Culver's-root	Veronicastrum virginicum
curly dock	Rumex crispus
daisy fleabane	Erigeron anuus
daisy fleabane	Erigeron strigosus
day lily	Hemerocallis fulva
dogbane	Apocynum sibericum
Dutchman's breeches	Dicentra cucularia
eastern red cedar	Juniperus virginiana
elm-leaved goldenrod	Solidago ulmifolia
enchanter's nightshade	Circaea quadrisulcata
false rue anemone	Isopyrum biternatum
false Solomon's-seal	Smilacina rademosa
fescue	Festuca obtusa
field pussytoes	Antennaria neglecta
field thistle	Cirsium discolor
figwort	Scrophularia marilandica
flowering spurge	Euphorbia corollata

Appendix 5 (cont.)

Common Name	Scientific Name
fragile fern	*Cystopteris fragilis*
fragrant bedstraw	*Galium triflorum*
gentian	*Gentiana sp.*
germander	*Teucrium canadense*
giant ragweed	*Ambrosia trifida*
ginseng	*Panax quinquefolius*
golden alexanders	*Zizia aurea*
goldenrod	*Solidago sciaphilia*
gooseberry	*Ribes missouriense*
gray dogwood	*Cornus racemosa*
gray goldentod	*Solidago nemoralis*
gray-headed coneflower	*Ratibida pinnata*
green ash	*Fraxinus pennsylvanica*
hackberry	*Celtis occidentalis*
hard-leaved goldenrod	*Solidago rigida*
harebell	*Campanula rotundifolia*
hawthorn	*Crataegus sp.*
heath aster	*Aster ericoides*
hedge bindweed	*Convolvulus sepium*
hog-peanut	*Amphicarpa bracteata*
honewort	*Cryptotaenia canadensis*
honey locust	*Gleditsia triacanthos*
horsetail	*Equisetum arvense*
Indian grass	*Sorghastrum nutans*
Indian pipe	*Monotropa uniflora*
interrupted fern	*Osmumda claytoniana*
ironwood	*Ostrya virginiana*
jack-in-the-pulpit	*Arisaema triphyllum*
Jerusalem artichoke	*Helianthus tuberosus*
jumpseed	*Polygonum virginiana*
Kentucky bluegrass	*Poa pratensis*
Kentucky coffee-tree	*Gumnocladus dioica*
lady fern	*Athyrium felis-femina*
large-flowered bellwort	*Uvularia grandiflora*
large woodsia	*Woodsia obtusa*
late goldenrod	*Solidago gigatea*
leadplant	*Amorpha canescens*
leafcup	*Polymnia canadensis*
little bluestem	*Andropogon scoparius*
little ragweed	*Ambrosia artimisiifolia*
long-headed thimbleweed	*Anemone cylindrica*

Appendix 5 (cont.)

Common Name	Scientific Name
lopseed	Phyrma leptostachya
lousewort	Pedicularis canadensis
maidenhair fern	Adiantum pedatum
mayapple	Popophyllum peltatum
meadow rue	Thalictrum dioicum
miterwort	Mitella diphylla
moonseed	Minispermum canadense
naked-flowered tick-trefoil	Desmodium nudiflorum
nannyberry	Viburnum lentago
New Jersey tea	Ceanothus americanus
ninebark	Physocarpus opulifolius
nodding trillium	Trillium cernuum
northern bedstraw	Galium boreale
orchard grass	Dactylis glomerata
ox-eye	Heliopsis heliathoides
pagoda dogwood	Cornus alternifolia
pale plantain	Plantago rugelii
pale purple coneflower	Echinacea pallida
pale touch-me-not	Impatiens pallida
panicled aster	Aster simplex
paper birch	Betula papyrifera
path rush	Juncus tenuis
pointed-leaved tick-trefoil	Desmodium glutinosum
poison ivy	Toxicodendron radicaus
polypody	Polypodium vulgare
poverty oat-grass	Danthonis spicata
prairie crab	Pyrus ioensis
prickly ash	Zanthoxylum americanum
prickly gooseberry	Ribes cynosbati
quackgrass	Agropyrom repens
quaking aspen	Populus tremuloides
Queen Anne's lace	Daucus carota
raspberry	Rubus sp.
rattlesnake fern	Botrychium virginianum
rattlesnake plantain	Goodyera pubescens
red baneberry	Actaea rubra
red clover	Trifolium proatense
red elm	Ulmus rubra
red oak	Quercus rubra
red osier	Cornus stolonifera
redtop	Agrostis alba
reed canary grass	Phalaris alba

Appendix 5 (cont.)

