

1 the period of significance, and are extant
 2 features built to beautify the landscape. Few
 3 changes have been made to these features
 4 since the 1930s. They retain integrity and
 5 contribute to the cultural landscape.

6
 7 **Vegetation**

8
 9 The vegetation at Hicks Hotel consists of
 10 an oak hickory forest. Perennial plantings
 11 are extant including daffodils in the stone
 12 flower beds. Ornamental plantings including
 13 daffodils, daylilies, and flowering quince are
 14 extant adjacent to Hicks Hotel.^{3,25} Anecdotal
 15 evidence from the Hicks family suggests that
 16

17 3.25 Botanical Survey of 67 Acres and Recommendations.

18 a vegetable garden was associated with Hicks
 19 Hotel, located behind the hotel.^{3,26}

20

21 *Assessment of Integrity*

22 During the period of significance, vegetation
 23 was maintained around Hicks Hotel as a
 24 mown lawn with shade trees, perennials, and
 25 gardens. By the 1960s, hillsides reforested
 26 naturally and the once sparsely vegetated
 27 area became overgrown with trees. The lawn,
 28 perennial plantings, and garden were no
 29 longer maintained. Hicks Hotel was cleared
 30 for interpretation in the 1980s, but has since
 31 regrown. The vegetation at Hicks Hotel has
 32 diminished integrity.

33

34 3.26 Botanical Survey of 67 Acres and Recommendations.

Matrix 3-17. Hicks Hotel - Buildings and Structures/Ruins				
Feature	Date	Description	Condition	Contributing/ Non-Contributing
Hicks General Store Ruins	1916	Mortared stone exterior walls with concrete cap and a slab on grade concrete floor remain. Remnants of burned wood can be seen in certain locations. Areas of plaster are intact in a few locations. Mortar is failing in places and rocks are loose and have fallen out of the walls. Plants are growing up the outside of the walls and through cracks in the concrete floor.	Poor	Contributing
Hicks Hotel Ruins	1903	Stacked stone stair and possibly a chimney base, along with a few stacked stone piers remain within the overgrown vegetation.	Poor	Contributing

Matrix 3-18. Hicks Hotel - Small Scale Features				
Feature	Date	Description	Condition	Contributing/ Non-Contributing
Hicks Wall		3 to 4' Height, varies by location. Cobblestone construction east end; coursed ashlar west end. Concrete steps with cobblestone columns, 2 locations. Concrete steps and porch at entrance to Hicks General Store.	Good/Fair	Contributing
Stone Flower Beds		Raised mortared cobblestone, in diamond, round, and rectangular shapes. Raised approx. 6" above adjacent grade	Fair	Contributing
Brick Walkway			Good/Fair	Contributing



Figure 3-155. Group in front of Hicks Hotel, 1920s. (BUFF Archives)



Figure 3-156. Hicks Wall, cobblestone columns and concrete stairs. (Mundus Bishop 2017)



Figure 3-157. Hicks General Store, after renovation into NPS staff housing, 1984. (S. Rogers, BUFF Archives)



Figure 3-158. Hicks General Store ruins interior. (Mundus Bishop 2017)



Figure 3-159. Stone flower bed with extant ornamental vegetation. (Mundus Bishop 2017)



Figure 3-160. Concrete stairs at Hicks Hotel ruins. (Mundus Bishop 2017)

Affected Environment

1 This section describes potential resource
2 impacts resulting from implementing the
3 treatment alternatives. It is organized
4 by impact topics that were derived from
5 internal and external scoping. The existing
6 setting or baseline conditions (i.e. affected
7 environment) of each resource within the
8 study area is described. The information is
9 meant to provide overall background and
10 context of the resources and will be used
11 to compare the effects of the proposed
12 treatment alternatives against the current
13 conditions of the project area in the
14 Environmental Consequences chapter.

15
16 More detailed information on resources
17 described in this CLR/EA may be found in
18 documents referred to in the text and cited
19 in the Bibliography. Where applicable, links
20 to documents available on the internet are
21 provided in the bibliography.

22 23 **Cultural Landscapes, Historic Structures,** 24 **Archeological Resources**

25
26 The following is a summary of the cultural
27 landscape, historic structures, and
28 archeological resources in the study area.
29 These resources, their historic context, and
30 the overall cultural history of Buffalo National
31 River are fully described in Chapter 2.

