Report on the Natural Features Inventory of the Crane Property For the City of Columbia Parks & Recreation Department

Limestone/Dolomite Cliff, Crane Property, Columbia Parks & Recreation Department

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1. Introduction:

In October, 2007 staff from Columbia's Parks and Recreation Department met with Department of Natural Resources, Division of State Parks staff to discuss the Crane Property that was acquired by the City of Columbia to develop a new city park. The site is, in part, immediately east and contiguous with Rock Bridge Memorial State Park and Gans Creek Wild Area. City planners wanted to inform state park staff of the planning process the city is engaged in for the development and use of the Crane Property. State park staff appreciate the opportunity to be involved as a cooperating partner with the City of Columbia in the planning effort. As a result of the meeting the Department of Natural Resources offered to assist the Columbia Parks & Recreation Department by conducting surveys of the Crane property to identify resources of natural history interest including caves and terrestrial natural communities. Three floristic surveys were conducted (January 18, 2008, May 21, 2008, and June 20, 2008). These were focused within the upper watershed of Gans Creek in a portion of the Crane property that has relatively intact woodland and riparian communities. Other areas of the property to the north were heavily utilized for grazing or agricultural production with little prospect for features of natural history interest. The area surveyed is directly contiguous to the Gans Creek Wild Area within Rock Bridge Memorial State Park. The development of this area for passive nature-based recreation is a great opportunity for further cooperation between the City of Columbia and the Department of Natural Resources.

Other surveys conducted by Rock Bridge Memorial State Park staff were focused on Elbow Cave. Over several months, including multiple visits, staff worked to map Elbow Cave to gain a better understanding of cave and related karst resources.

2. Results:

The Crane Property floristic surveys resulted in a number of interesting discoveries. The property along Gans Creek includes terrestrial natural communities, aquatic communities and geologic features of natural history interest. The attached map (see Appendix) provides reference for the following discussion.

A terrestrial natural community is defined as an "interrelated assemblage of plants and animals found in a given area." The primary features used to differentiate types of terrestrial natural communities are: plant species present, vegetation structure, soil characteristics (moisture, aspect and slope), parent material (e.g. limestone, sandstone, chert, etc.), and natural processes (fire, climate and the grazing of herbivores). The standard reference used for this report is "The Terrestrial Natural Communities of Missouri" (Nelson, 2005).

The terrestrial natural communities observed during the surveys include limestone/dolomite cliff and talus, dry and dry-mesic limestone/dolomite woodland, limestone glade, bottomland forest, riverfront, stream edge, spring and spring branch, and cave communities. While the communities observed are not pristine or of high quality, they do have a notable level of integrity and potential for restoration and nature based recreation and interpretation.

<u>Limestone cliff and talus</u> communities due to their inaccessibility for grazing and timber operations are floristically intact. Dominant trees and shrubs include chinquapin oak, sugar maple, blue ash, bladdernut, and trumpet creeper. Associated wildflowers include columbine,

jack-in-the-pulpit, Drummond's goldenrod, waterleaf, assorted sedges and ferns. Bush honeysuckle is a problematic and dominant shrub along sections of the cliff. Of note is the presence of several caves and shelters along the south face of the cliff. One cave is currently used as a nesting site for turkey vultures. When explored several juvenile vultures were observed.

The limestone/dolomite glade is heavily encroached and narrowed by invasive eastern red cedar trees. Even so glade species are evident in the remaining glade corridor including bent milk vetch, side oats grama, wild hyacinth, prickly pear cactus, yellow star grass, hairy ruellia, and bird's foot violet. The glade observed is a small- patch community (less than 0.2 acres) and shows evidence of prior grazing disturbance but is an interesting feature within a wooded landscape. Several such glade communities have been restored at Rock Bridge Memorial State Park.

The limestone/dolomite woodlands range from dry to dry-mesic depending on soil depth, moisture and nutrient availability. Generally the 'rich' or dry-mesic woodlands, developed on deeper soils, were logged more heavily than dry limestone/dolomite woodlands on thin or rocky soils. Dry woodlands are best developed on narrow ridges above or adjacent to cliffs or adjacent to the glade on thin soils. These woodlands as a matrix community have good structure and composition for a woodland in Boone County, Missouri.

The dry-mesic limestone/dolomite woodlands are dominated by white oak, black oak, and hickory. Dry limestone/dolomite woodlands are dominated by chinquapin oak, , post oak, black oak with blue ash common in some areas, associated with the cliff edge. Old growth trees (ca. 150 years old or better) are notable (chinquapin oak, post oak, burr oak, white oak, and blue ash).

Bottomland forest, and riverfront forest occur in isolated small patches or provide a buffer between old field and stream edge. These areas feature hackberry, black walnut, green ash, sycamore, cottonwood trees and an interesting ground flora of native grasses, sedges, and wildflowers. Of particular note is a heron rookery, with seven active nests. It is not known how many great blue herons were fledged from the rookery in 2008. It is well established and a feature of interest.

Streamedge communities are linear and are adapted to the physical forces of high water flow as well as low flow conditions. The stream edge communities are intact but exhibit some of the degradation associated with livestock grazing. Black willow and water willow are characteristic species.

Aquatic Communities (Prairie-Lower Missouri Small Stream)
Within Rock Bridge Memorial State Park, Gans Creek has been designated as a 'Outstanding State Resource Water' (OSRW). Outstanding State Resource Waters are "high quality waters with a significant aesthetic, recreational or scientific value," as determined by the Clean Water Commission. They are designated on public lands where these conditions exist.

According to the Missouri State Parks Fish Faunal Survey (Vokoun and Noltie, 2000) The species richness of the stream within the park is above average compared to other streams in the region. The Department of Natural Resources is committed to protecting the watershed and is interested

in working with the City of Columbia to assure that aquatic resources are protected. The same applies to the subsurface aquifer associated with karst and caves.