Common Name	Scientific Name
riverbank grape	Vitis riparia
rough-blazing star	Liatris aspera
rough cinquefoil	Potentilla norvegica
rough hawkweed	Hieracium scabrum
round-headed bushclover	Lespedeza capitata
round-leaved dogwood	Cornus rugosa
royal fern	Osmunda regalis
rue anemone	Anemonella thalictroides
scouring rush	Equisetaceae hyemale
sedge	Carex sp.
selfheal	Prunella vulgaris
seneca snakeroot	Polygala senega
shagbark hickory	Carya ovata
sharp-lobed hepatica	Hepatica acutiloba
shining club moss	Lycopodium lucidulum
shooting star	Dodecatheon meadia
showy goldenrod	Solidago speciosa
showy tick-trefoil	Desmodium canadense
Siberian elm	Ulmus pumila
silver maple	Acer saccharinum
silvery spleenwort	Athyrium thelyptroides
sleepy catchfly	Silene antirrhina
small-flowered crowfoot	Ranuculus abortivus
smooth bromegrass	Bromus inermis
smooth dock	Rumex altissimus
smooth sumac	Rhus glabra
smooth yellow violet	Viola pensylvanica
spiderwort	Tradescantia sp.
spikenard	Aralia racemosa
spotted St. Johnswort	Hypericum punctatum
staghorn sumac	Rhus typhina
stiff coreopsis	Coreopsis palmata
stiff gentian	Gentiana quinquifolia
stinging nettle	Urtica dioica
sugar maple	Acer saccharum
sullivantia	Sullivantia renifolia
sunflower	Helianthus sp.
sweet clover	Melilotus sp.
sweet cicely	Osmorphiza claytoni
sweet Joe-pye-weed	Eupatorium purpureum
switchgrass	Panicum virginicus
tall bellflower	Campanula americana

Appendix 5 (cont.)

Common Name	Scientific Name
tall thistle	Cirsium altissumum
Tatarian honeysuckle	Lonicera tatarica
timothy	Phleum pratense
toothwort	Pentaria laciniata
vetch	Vicia angustifolia
violet	Viola sororia
Virginia creeper	Parthenocissus quinquefolia
Virginia ground-cherry	Physalis virginiana
Virginia waterleaf	Hydrophyllum virginianum
Virginia wildrye	Elymus virginicus
virgin's bower	Clematis virginiana
white ash	Fraxinus americana
white avens	Geum canadense
white campion	Lychnis alba
white clover	Trifolium repens
white mulberry	Morus alba
white oak	Quercus alba
white pine	Pinus strobus
white snake root	Eupatorium rugosum
white sweet clover	Melilotus alba
white vervain	Verbena urticifolia
white wild licorice	Galium circaezans
whorled milkweed	Asclipeas verticillata
wide-leaved sedge	Carex sp.
wild bergamot	Monarda fistulosa
wild geranium	Geranium macilatum
wild ginger	Asarum canadense
wild honeysuckle	Lonicera dioica
wild lettuce	Lactuca canadensis
wild lily-of-the-valley	Maianthemum canadense
wild parsnip	Pastinaca sativa
wild plum	Prunus americana
wild rose	Rosa suffulta
wild sarsapharilla	Aralia nudicaulis
wild yam	Dioscorea
willow	Salix sp.
wintercress	Barbarea vulgaris
witch hazel	Hamamelis virginiana
wood anemone	Anemone quinquefolia
wood nettle	Laportea canadensis
wood rush	Luzula acuminata
wooly blue violet	Viola sororia

Appendix 5 (cont.)

Common Name	Scientific Name
yarrow	Achillea millefolium
yellow birch	Betula lutea
yellow sweet clover	Melilotus officinalis
yellow wood-sorrel	Oxalis stricta

APPENDIX 6

SUGGESTIONS

A real appreciation of the Park can only be reached with a proper background in the natural and cultural history of the area and a knowledge of its biota. For the uninitiated, this information is probably best gathered at a visitors' center.