32
33 Standing structures and ruins are the most
34 visible parts of the overall Buffalo National
35 River cultural landscape and are scattered
36 throughout its boundary. Settlement occurred
37 along the river's length, in fertile tributary
38 valleys, and along forested slopes. Structures
39 or other remains are virtually everywhere,
40 whether still in use as part of active farms or
41 long abandoned.

42
43 Rush Historic District is a 1,300-acre former
44 zinc mining district located on the Buffalo

45 National River and two of its tributaries,
46 Rush and Clabber creeks, roughly thirty miles
47 upstream from Buffalo River's confluence
48 with White River. The study area is accessible
49 to automobiles by an unpaved road that
50 connects to County Road 635 and Arkansas
51 Highway 14, and it also features a boat
52 landing on Buffalo River. It is a remnant
53 industrial landscape containing the remains
54 of open-pit and underground zinc mines,
55 concentrating mills, worker housing, and
56 other commercial establishments, in addition
57 to numerous small-scale features that reflect
58 mining community life. The study area's
59 contributing resources have been listed on or
60 determined eligible for the National Register
61 of Historic Places. A variety of historic
62 structures in Rush Historic District are still
63 visible above ground, including foundations,
64 ruins, and standing buildings. Roads and the
65 zinc mines are also contributing resources. In
66 addition to visible above ground resources,
67 buried historic resources occur throughout
68 the study area.

69
70 The archeological resources at Buffalo
71 National River encompass 12,000 years
72 of human activity and include numerous
73 prehistoric and historic archeological sites,
74 including in the study area.^{3.27} A common
75 occurrence at Buffalo National River is
76 the overlay of historic structure upon
77 historic archeological site upon prehistoric
78 archeological site. Site condition varies from
79 good to destroyed, with impact levels varying
80 from low to severe. In the study area, the
81 Dirst site is a well-documented prehistoric
82 archeological site located along the Buffalo
83 River at its confluences with Rush and

84
85
86 ^{3.27} Theodore Catton. *Life, Leisure, and Hardship Along the*
87 *Buffalo Historic Resources Study Buffalo National River.*
88 (Omaha: Department of the Interior, National Park
Service, Midwest Region, 2008).

1 Clabber creeks.^{3.28} Recovered artifacts from
2 stratified deposits date from Early Archaic to
3 Early Mississippian, suggesting various series
4 of use and occupation of the Dirst site from
5 as early as 10,500 years ago to as recently as
6 840 years ago.^{3.29} It appears that intact living
7 surfaces and housing remains were preserved
8 at the site. The site is significant because
9 it is one of less than a dozen excavated
10 multicomponent stream terrace sites in the
11 Ozark Highland region.^{3.30} The site is co-
12 located with currently used areas including
13 the road to the boat ramp, the campground,
14 and the road to Clabber Creek. The stratified
15 deposits - including a midden zone—in
16 which artifacts were found representing
17 the Mississippi, Woodland, and possibly the
18 Late Archaic periods. It further appeared
19 that intact living surfaces and occupational
20 features, including house remains, were
21 preserved in buried contexts. In addition
22 to artifacts, buried sediments at this site
23 contained charcoal, animal bone, mussel shell,
24 and possibly other indicators of prehistoric
25 lifeways and environments. Historic mining,
26 particularly the White Eagle Mine Complex
27 (M2), was also located in or near the Dirst
28 site. Management recommendations for the
29 site focus on minimizing and controlling
30 potential adverse effects and protecting the
31 most sensitive aspects of the site.^{3.31}

33 **Vegetation**

34
35 Many northern and southern ecosystems
36 converge in Buffalo National River, as do

38 3.28 George Sabo III et al., *Archeological Investigations at*
39 *3MR80-Area D in the Rush Development Area, Buffalo*
40 *National River, Arkansas. Southwest Cultural Resources*
41 *Center Professional Papers No. 38.* (Santa Fe: U.S.
42 Department of the Interior, National Park Service
43 Southwest Region, 1990).