Cave Communities are addressed in the following report.

3. Elbow Cave Report, December, 2008
Prepared by Kathryn DiFoxfire, Interpretive Resource Technician, RBMSP

Description of project:
Chouteau Grotto (a local chapter of the National Speleological Society) and Rock Bridge Memorial State Park staff and volunteers surveyed and inventoried Elbow Cave from February 19 – June 14, 2008. The entire cave was surveyed with the exception of several small, tight passages in the lower level where the hazard of getting stuck outweighed the benefits of surveying.

Overview:
Elbow Cave is a multi-level Burlington limestone cave with two entrances and a total surveyed length of 1544 feet with about 1/3 in the upper levels and 2/3 in the lowermost level. It is fed by both sinkholes and an intermittent stream that drains directly into the cave's sinkhole entrance. The upper level passages fork several times and lead to a variety of rooms and passages, some of which require hands and knees crawling. The lowest level is a streambed that lies roughly beneath and/or parallel to the upper levels and continues to the cave's other entrance. Most of the 1000-foot-long streambed passage requires belly or hands-and-knees crawling as the majority of the passage is between 15 inches and three feet high and contains only one place high enough to actually stand up. The cave has a rich and active biology, some active speleothems, and is subject to severe flash flooding. Water level in the stream varies from a few inches to 2.5 feet at normal levels. During flood situations, the cave will flood to the ceiling throughout most (or possibly all) of the lowest level and can be several feet deep within sections of the upper levels.

The cave provides habitat for a rich variety of animal life including bats, salamanders, raccoons, beetles, cave crickets, centipedes, millipedes, gnats, spiders, monorail worms, isopods, amphipods, and other aquatic and non-aquatic invertebrates. A phoebe nest with eggshells was found about 90 feet inside the cave. The most impressive calcite deposit of the cave is a pristinely-white, 6-foot high rimstone dam formation with a constantly flowing small waterfall. There is also some flowstone on the walls of the main passage and small formations throughout the cave.

Air and water temperature fluctuates and parallels somewhat with the outside temperature. The lower levels are noticeably cooler than the upper levels, but in certain places in the cave, the water that flows in from the surface can be warm on hot, summer days (and likely cold on cold winter days).

Concerns / Potential Public Impact
Biology
The cave has an active ecosystem which may be severely impacted with unrestricted access. A small pool in the Rimstone Room is a breeding pool for salamanders and can easily be trampled and ruined by careless explorers, especially when accessing the Right Hand Passage leading from the room. Because of the low ceiling areas, bats may be knocked from the ceiling.

No bats were observed above small guano piles near the back of the cave, leaving identity unknown, but the clustered nature of the guano suggests the possibility of use by federally-endangered gray bats during summer months or possible hibernating clusters of little brown bats. Additional surveys may be needed to determine the bat species responsible for the guano piles and whether the bats are still using the cave.

Formations

While the main passage lacks much in the way of major formations, the flowstone in the Rimstone Room is quite active and pristine and could suffer much damage if access to the cave is unrestricted, especially if people decide to climb on the formation. The water flowing over the formation has been active on each trip despite the lack of rain at times or regardless of rain fall events. There is no noticeable pool of water on the property above the cave but there are some ponds on nearby private property that may drain into the cave.

Navigation / Exploring / Risk of Hypothermia

Because of the multiple forks, getting lost is a minor concern in the upper levels; some people, especially younger children, may get confused on finding the correct way out of the Rimstone Room. The upper level has a few steep slopes; we flagged one potential drop-off point with a temporary barrier. The lowest level has few forks; however, it may be difficult for those unfamiliar with the cave to find the exit because of the need to bellycrawl beneath a ledge. Hypothermia is also a major concern in the lower levels because of the need to crawl for long periods of time through water. Exploration in the lower level should not be attempted without a wetsuit.

Narrow passageways

While most of the main cave is navigable by the average adult in good physical condition, the several crawlways that lead to lower levels are not. All of the access points to the lowest level have low, narrow and tight squeezes. Younger children and teens may be able to fit in most of the lowest level, but many of the passageways are tight squeezes for the average adult, and too narrow or low for larger adults. Two of the access points are also steep and can be muddy making it difficult to climb back up. We rigged temporary handlines in several places for getting in and out of some of the slopes and tight spaces (handlines were removed after each trip). In addition to the lowest level, there are a few crawlways in the upper level with potential for getting stuck or injured.

Potential for Flooding

The cave is subject to flash flooding. Much of the flooding is likely water flowing down the outside drainage and entering through the sinkhole entrance judging by the amount and location of the wood debris within the cave. There are also numerous sinkholes on the surface which provide additional means for water to enter the cave. During heavy rains, parts of the upper level near the entrance floods to the ceiling, as does most, if not all, of the lower level.

Access / Cave Gating: Since the cave is located in a major regional park where many people may stumble onto it accidentally and enter without proper preparations, we recommend restricting general public access via cave gates at both entrances for the following reasons: high risk of flash flooding; high risks of people, especially small children, exploring the dangerous lower levels where they could get lost, stuck, experience hypothermia or drown; and high risk of casual explorers ruining the fragile ecosystem of the cave. We do recommend providing limited access to properly prepared small groups led by guides familiar with the cave features and cave risks.

The upper levels would be appropriate and not overly dangerous to groups with no prior caving experience providing they are adequately prepared. Due to the significant amount of crawling and extremely wet conditions, the lower level should be accessed only by cavers with some prior caving experience in wild caves (as opposed to "show" caves with developed trails and installed lighting). Wetsuits should be required and a minimum age limit (e.g., 14 or older) should be established.

Cave gates would have to be able to accommodate bat, raccoon and other animal access; divert logs and other major flood debris away from the gates; and allow water with minor wood debris to enter/exit the two entrances.