Such a center would: (1) outline the geologic history of the area, (2) describe the bedrock units, and (3) explain the physiographic development of the area. Other portions of the center would provide information on the Park biota and the cultural history of the region. After such a briefing the visitor could take to the trails and see first-hand the features described in the exhibits. Just in case such a center may be built, I have made a collection of individual fossils and fossiliferous slabs which could be used for displays.

However, the ideal is rarely attained, especially when money is involved. I therefore suggest a second more attainable aid to the park visitor, a guide book. Such a book would describe in detail the natural and cultural history of the Parks. It would also include descriptions and illustrations of the rocks and most common fossils of the area as well as those of park plants, animals, birds and Indian artifacts. The guidebook would include diagrams and descriptions of the park trails and would be keyed to sign-posts along the trails to explain special features to the hiker. If the guide book were especially developed to be <u>sold</u> at the Park it could be quite detailed and it would obviate the need for free single-sheet trail guides which can become an expense and a potential litter problem.

The availability of guide books would allow a two-level utilization of park features. The major features--overviews, waterfalls, caves--could be labelled with signs and/or diagrams so that the casual visitor could enjoy the park at his/her interest level. For the hiker-naturalist, the detailed description of the park's features provided by the guide would enable him/her to understand more fully the significance of what he/she sees.

Whether or not a guide book is produced, there are a minor number of illustrative displays which should be erected in the Park.

I would suggest five major display/signs. One of these would be for the Mississippi overview in the picnic area of Pikes Peak. It should include a map of the view area with the rivers, ridge crests, terraces and features of the flood plain included and labelled. It might be less distracting and more easily understood if it were constructed in a table-like position on the cliff side of the trail. The viewers could then look at the map and by slightly lifting their gaze see the actual features spread before them. I would suggest similar displays in (1) the Indian Mound Open Woodland areas of Pikes Peak Park, (2) the river overlook at Point Ann, and (3) the town overlook at Point Ann.

I also would recommend a large map-diagram in both parking lots which would portray the Park and its trails and overlooks so that the visitor could plan a tour of the appropriate length and exertion. To facilitate the latter I would recommend that trail distances be indicated and that trails be color coded on the maps to indicate the degree of difficulty or steepness.

With the exception of the above displays, I think most other signs

should be very small and limited to simple labels and/or direction arrows. I feel that trail signs clutter the view and tend to be removed and destroyed.

In order to minimize the signs and yet facilitate the understanding of park features, I recommend the use of numbered tags emplaced at ground level. These would be keyed to descriptive trail guides. These signs could be placed to mark all kinds of park features as well as outcrops.

The following is a list of places that could be marked with such a system (see Park Trails, p. 14):

/_1 I would recommend that a numbered marker be placed at this point, keyed to a descriptive trail guide, or, without a guide, a label-sign be placed here, identifying the bear mound.

/_3 I would recommend a numbered marker keyed to a trail guide be placed at the first extensive outcrop of the Galena formation about 50 feet from the lookout point.

/_4 I would recommend a numbered marker, keyed to a trail guide, be placed at the contact of the Galena/Decorah. The trail guide should include detailed descriptions of all the lithologic units and the nature of their contacts. Without a trail guide I would recommend a small sign identifying the contact and the names of the units in contact.

/_5 I would recommend a sign as above to mark the Decorah-Platteville contact, or without a guide a larger sign as above indicating the contact and the names of the units involved.

/_6 I would recommend a sign or signs as above pointing out the Platteville-St. Peter contact.

/$_{-10}$ If the cave in the St. Peter is to remain as a part of the trail, a sign directing people to it should be placed where the path branches.

Should a descriptive trail guide be implemented, I would augment the trail signs above with a series labeled /$_{-a}$ to /$_{-f}$. These markers would be placed at the contacts of the formational members:

/$_{-a}$ Ion member, Decorah formation

/$_{-b}$ Guttenberg member, Decorah formation

/$_{-c}$ Specht's Ferry member, Decorah formation

/$_{-d}$ McGregor member, Platteville formation

/$_{-e}$ Pecatonica member, Platteville formation

/$_{-f}$ Glenwood member, Platteville formation

Should conventional signs be used instead, I would recommend that larger descriptive/interpretive signs be placed at

/$_{-2}$ At the branching of the trails I would recommend a table-map display portraying the Park and its trails and indicating the major features (Bridal Veil Falls, Sand Cave, mound areas, scenic overlooks). It would be a smaller version of the map-signs placed in the parking lots.