44 3.29 George Sabo III et al., *Archeological Investigations at*
45 *3MR80-Area D.*

46 3.30 George Sabo III et al., *Archeological Investigations at*
47 *3MR80-Area D.*

48 3.31 George Sabo III et al., *Archeological Investigations at*
49 *3MR80-Area D.*

50 some western and eastern species. This
51 convergence results in around 56 vegetation
52 association types,^{3.32} including some rare or
53 uncommon types, in Buffalo National River.
54 For this reason, vegetation management
55 and preservation are priorities of Buffalo
56 National River. Unless otherwise noted,
57 vegetation community descriptions are based
58 on research completed in Buffalo National
59 River under the NPS vegetation inventory
60 program.^{3.33}

61 Plant communities in Buffalo National River
62 are dominated by hardwood forests that
63 range from dry to mesic and consist mostly of
64 oaks and hickories. Dry-xeric oak forests, with
65 post oak and blackjack oak and dry-mesic
66 oak-hardwood forests with white oak, red
67 oak, and hickories are typical of the region.
68 These oak-hardwood forests are the dominant
69 forests at Buffalo National River. Chinkapin
70 oak tends to range from dry-mesic to xeric.
71 Mesic oak-hardwood forests consist of red
72 oak and sugar maple. Conifer forests and
73 woodlands consist of shortleaf pine and/or
74 eastern red-cedar; conifer glade woodlands
75 consist of red-cedar and Ashe's juniper. Many
76 forests and woodlands are also a mix of the
77 conifers and oak-hardwoods discussed above.
78 Both oak-hardwood and conifer woodlands
79 are speckled throughout the landscape on
80 dry-xeric sites. Forests beginning to become
81 established in open or disturbed areas are
82 typically not oak dominant but rather consist
83 of sweetgum, black walnut, honeylocust, black
84 locust, and/or a variety of other hardwood
85 trees common to disturbance sites. The
86 riparian hardwood forests along Buffalo River
87 and its tributaries, whether large or small,
88 consist mostly of silver maple, American
89 sycamore, green ash, and/or American elm.
90 Riparian shrub wetlands are common along
91 Buffalo River, intermingled with the margins
92 of the riparian hardwood forests.

93 3.32 Hop et al., *Vegetation inventory Buffalo National River.*

94 3.33 Hop et al., *Vegetation inventory Buffalo National River.*

1 Vegetation communities in the study area
 2 closely reflect those in the remainder
 3 of Buffalo National River, with the oak-
 4 dominated communities being most prevalent
 5 (see Table 3-1). Coniferous and mixed-
 6 coniferous forest and woodland communities
 7 are concentrated on south-facing slopes in
 8 the Rush Creek and Buffalo River valleys
 9 (see Figure 3-84). Communities along Rush
 10 Creek and Buffalo River include Bottomland
 11 Hardwood Forest, Bottomland Shrubland,
 12 and Gravel Bar Sparse Vegetation (see Figure
 13 3-84). Most of the vegetation communities
 14 in the study area are common throughout
 15 Buffalo National River and elsewhere,
 16 although one of the Conifer Woodland sub-
 17 types, Ozark Ashe's Juniper Woodland, is
 18 considered globally rare but locally more
 19 common.^{3.34}

20
 21 The land in Buffalo National River had been
 22 used for various activities such as grazing,
 23 farming, logging, mining, and settlement.
 24 These activities are sources of disturbance
 25 that affect native plant communities to
 26 various intensities and extents. These
 27 disturbances have altered many native
 28 vegetation communities, which provides
 29 opportunities for invasions by non-native
 30 species. At least 21 plant species are known to
 31 be invasive at Buffalo National River including
 32 tree of heaven, Chinese privet, European
 33 privet, mimosa, kudzu, lespedeza, Johnson
 34 grass, and autumn olive.^{3.35} Garlic mustard
 35 and common mullein are found at many
 36 homesites in the park. In the study area, non-
 37 native species are most likely to be found in
 38 or adjacent to disturbed areas such as roads,
 39 parking lots, trails, fallow or abandoned
 40 agricultural fields, structures, and mined
 41 areas.

43 3.34 Hop et al., *Vegetation inventory Buffalo National River*.

44 3.35 U.S. Department of the Interior, National Park Service.
 45 "Invasive Plants." *Buffalo National River*. 2017a. [https://](https://www.nps.gov/buff/learn/nature/invasive-plants.htm)
 46 www.nps.gov/buff/learn/nature/invasive-plants.htm
 (accessed October 25, 2017).