4. Recommendations for Crane Property Park

1) Watershed Management

Background: Gans Creek is a State Outstanding Resource Water (OSRW), as designated by the state Clean Water Commission and is important to wildlife habitat, pubic recreation and the health of public waters. Runoff from all of the Crane property finds its way into Gans Creek with the exception of some sinkholes near the southern boundary, which likely drain into Devil's Icebox Cave. Other sinkholes recharge Elbow Cave. The water that flows through Elbow Cave, exits as a spring that contributes to Gans Creek.

Goal: Minimize manmade stormwater runoff and water pollution on the entire Crane property to protect aquatic animals and habitats of Gans Creek, Elbow Cave and Devil's Icebox Cave.

Specific Recommendations:

- If possible, avoid developments or other negative watershed impacts in the southern karst area.
- Minimize vegetation removal and soil disturbance.
- Install the best erosion control features possible from the earliest onset of soil disturbance and maintain it for the duration of construction activities and until vegetation is established.
- Install BMPs designed to manage stormwater produced from developed areas. In addition to impervious parking lots, this includes temporarily detaining or treating waters from ball fields if herbicides, pesticides and fertilizers will be applied.
- Establish and enforce restrictions concerning the types of and amounts of herbicides, pesticides and fertilizers that can be applied to park grounds.

2) Elbow Cave

Background: Elbow Cave is a multi-level Burlington limestone cave with two entrances and a total surveyed length of 1544 feet with about 1/3 in the upper levels and 2/3 in the lowermost level. It is fed by both sinkholes and an intermittent stream that drains directly into the cave's sinkhole entrance. The upper level passages fork several times and lead to a variety of rooms and passages some of which require hands and knees crawling but are otherwise easily navigable by the average physically-active adult. The lowest level is a streambed that lies roughly beneath and/or parallel to the upper levels and continues to the cave's other entrance. Most of the

streambed passage requires belly or hands-and-knees crawling. The cave has a rich and active biology, some active calcite deposits, and is subject to flash flooding.

Goal: Protect the natural resources of Elbow Cave and provide limited public access.

Specific Recommendations:

- Protect the cave recharge area (see Watershed Protection above).
- Provide limited public access through a permit process for qualified groups.

  If you expect a significant number of the public to visit the cave entrances, then the following recommendations apply:

  - Install cave gates to protect public safety and prevent damage to cave resources.
  - Enable the public to enter at-will a short hazard-free section near the entrance, but gate and control access to sections that contain hazards. This would require gates inside both the left and right forks of the main entrance and a small gate at the other entrance.
  - Contact MDC Cave Biologist Bill Elliott for help with cave gate design and suggestions for building a two-stage system that can catch and redirect larger debris and prevent it from entering the cave and damaging the gates.
  - Follow a maintenance schedule of regular removal of logs and branches from cave gates and reduce the difficulty of this task by removing dead logs and down branches from the wooded area surrounding the cave entrance before they are washed into the cave. Allow leaves and twigs to enter the cave because they are a source of nutrients for cave biota and won't cause problems for the cave gates.
  - If the cave is properly gated, build a trail to the entrance of Elbow Cave.
  - If the cave is properly gated, develop and display an outdoor exhibit sign to educate the public about karst hydrology and cave resources.

3) Natural Community Management

The mission of the Division of State Parks is to preserve and interpret the state's most outstanding natural landscapes and cultural landmarks, and to provide outstanding recreational opportunities compatible with those resources." The Department of Natural Resources is actively involved in restoration projects throughout Missouri with demonstrated success. The communities observed on the Crane Property exhibit potential for restoration. At Rock Bridge Memorial State Park MODNR uses prescribed fire to manage prairie grassland units, woodlands and glades. If the City of Columbia is interested in planning for ecological management MODNR may be able to assist.

Goal: Management of Terrestrial Natural Communities

4) Invasive Exotic Plant Species

Invasive plant species including bush honeysuckle, crown vetch, autumn olive, multiflora rose, and star-of-bethlehem were observed and recorded during the survey. Through time these species may come to dominate the vegetation thereby degrading existing intact natural terrestrial communities that provide recreational and interpretive benefits to the user. Bush honeysuckle is well established along portions of the cliff and riparian zone and likely will become more

dominant unless control measures are taken. Crown vetch and autumn olive are less well established but occur within the riparian zone where seeds may spread throughout the watershed. All three species present a concern for management downstream within Rock Bridge Memorial State Park. A source of seed upstream presents management issues with the state park.

Eastern red cedar, while native, is classified as an invasive native species. The small glade communities on the Crane Property are surrounded by eastern red cedar trees. At Rock Bridge Memorial State Park glades have been restored by removing eastern red cedar.

Goal: Prevent the spread of invasive exotic species (ie. bush honeysuckle, crown vetch, and sericea lespedeza).
Specific Recommendation:

- Identify and control invasive exotic species that can spread throughout the watershed.
- Provide information about invasive exotic species and how they threaten natural communities and green space.
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5) Deer:
Background: Since 2002, RBMSP has held a special managed deer hunt every year that data indicated that deer were overpopulated. The target set by the Missouri State Park system is to have a deer population of no more than 25 deer per square mile. At greater densities, deer overgraze certain plants and damage the ecosystem. Deer will move between the two properties.

Goal: Prevent an overpopulation of deer and the damage they can cause.

Specific Recommendation:

- Provide limited deer hunting opportunities as needed to prevent an overpopulation of deer.
- Communicate deer hunting rules and post signs that clearly mark the boundary between the two parks in order to prevent hunters from crossing over during either park's hunt since there will likely be different seasons and methods that apply.