/$_{-7}$ At this trail branch I would place a numbered marker in a larger information sign pointing out McGregor Bridal Veil Falls and the St. Peter cascades. It might also include a supplemental note indicating that similar though smaller falls occur elsewhere in the park wherever streams flow over these units.

/$_{-8}$ I would recommend a duplication of sign /$_{-7}$ so that hikers

coming down the west side of the loop will see a description of the falls/ cascades before they cross the stream.

/_9 I would recommend an informative sign indicating that the sandstone pillar is St. Peter sandstone.

Trail Development -- Point Ann

Point Ann has a well-developed trail system with generally moderate grades and smooth footing. I would recommend that three overlooks be developed in the Park, two on the north loop: one where the trail approaches the northeast corner of the Park. Here the removal of a few trees and erection of a guard rail would allow the visitor an excellent view of the Mississippi river. The second overlook could be constructed on the same east-west ridge about 600 feet to the west of the first, since here the visitor could get a bird's eye view of the town of McGregor. The third overlook could be built near the mounds for a second viewpoint of the Mississippi.

The trail passes close to only one rock outcrop (St. Peter) about 400 feet past the mounds. This outcrop should be labelled. /_10

The Jordan sandstone, which only outcrops along the river road leading to the Point Ann parking lot, could be labelled but since such a sign would be accessible to a wide variety of people, many not park visitors, its value may be low and its susceptibility to theft or destruction high.

Trail Development -- Pikes Peak

The trails in Pikes Peak Park offer the opportunity to view a nearly complete stratigraphic sequence of the area. It thus allows observation of

rock type and thickness, fossil content, and weathering and erosional characteristics of the units. As such, it is almost a classroom/laboratory for the geologist.

Descriptions of the lithology and fossil content should be made available to serious visitors so that they could learn to identify the units as they are repeatedly exposed along the Park trails and to understand the spring-seep horizons and the occurrence of waterfalls and cascades and their relationship to certain strata. As stated above, this can be done with markers, particularly along the north park trail, at the formational contacts. If a guide book or map is produced, markers may also be placed to indicate formational members.

The trail itself has some problems which should be considered. Portions are extremely steep and where possible should be reduced in grade. The north-point trail is the steepest, particularly where it traverses the St. Peter sandstone. Where the trail nears "painted rocks glen" and passes into sand float, it reaches nearly 30°. Further, the loose sand washes badly, leaving the wooden steps as isolated projections. I think that a switchback to the east at this point would certainly reduce the grade and erosion.

As the trail nears the falls it flattens, offering a nice view of the stream valley--the falls and cascades and the St. Peter sandstone. There seems to be some confusion over just what is (are) the bridal veil falls. I assumed the upper falls over the McGregor were the falls, but the Iowa Survey (Koch, Prior, Tuthill, 1973) refers to the cascade over the St. Peter beneath as the falls. It looks like a decision has to be made here as to what is what and

appropriate signs made to indicate the decision.

Near this viewpoint is a fork in the trail which leads, down another steep grade, to the sand cave in the stream valley. The sand cave is a popular place to visit, but access to it is difficult. Any trail must be developed in a part of the stream valley and as such is subject to periodic flooding and washout.

I am of two minds concerning this part of the trail system. I would like to see the sand cave and the Prairie du Chien remain accessible to the visitor with a geologic interest. However I am concerned with trail safety and the vandalism problems in this segment.

As the loop continues up from the lower parts of the valley, it crosses the stream via a bridge just below the falls. Just across the bridge the trail becomes steep and muddy. The mud is produced by springs and seeps along the Glenwood shale. At this point a series of wooden steps could traverse the shale. This would improve the footing and facilitate the drainage. The trail rises to the level of the falls (in the McGregor) where it branches with one segment leading across the valley under the falls and the other crossing above it. The upper trail coincides with a second shale layer (the Specht's Ferry). This is also an area of springs and seeps and the water mixed with the shale has produced an extended area of mud along the trail. The Park staff has begun to erect a boardwalk over this segment of the trail and I recommend that it be extended to cover this entire segment of the trail until it rises above the shale horizon.