Table 3-1. Study Area Cover Types		
Cover Type	Acres	Percent Cover
Vegetation Communities		
Oak - (Hardwood) Forest	586.30	50%
Oak - (Hardwood) Woodland	158.34	12%
Conifer Woodland	98.47	8%
Conifer - Hardwood Forest	97.33	8%
Successional Forest	89.34	8%
Bottomland Hardwood Forest	51.94	5%
Mesic Hardwood Forest	21.06	2%
Bottomland Shrubland	14.78	1%
Gravel Bar Sparse Vegetation	6.41	1%
Conifer - Hardwood Woodland	4.76	<0.1%
Conifer Forest	2.97	<0.1%
Herbaceous Field	2.91	<0.1%
Successional Shrubland	1.89	<0.1%
Herbaceous Glade	1.36	<0.1%
Unvegetated Areas		
Cultural	17.63	1%
Open Water	44.59	4%
Total	1181.63	100%

Source: Mundus Bishop 2018, Adapted from NPS Vegetation of the Buffalo National River.

1 Water Resources

2
3 The enabling legislation for Buffalo National
4 River (16 U.S.C. § 460m-8 (1972)) describes
5 the purpose of Buffalo National River
6 as “conserving and interpreting an area
7 containing unique scenic and scientific
8 features, and preserving as a free-flowing
9 stream an important segment of the
10 Buffalo River in Arkansas for the benefit
11 and enjoyment of present and future
12 generations...” The Arkansas Department of
13 Environmental Quality has designated Buffalo
14 National River as “Extraordinary National
15 Resource Waters.”^{3.36} In keeping with the
16 enabling legislation and state designation,
17 maintaining Buffalo National River’s
18 ecological functions and values, including
19 high water quality, is a primary influence on
20 how NPS manages Buffalo National River and
21 evaluates proposed activities that may affect
22 the river.

23
24 The Buffalo River watershed drains 1,338
25 square miles, starting from the Boston
26 Mountains in the west to White River in the
27 east.^{3.37} The length of Buffalo National River
28 includes 135 miles of the 151-mile-long
29 Buffalo River. Numerous tributaries, including
30 Rush and Clabber creeks, enter the river. The
31 geology and hydrology of the Buffalo River
32 watershed is unique because of a combination
33 of factors such as karst geomorphology,
34 steep topography, shallow soils and highly
35 integrated ground/surface water.^{3.38}

36
37 The water quality of the river has remained
38 relatively high due to the large amount of
39 forested land, few point source pollution

41 3.36 Arkansas Pollution Control and Ecology Commission.
42 *Regulation No. 2 Regulation Establishing Water Quality*
43 *Standards for Surface Waters of the State of Arkansas.*
(Little Rock, 2011).

44 3.37 D. Mott, J. Laurans. *Water Resources Management Plan.*
45 (Harrison: U.S. Department of Interior, National Park
Service, Buffalo National Park, 2004).

46 3.38 Mott and Laurans. *Water Resources Management Plan.*

47 sources, and a relatively sparse population
48 within the watershed. Recently though,
49 while still higher than many rivers in the
50 region, Buffalo National River’s water
51 quality is threatened by the rapid rate of
52 land conversion from forest to cattle grazing
53 and confined feeding operations.^{3.39} Water
54 quality problems are related to high fecal
55 coliform bacteria levels, sediment loading,
56 and nutrient enrichment from a variety of
57 animal operations, inadequate rural septic
58 systems, and runoff from bare ground. Based
59 on 25 years of water quality monitoring data,
60 the water quality along the middle portion
61 of Buffalo River is declining, exemplified by
62 elevated levels of nutrients (nitrate, nitrite,
63 and phosphorous), fecal coliform bacteria,
64 and sediment loading.^{3.40}

65
66 In general, water quality monitoring results
67 for Buffalo River at Rush Landing and Rush
68 and Clabber creeks indicate water quality
69 remains high and has not degraded to the
70 degree seen in middle Buffalo River.^{3.41}

71
72 Of concern in the study area is the potential to
73 affect water quality through sediment loading
74 and turbidity associated with runoff from
75 road and trail surfaces, ditches, mine spoils,
76 and soils exposed by ground-disturbing
77 activities. Within the steep terrain of the
78 study area, stormwater runoff from unpaved
79 roads and cleared land carries both fine and
80 coarse sediments to Buffalo National River.
81 Increased turbidity results in an unnatural
82 decrease in stream channel stability, increase
83 in eroding stream banks, and degradation of
84 aquatic habitat.

85

86

87

88 3.39 Mott and Laurans. *Water Resources Management Plan.*

89 3.40 Watershed Conservation Resource Center. *Surface-Water*
90 *Quality in the Buffalo National River (1985-2011).* (Little
Rock, 2017).

91 3.41 Mott and Laurans. *Water Resources Management Plan,* and
92 Watershed Conservation Resource Center. *Surface-Water*
Quality in the Buffalo National River (1985-2011).