6) Trails:
Background: The trails that are in adjacent lands of RBMSP are in the Gans Creek Wild Area, governed by statewide Wild Area policies. These wild area rules prohibit bicyclists and restrict horseback riding to June 1 through Oct. 31 on days when trail conditions are not muddy. Hiking is permitted daily from sunrise to sunset. The spirit behind wild area policies is to provide people with wilderness experiences (natural surroundings, solitude, quiet).

Goal: Coordinate and develop in ways that encourage visitors to use trails in both parks according to rules that apply.

Specific Recommendations:

- As much as possible, avoid making changes that will detract from a wilderness experience for visitors to the Gans Creek Wild Area.
- Coordinate about trail locations and rules.

6 Conclusion;

The surveys conducted on the Crane property over the last 8 months uncovered a number of communities and features of natural history interest. As planning progresses MODNR would be pleased to work with the City of Columbia to provide nature-based recreational opportunities if this is the desire of the City Parks & Recreation Department. Attached find photos, maps, and species lists from the survey of the Crane Tract. Bird lists and other information is included from Rock Bridge Memorial State Park to provide a representative lists of birds and other animals that are may occur within the survey area.

Gans Creek streamedge, cliff and talus communities

Limestone Glade Opening surrounded by eastern red cedar (Juniperus virginiana)

Bottomland Forest

Dry limestone/dolomite woodland

Cave

Dry Limestone/Dolomite Cliff

Riverfront Forest and Stream Edge Communities

Vascular Plants of the Crane Property

Floristic Assessment Report

Assessment

Crane Property - MODNR

Study Area: **Objective:** Crane Tract Area

County: Boone

Date: 2008

Lead Observer: Currier, Mike **Other participants:** Campbell

Native Species Richness	152	**Native Quality**	4.059	**Native Index**	50.045	**Native Wetness**	2.178
FACU+							
Total Species Richness	170	**W/Adventives**	3.629	**W/Adventives**	47.322	**W/Adventives**	2.329
FACU+							

All Species	170		**Native**	152	89.4%	**Adventive**	18	10.6%
Tree	28	16.5%	**Tree**	27	17.8%	**Tree**	1	5.6%
Shrub	9	5.3%	**Shrub**	6	3.9%	**Shrub**	3	16.7%
W-Vine	5	2.9%	**W-Vine**	5	3.3%	**W-Vine**	0	0.0%
H-Vine	1	0.6%	**H-Vine**	1	0.7%	**H-Vine**	0	0.0%
P-Forb	77	45.3%	**P-Forb**	71	46.7%	**P-Forb**	6	33.3%
B-Forb	5	2.9%	**B-Forb**	3	2.0%	**B-Forb**	2	11.1%
A-Forb	17	10.0%	**A-Forb**	14	9.2%	**A-Forb**	3	16.7%
U-Forb	0	0.0%	**U-Forb**	0	0.0%	**U-Forb**	0	0.0%
P-Grass	12	7.1%	**P-Grass**	10	6.6%	**P-Grass**	2	11.1%
A-Grass	1	0.6%	**A-Grass**	0	0.0%	**A-Grass**	1	5.6%
U-Grass	0	0.0%	**U-Grass**	0	0.0%	**U-Grass**	0	0.0%
P-Sedge	11	6.5%	**P-Sedge**	11	7.2%	**P-Sedge**	0	0.0%
A-Sedge	0	0.0%	**A-Sedge**	0	0.0%	**A-Sedge**	0	0.0%
Fern	4	2.4%	**Fern**	4	2.6%	**Fern**	0	0.0%
Lichen	0	0.0%	**Lichen**	0	0.0%	**Lichen**	0	0.0%
Moss	0	0.0%	**Moss**	0	0.0%	**Moss**	0	0.0%

Native COFC Summary

COFC	Count
0	6
1	7
2	10
3	27
4	40
5	33
6	21
7	6
8	2
9	0
10	0

Flora	*COFC*	*Scientific Name*	*Common Name*		**Phys**	*NT/AD*
ACARH	0	*Acalypha rhomboidea*	Rhombic Copperleaf	FACU	A-FORB	Nt
ACENE	1	*Acer negundo*	Box Elder	FACW-	TREE	Nt
ACESUG	5	*Acer saccharum*	Sugar Maple	FACU	TREE	Nt
ACHMI	0	*Achillea millefolium*	Yarrow	FACU	P-FORB	Ad
AESGL	5	*Aesculus glabra*	Ohio Buckeye	FAC+	TREE	Nt
AGRPU	3	*Agrimonia pubescens*	Soft Agrimony	UPL	P-FORB	Nt
AMBAR	0	*Ambrosia artemisiifolia*	Common Ragweed	FACU	A-FORB	Nt
AMPBR	4	*Amphicarpa bracteata*	Hog Peanut	FAC	H-VINE	Nt
ANEVI	4	*Anemone virginiana*	Tall Anemone	UPL	P-FORB	Nt
ANETH	5	*Anemonella thalictroides*	Rue Anemone	UPL	P-FORB	Nt
ANTNE	4	*Antennaria neglecta*	Field Cat's Foot	UPL	P-FORB	Nt
ANTPL	5	*Antennaria plantaginifolia*	Pussy's Toes	UPL	P-FORB	Nt
AQUCA	6	*Aquilegia canadensis*	Columbine	FAC-	P-FORB	Nt
ARALA	5	*Arabis laevigata*	Smooth Bank Cress	UPL	B-FORB	Nt
ARCMI	0	*Arctium minus*	Common Burdock	UPL	B-FORB	Ad
AREPA	7	*Arenaria patula*	Slender Sandwort	UPL	A-FORB	Nt
ARIAT	6	*Arisaema atrorubens*	Jack-In-The Pulpit	FACW-	P-FORB	Nt
ARIDR	6	*Arisaema dracontium*	Green Dragon	FACW	P-FORB	Nt
ASACA	6	*Asarum canadense*	Wild Ginger	UPL	P-FORB	Nt