Here are some specific comments about land use practices, either

presently in practice or proposed.

1. Be cautious about harvesting dead, standing timber for camp-ground firewood.

Many woodpeckers, contrary to popular belief, are poorly adapted for digging in wood. Thus must rely upon long-dead standing trees with rotten surfaces for excavation (Spring, 1965; Jackson, 1976; Kilham, 1979). Downy, Red-bellied, and Red-headed woodpeckers are noted in the preceding references in this regard. If standing timber is harvested, the nesting opportunities for these birds are reduced, and I believe that dead timber harvest around the Linear Mounds Clearing in the winter of 1978-79 greatly reduced the numbers of Red-headed Woodpeckers breeding at that location in 1979. Because many other birds and mammals rely upon woodpeckers to excavate nest holes for them (e.g. flying squirrels, bluebirds, Wood Ducks, Black-capped Chickadees, wrens of several species), reduction of woodpecker nesting sites also limits the distribution and nesting opportunities for these other animals. There is much downed timber in the park which could be harvested if it is necessary to supply firewood for the camp ground. If standing timber must be harvested, only those trees which do not already have woodpecker holes in them should be taken, because the woodpecker species mentioned previously often return to excavate new nest holes directly under the nest they used the preceding year (e.g. Jackson, 1976).

2. Oppose any development which will disturb old successional areas around the white pine plantation or Weir's Glen.

These are areas which hold the only breeding populations of the threatened or endangered warblers located in this study, as well as several of the mammalian species which may appear on the Iowa listing.

3. Oppose any development which will disturb the oldfields north of the Ranger's house.

This was an area to which winter populations of deer retreated during the hard winter of 1978-79, and disturbance of this habitat will reduce winter range for these animals. This is also an area likely to hold endangered, threatened, or unknown status mammals, and provides the only nesting habitat for Bobolinks, Eastern Meadow Larks, and Horned Larks within the park. Mowing or selectively burning small patches of this habitat well away from the edges used by deer might improve the habitat for the bird species mentioned, and lead to an increase in their populations.

Introduction of prairie species into this area would increase the diversity in the park vegetation. It would also replace some of the introduced pasture plants and weeds with native species.

Planting could range from completely destroying patches of the present vegetation by cultivation or herbicide treatment and seeding native species to seeding only pocket gopher mounds or other disturbed areas.

Controlled burning every 2 or 3 years will greatly enhance the vigor and spread of prairie species.

4. Specifically and strongly oppose the proposed Barge Staging Area along the eastern park boundary south of McGregor.

This area contains the only flood plain forest within the park's boundary, as well as containing high densities of several birds on one or another of the listings which do not occur at high densities elsewhere in the park (please see specific discussions in the bird section of this paper). Warbling vireos, in particular, are among the most conspicuous birds along the railroad tracks. Their low numbers elsewhere in the park, and their status on Arbib's Blue List (1978) suggest that this is unusually good habitat for these birds. The limestone bluffs facing the river contain holes providing nesting sites for large numbers of Rough-winged Swallows, birds which do not nest elsewhere within the park. These holes probably provide important daytime escapes for the wealth of bats which hunt along the river's edge at night. Alteration of that area along the railroad tracks would have serious impact on the park's wildlife, and a strong stance should be taken against the development of a staging area south of McGregor.

5. If camp grounds must be enlarged, or further facilities developed within the park, alteration of "woodland" or "Oak-hickory" communities would have less impact upon vertebrate populations and diversity than would the destruction of older or younger communities.

Because of the intermediate age of these communities, they are low in "specialist" species, either adapted to the climax Red oak-Sugar Maple forest or to the earlier brushy seral stages. No species were found only in

"Woodland" or "Oak-hickory" communities (Tables 3, 4 or 6).

6. Periodically burn prairie openings.

Early spring controlled burning of these openings on a biennial or triennial basis will prevent invasion by brush and tree species. Burning will favor warm-season prairie species at the expense of introduced cool-season species. To control the fire burning should be done in the spring when the grass has dried out, but leaf litter in the adjacent forest is still moist. The fire should be started on the downwind side of the area to be burned and the back fire allowed to move against the wind across the opening. This method is slower than using a head fire but is much easier to control. Equipment for managing the fire would include back-pack water pumps, rakes, shovels and some type of lighter.