ASCPU	6	*Asclepias purpurascens*	Purple Milkweed	FACU	P-FORB	Nt
ASCQU	6	*Asclepias quadrifolia*	Four-Leaved Milkweed	UPL	P-FORB	Nt
ASITR	5	*Asimina triloba*	Pawpaw	FAC	TREE	Nt
ASTAN	6	*Aster anomalus*	Blue Aster	UPL	P-FORB	Nt
ASTAZ	7	*Aster azureus*	Azure Aster	UPL	P-FORB	Nt
ASTSA	4	*Aster sagittifolius*	Arrow-Leaved Aster	UPL	P-FORB	Nt
ASTDI	6	*Astragalus distortus*	Bent Milk Vetch	UPL	P-FORB	Nt
BARVU	0	*Barbarea vulgaris*	Yellow Rocket	FAC	P-FORB	Ad
BOECY	4	*Boehmeria cylindrica*	False Nettle	OBL	P-FORB	Nt
BOTVI	4	*Botrychium virginianum*	Rattlesnake Fern	FACU	FERN	Nt
BOUCU	7	*Bouteloua curtipendula*	Side-Oats Grama	UPL	GRASS	Nt
BROPU	5	*Bromus purgans*	Woodland Brome	FACU+	GRASS	Nt
BROST	0	*Bromus sterilis*	Poverty Brome	UPL	GRASS	Ad
CAMSC	6	*Camassia scilloides*	Wild Hyacinth	FAC+	P-FORB	Nt
CAMRAD	3	*Campsis radicans*	Trumpet Creeper	FAC	W-VINE	Nt
CXART	6	*Carex artitecta*	Bellows-Beaked Sedge	UPL	SEDGE	Nt
CXBLA	3	*Carex blanda*	Wood Sedge	FAC	SEDGE	Nt
CXBUS	3	*Carex bushii*	Bush's Sedge	FACW	SEDGE	Nt
CXCEP	5	*Carex cephalophora*	Woodbank Sedge	FACU	SEDGE	Nt
CXCONJ	5	*Carex conjuncta*	Soft Fox Sedge	FACW	SEDGE	Nt
CXFRA	5	*Carex frankii*	Frank's Sedge	OBL	SEDGE	Nt
CXGRACS	7	*Carex gracilescens*	Graceful Sedge	UPL	SEDGE	Nt
CXJAM	5	*Carex jamesii*	Grass Sedge	UPL	SEDGE	Nt
CXMUH	5	*Carex muhlenbergii*	Sand Sedge	UPL	SEDGE	Nt
CXRET	4	*Carex retroflexa*	Reflexed Sedge	UPL	SEDGE	Nt
CXUMB	6	*Carex umbellata*	Umbel-Like Sedge	UPL	SEDGE	Nt
CARCO	5	*Carya cordiformis*	Bitternut Hickory	FAC	TREE	Nt
CAROVT	4	*Carya ovata*	Shagbark Hickory	FACU	TREE	Nt
CELOC	4	*Celtis occidentalis*	Hackberry	FAC-	TREE	Nt
CEPOC	3	*Cephalanthus occidentalis*	Buttonbush	OBL	SHRUB	Nt
CERCA	3	*Cercis canadensis*	Redbud	FACU	TREE	Nt
CHEFE	8	*Cheilanthes feei*	Slender Lip Fern	UPL	FERN	Nt
CHRLE	0	*Chrysanthemum leucanthemum*	Ox-Eye Daisy	UPL	P-FORB	Ad
CLAVI	3	*Claytonia virginica*	Spring Beauty	FACU	P-FORB	Nt
CORVA	0	*Coronilla varia*	Crown Vetch	UPL	P-FORB	Ad
CRYCA	2	*Cryptotaenia canadensis*	Honewort	FAC	P-FORB	Nt
CYNVI	6	*Cynoglossum virginianum*	Wild Comfrey	UPL	P-FORB	Nt
CYSFR	5	*Cystopteris fragilis*	Fragile Fern	FACU	FERN	Nt
DACGL	0	*Dactylis glomerata*	Orchard Grass	FACU	GRASS	Ad
DANSP	3	*Danthonia spicata*	Poverty Oat Grass	UPL	GRASS	Nt
DESPIBR	3	*Descurainia pinnata brachycarpa*	Short-Fruited Pinnate Tansy-Mustard	UPL	A-FORB	Nt
DESPAN	3	*Desmodium paniculatum*	Panicled Tick Trefoil	FACU	P-FORB	Nt
DIAAM	6	*Diarrhena americana*	Beak Grass	FACW	GRASS	Nt
DICCU	6	*Dicentra cucullaria*	Dutchman's Breeches	UPL	P-FORB	Nt
DIOSPVI	3	*Diospyros virginiana*	Persimmon	FAC	TREE	Nt
ELAUM	0	*Elaeagnus umbellata*	Autumn Olive	UPL	SHRUB	Ad
ELECAR	3	*Elephantopus carolinianus*	Elephant's Foot	FAC-	P-FORB	Nt
ELLNY	1	*Ellisia nyctelea*	Aunt Lucy	FAC+	A-FORB	Nt
ELYVIR	4	*Elymus virginicus*	Virginia Wild Rye	FACW-	GRASS	Nt
ERIPH	3	*Erigeron philadelphicus*	Marsh Fleabane	FACW	B-FORB	Nt
ERISTG	3	*Erigeron strigosus*	Daisy Fleabane	FAC-	A-FORB	Nt
ERYAL	5	*Erythronium albidum*	White Trout Lily	UPL	P-FORB	Nt
EUPAPU	4	*Eupatorium purpureum*	Purple Joe Pye Weed	FAC	P-FORB	Nt
EUPARU	2	*Eupatorium rugosum*	White Snakeroot	FACU	P-FORB	Nt
EUPASER	1	*Eupatorium serotinum*	Late Boneset	FAC+	P-FORB	Nt
FESEL	0	*Festuca elatior*	Meadow Fescue	FACU-	GRASS	Ad

FRAPE	5	*Fraxinus pennsylvanica*	Red Ash	FACW	TREE	Nt
FRAQU	6	*Fraxinus quadrangulata*	Blue Ash	UPL	TREE	Nt
GALAP	0	*Galium aparine*	Annual Bedstraw	FACU	A-FORB	Nt
GALCIR	4	*Galium circaezans*	Wild Licorice	FACU-	P-FORB	Nt
GALCO	4	*Galium concinnum*	Shining Bedstraw	FACU	P-FORB	Nt
GERGRCI	6	*Gerardia grandiflora*	Big-Flowered Gerardia	UPL	P-FORB	Nt
GLETR	2	*Gleditsia triacanthos*	Honey Locust	FAC	TREE	Nt
GYMDI	6	*Gymnocladus dioica*	Kentucky Coffee Tree	UPL	TREE	Nt
HETRE	6	*Heteranthera reniformis*	Kidney-Leaf Mud Plantain	OBL	P-FORB	Nt
HEURIGR	5	*Heuchera richardsonii grayana*	Jane's Rush Pea	FAC-	P-FORB	Nt
HIEGR	4	*Hieracium gronovii*	Hairy Hawkweed	UPL	P-FORB	Nt
HYDAP	5	*Hydrophyllum appendiculatum*	Great Waterleaf	UPL	P-FORB	Nt
HYPHI	4	*Hypoxis hirsuta*	Yellow Star Grass	FAC	P-FORB	Nt
HYSPA	4	*Hystrix patula*	Bottlebrush Grass	UPL	GRASS	Nt
IMPCA	3	*Impatiens capensis*	Orange Jewelweed	FACW	A-FORB	Nt
ISOBI	5	*Isopyrum biternatum*	False Rue Anemone	FAC	P-FORB	Nt
JUGNI	4	*Juglans nigra*	Black Walnut	FACU	TREE	Nt
JUNTE	0	*Juncus tenuis*	Roadside Rush	FAC	P-FORB	Nt
JUNVI	2	*Juniperus virginiana*	Red Cedar	FACU	TREE	Nt
JUSAM	5	*Justicia americana*	Water Willow	OBL	P-FORB	Nt
LAMAM	0	*Lamium amplexicaule*	Henbit	UPL	P-FORB	Ad
LAPCA	4	*Laportea canadensis*	Wood Nettle	FACW	P-FORB	Nt
LESVIR	5	*Lespedeza virginica*	Slender Bush Clover	UPL	P-FORB	Nt
LONMA	0	*Lonicera maackii*	Amur Honeysuckle	UPL	SHRUB	Ad
LUZBU	4	*Luzula bulbosa*	Wood Rush	FACU	P-FORB	Nt
MACPO	0	*Maclura pomifera*	Osage Orange	FACU	TREE	Ad
MENCAN	4	*Menispermum canadense*	Moonseed	FAC+	W-VINE	Nt
MUHSO	4	*Muhlenbergia sobolifera*	Rock Satin Grass	UPL	GRASS	Nt
MYOVI	2	*Myosotis virginica*	White Forget-Me-Not	FACU-	A-FORB	Nt
OPUCO	4	*Opuntia compressa*	Prickly Pear	UPL	P-FORB	Nt
ORNUM	0	*Ornithogalum umbellatum*	Star-Of-Bethlehem	FAC-	P-FORB	Ad
OSTVI	4	*Ostrya virginiana*	Ironwood	FACU-	TREE	Nt
OXAVI	5	*Oxalis violacea*	Violet Wood Sorrel	UPL	P-FORB	Nt
PANCL	4	*Panicum clandestinum*	Deer Tongue Grass	FACW	GRASS	Nt
PANLA	0	*Panicum lanuginosum*	Wooly Panic Grass	FAC	GRASS	Nt
PARPE	3	*Parietaria pensylvanica*	Pellitory	FACU	A-FORB	Nt
PARQU	3	*Parthenocissus quinquefolia*	Virginia Creeper	FAC-	W-VINE	Nt
PELAT	7	*Pellaea atropurpurea*	Purple Cliff Brake	UPL	FERN	Nt
PENDI	4	*Penstemon digitalis*	Foxglove Beard Tongue	FAC-	P-FORB	Nt
PENPA	4	*Penstemon pallidus*	Pale Beard Tongue	UPL	P-FORB	Nt
PHLDI	4	*Phlox divaricata*	Blue Phlox	FACU	P-FORB	Nt
PLALA	0	*Plantago lanceolata*	English Plantain	FAC	A-FORB	Ad
PLAOC	3	*Platanus occidentalis*	Sycamore	FACW	TREE	Nt
POASY	5	*Poa sylvestris*	Woodland Blue Grass	FAC	GRASS	Nt
PODPE	4	*Podophyllum peltatum*	May Apple	FACU	P-FORB	Nt
POLGCA	4	*Polygonatum canaliculatum*	Smooth Solomon's Seal	FACU	P-FORB	Nt
POLVI	1	*Polygonum virginianum*	Virginia Knotweed	FAC	P-FORB	Nt
POTSI	3	*Potentilla simplex*	Common Cinquefoil	FACU-	P-FORB	Nt
PRUSE	2	*Prunus serotina*	Wild Black Cherry	FACU	TREE	Nt
QUEAL	4	*Quercus alba*	White Oak	FACU	TREE	Nt
QUEIM	3	*Quercus imbricaria*	Shingle Oak	FAC-	TREE	Nt
QUEMAC	4	*Quercus macrocarpa*	Bur Oak	FAC-	TREE	Nt
QUERU	5	*Quercus rubra*	Red Oak	FACU	TREE	Nt
QUEST	4	*Quercus stellata*	Post Oak	FACU-	TREE	Nt
QUEVE	4	*Quercus velutina*	Black Oak	UPL	TREE	Nt
RANHI	6	*Ranunculus hispidus*	Hispid Buttercup	FAC	P-FORB	Nt

RHUGL	1	*Rhus glabra*	Smooth Sumac	UPL	SHRUB	Nt
RHURA	1	*Rhus radicans*	Poison Ivy	FACU	W-VINE	Nt
RIBMI	3	*Ribes missouriense*	Wild Gooseberry	UPL	SHRUB	Nt
ROSMU	0	*Rosa multiflora*	Multiflora Rose	FACU	SHRUB	Ad
RUEHU	3	*Ruellia humilis*	Hairy Ruellia	FACU-	P-FORB	Nt
SALNI	2	*Salix nigra*	Black Willow	OBL	TREE	Nt
SANGCA	5	*Sanguinaria canadensis*	Bloodroot	FACU-	P-FORB	Nt
SANICA	3	*Sanicula canadensis*	Canadian Black Snakeroot	FACU+	B-FORB	Nt
SANGR	2	*Sanicula gregaria*	Clustered Black Snakeroot	FAC+	P-FORB	Nt
SCUOV	5	*Scutellaria ovata*	Heart-Leaved Skullcap	FACU	P-FORB	Nt
SCUPA	4	*Scutellaria parvula*	Small Skullcap	FACU	P-FORB	Nt
SEDPU	6	*Sedum pulchellum*	Widow's Cross	FACU-	A-FORB	Nt
SILAN	2	*Silene antirrhina*	Sleepy Catchfly	UPL	A-FORB	Nt
SISCA	4	*Sisyrinchium campestre*	Prairie Blue-Eyed Grass	UPL	P-FORB	Nt
SMIRA	4	*Smilacina racemosa*	Feathery False Solomon's Seal	FACU	P-FORB	Nt
SMITA	3	*Smilax tamnoides*	Bristly Greenbriar	FAC	W-VINE	Nt
SOLDR	8	*Solidago drummondii*	Drummond's Goldenrod	UPL	P-FORB	Nt
SOLUL	4	*Solidago ulmifolia*	Elm-Leaved Goldenrod	UPL	P-FORB	Nt
SPEBI	3	*Specularia biflora*	Small Venus' Looking Glass	UPL	A-FORB	Nt
STATR	5	*Staphylea trifolia*	Bladdernut	FAC	SHRUB	Nt
STEME	0	*Stellaria meadia*	Common Chickweed	FACU	A-FORB	Ad
SYMOR	1	*Symphoricarpos orbiculatus*	Coralberry	FACU	SHRUB	Nt
TEPVI	5	*Tephrosia virginiana*	Goat's Rue	UPL	P-FORB	Nt
TILAM	5	*Tilia americana*	Basswood	FACU	TREE	Nt
TORJA	0	*Torilis japonica*	Hedge Parsley	UPL	A-FORB	Ad
TRAOH	4	*Tradescantia ohiensis*	Common Spiderwort	FACU+	P-FORB	Nt
TRADU	0	*Tragopogon dubius*	Goat's Beard	UPL	B-FORB	Ad
TRISES	5	*Trillium sessile*	Toad Trillium	FACU-	P-FORB	Nt
TRIVI	7	*Trillium viride*	Green Trillium	UPL	P-FORB	Nt
ULMRU	3	*Ulmus rubra*	Slippery Elm	FAC	TREE	Nt
URTDI	3	*Urtica dioica*	Tall Nettle	FAC+	P-FORB	Nt
VALRA	0	*Valerianella radiata*	Beaked Corn Salad	FAC+	A-FORB	Nt
VERCA	5	*Verbena canadensis*	Rose Vervain	UPL	P-FORB	Nt
VERBAL	4	*Verbesina alternifolia*	Yellow Ironweed	FACW	P-FORB	Nt
VERBA	2	*Vernonia baldwini*	Western Ironweed	UPL	P-FORB	Nt
VIBRU	4	*Viburnum rufidulum*	Southern Black Haw	FACU-	SHRUB	Nt
VIOPEA	5	*Viola pedata*	Bird's Foot Violet	UPL	P-FORB	Nt
VIOTRL	5	*Viola triloba*	Three-Leaved Violet	UPL	P-FORB	Nt
VIOVI	6	*Viola viarum*	Plains Violet	FACU	P-FORB	Nt

The Missouri Chapter of The Nature Conservancy has developed 'Coefficients of Conservatism' (COFC) for vascular plants. Each species is assigned a number between 0 and 10 that reflects in the opinion of experienced botanists the fidelity of each species to high quality natural communities. In general, a coefficient of '0' is indicative of introduced or exotic species. Coefficients between 1-3 include species that are adapted to ruderal habitats or increase with disturbance; coefficients between 4-6 include typical dominant or matrix species; coefficients between 7-8 include taxa most commonly associated with natural areas, but that persist where habitat has been lightly degraded; and species with coefficients 9-10 are considered to be restricted to relatively intact natural areas (Taft and Wilhelm, 1997). The occurrence of 'conservative' species along with other typical native species is often indicative of high natural quality or restoration potential.

Checklist for Birds of Rock Bridge State Park

	SS	AS
Herons and Allies		
___ Great Blue Heron (Ardea herodias)		
Waterfowl		
___ Canada Goose (Branta canadensis)		
___ Wood Duck (Aix sponsa)		
Vultures, Hawks, and Falcons		
___ Turkey Vulture (Cathartes aura)		
___ Red-shouldered Hawk (Buteo lineatus)		
___ Red-tailed Hawk (Buteo jamaicensis)		
___ American Kestrel (Falco sparverius)		
Gallinaceous Birds		
___ Wild Turkey (Meleagris gallopavo)		
___ Northern Bobwhite (Colinus virginianus)		
Shorebirds, Gulls, and Alcids		
___ Killdeer (Charadrius vociferus)		
___ Spotted Sandpiper (Actitis macularia)		
___ American Woodcock (Scolopax minor)		
Pigeons and Doves		
___ Rock Dove (Columba Livia)		
___ Mourning Dove (Zenaida macroura)		
Cuckoos, Anis, and Roadrunners		
___ Yellow-billed Cuckoo (Coccyzus americanus)		
Owls		
___ Eastern Screech-Owl (Otus asio)		
___ Great Horned Owl (Bubo virginianus)		
___ Barred Owl (Strix varia)		
Goatsuckers		
___ Common Nighthawk (Chordeiles minor)		
___ Chuck-will's-widow (Caprimulgus carolinensis)		
___ Whip-poor-will (Caprimulgus vociferus)		
Swifts and Hummingbirds		
___ Chimney Swift (Chaetura pelagica)		
___ Ruby-throated Hummingbird (Archilochus colubris)		
Trogons, Kingfishers, and Woodpeckers		
___ Belted Kingfisher (Ceryle alcyon)		
___ Red-headed Woodpecker (Melanerpes erythrocephalus)		
___ Red-bellied Woodpecker (Melanerpes carolinus)		
___ Downy Woodpecker (Picoides pubescens)		
___ Hairy Woodpecker (Picoides villosus)		
___ Northern Flicker (Colaptes auratus)		
___ Pileated Woodpecker (Dryocopus pileatus)		
Flycatchers, Kingbirds, Larks, and Swallows		
___ Eastern Wood-Pewee (Contopus virens)		
___ Acadian Flycatcher (Empidonax virescens)		
___ Eastern Phoebe (Sayornis phoebe)		
___ Great Crested Flycatcher (Myiarchus crinitus)		
___ Eastern Kingbird (Tyrannus tyrannus)		
___ Purple Martin (Progne subis)		
Flycatchers, Kingbirds, Larks, and Swallows		
___ Barn Swallow (Hirundo rustica)		
Jays, Crows, Wrens, and Gnatcatchers		
___ Blue Jay (Cyanocitta cristata)		
___ American Crow (Corvus brachyrhynchos)		
___ Black-capped Chickadee (Parus atricapillus)		
___ Tufted Titmouse (Parus bicolor)		
___ White-breasted Nuthatch (Sitta carolinensis)		
___ Carolina Wren (Thryothorus ludovicianus)		
___ Bewick's Wren (Thryomanes bewickii)		
___ House Wren (Troglodytes aedon)		
___ Sedge Wren (Cistothorus platensis)		

___ Blue-gray Gnatcatcher (Polioptila caerula)

Seasonal Status:	**Abundance Status:**	un - uncommon
PR - Permanent Resident	va - very abundant	occ - occasional
SR - Summer Resident	ab - abundant	ra - rare
WR - Winter Resident	co - common	acc - accidental
T - Transient/Migratory	fc - fairly common	po - possible

Thrushes to Starlings **SS** **AS**

___ Eastern Bluebird (Sialia sialis)
___ Wood Thrush (Hylocichla mustelina)
___ American Robin (Turdus migratorius)
___ Gray Catbird (Dumetella carolinensis)
___ Northern Mockingbird (Mimus polyglottos)
___ Brown Thrasher (Toxostoma rufum)
___ Cedar Waxwing (Bombycilla cedrorum)
___ European Starling (Sturnus vulgaris)

Vireos and Warblers **SS** **AS**

___ White-eyed Vireo (Vireo griseus)
___ Yellow-throated Vireo (Vireo flavifrons)
___ Warbling Vireo (Vireo gilvus)
___ Red-eyed Vireo (Vireo olivaceus)
___ Blue-winged Warbler (Vermivora pinus)
___ Northern Parula (Parula americana)
___ Yellow-throated Warbler (Dendroica dominica)
___ Prairie Warbler (Dendroica discolor)
___ Cerulean Warbler (Dendroica cerulea)
___ Black-and-white Warbler (Mniotilta varia)
___ American Redstart (Setophaga ruticilla)
___ Worm-eating Warbler (Helmitheros vermivorus)
___ Ovenbird (Seiurus aurocapillus)
___ Louisiana Waterthrush (Seiurus motacilla)
___ Kentucky Warbler (Oporornis formosus)
___ Common Yellowthroat (Geothlypis trichas)
___ Yellow-breasted Chat (Icteria virens)

Tanagers, Grosbeaks, and Towhees **SS** **AS**

___ Eastern Towhee (Pipilo erythrophthalmus)
___ Summer Tanager (Piranga rubra)
___ Scarlet Tanager (Piranga olivacea)
___ Northern Cardinal (Cardinalis cardinalis)
___ Rose-breasted Grosbeak (Pheucticus ludovicianus)
___ Blue Grosbeak (Guiraca caerulea)
___ Indigo Bunting (Passerina cyanea)
___ Dickcissel (Spiza americana)

Sparrows and Juncos **SS** **AS**

___ Chipping Sparrow (Spizella passerina)

Sparrows and Juncos **SS** **AS**

___ Field Sparrow (Spizella pusilla)
___ Grasshopper Sparrow (Ammodramus savannarum)
___ Song Sparrow (Melospiza melodia)

Blackbirds, Orioles, and Goldfinches **SS** **AS**

___ Red-winged Blackbird (Agelaius phoeniceus)
___ Eastern Meadowlark (Sturnella magna)
___ Common Grackle (Quiscalus quiscula)
___ Brown-headed Cowbird (Molothrus ater)
___ Orchard Oriole (Icterus spurius)
___ American Goldfinch (Carduelis tristis)
___ House Sparrow (Passer domesticus)

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