1 Special Status Species

2
 3 The Endangered Species Act of 1973
 4 requires examination of potential effects
 5 from activities on federally listed threatened
 6 and endangered species. Section 7 of the
 7 Endangered Species Act requires all federal
 8 agencies to consult with the U.S. Fish and
 9 Wildlife Service (USFWS) to ensure that any
 10 action authorized, funded, or carried out by
 11 the agency does not jeopardize the continued
 12 existence of listed species or critical habitats.
 13 In addition, the Management Policies 2006
 14 and Director's Order-77 Natural Resources
 15 Management Guidelines require the NPS
 16 to examine the effects on federal candidate
 17 species, as well as state-listed threatened,
 18 endangered, candidate, rare, declining,
 19 and sensitive species.^{3.42} To determine the
 20 potential for special status species to occur
 21 in the study area, Buffalo National River
 22 requested from the USFWS a list of federally-
 23 listed threatened and endangered species that
 24 may occur in the study area (see Appendix
 25 B Correspondence).^{3.43} Additionally, a list
 26 of Arkansas species of concern for Marion
 27 County was obtained from the Arkansas
 28 Natural Heritage Commission (ANHC) rare
 29 species search engine website.^{3.44} ANHC
 30 works to conserve Arkansas biodiversity by
 31 tracking the location and status of almost
 32 900 species of animals and plants. Tracked
 33 species are categorized as state threatened
 34 or endangered or as inventory elements.
 35 Inventory elements are considered of
 36 conservation concerns because they may be
 37 rare, peripheral, or of undetermined status in
 38 the state.

39

40 3.42 *Management Policies*. (Washington, D.C.: U.S. Department
 41 of the Interior, National Park Service, 2006).

42 3.43 *Official Species List*. (Conway: U.S. Department of the
 43 Interior, Fish and Wildlife Service, Arkansas Ecological
 Services Field Office, 2017).

44 3.44 Arkansas Natural Heritage Commission, "Research & Data,
 45 Rare Species Search (Marion County)." 2010. <http://www.naturalheritage.com/research-data/rarespecies-search.aspx>.
 46

Table 3-2. Federal and state-listed threatened and endangered species known, or with potential, to occur in the study area or be affected by activities in the study area.

Common Name (<i>Scientific Name</i>)	Federal Status	State Status
Invertebrates		
Hell Creek Cave crayfish (<i>Cambarus zophonastes</i>)	LE*	SE
Rabbitsfoot (<i>Quadrula cylindrica cylindrica</i>)	LT	SE
Snuffbox (<i>Epioblasma triquetra</i>)	LE	SE
Western fanshell (<i>Cyprogenia aberti</i>)	UR	INV
Vertebrates		
Gray bat (<i>Myotis grisescens</i>)	LE	SE
Haliaeetus leucocephalus (<i>Bald Eagle</i>)	BGEPA	INV
Indiana bat (<i>Myotis sodalis</i>)	LE	SE
Northern long-eared bat (<i>Myotis septentrionalis</i>)	LT	SE
Ozark big-eared bat (<i>Corynorhinus townsendii ingens</i>)	LE	SE
Tricolored bat (<i>Perimyotis subflavus</i>)	UR	-
Plants		
Alabama snow-wreath (<i>Nevusia alabamensis</i>)	-	ST
False gaura (<i>Stenosiphon linifolius</i>)	-	ST
Royal catchfly (<i>Silene regia</i>)	-	ST

*Not included on the USFWS species list for the study area.

BGEPA = Bald and Golden Eagle Protection Act;
 INV = State inventory element; LE = Federally listed endangered; LT = Federally listed threatened; UR = Under review; SE = State listed endangered; ST = State listed threatened

1 The USFWS listed six threatened or
2 endangered species as potentially occurring
3 in, or being affected by projects in, the study
4 area (USFWS 2017). The status under the
5 Endangered Species Act of two additional
6 species are under review to determine if
7 their listing as threatened or endangered
8 is warranted. The ANHC lists the same six
9 federally listed species and three additional
10 plant species as state threatened and
11 occurring in Marion County (ANHC 2017).
12 The ANHC lists one of the federal species
13 under review as an inventory element, but
14 not threatened or endangered, and does
15 not list the second species under review. No
16 solely state-listed endangered species were
17 included for Marion County. A complete list,
18 including those not protected, but listed as
19 inventory elements, by the Arkansas Natural
20 Heritage for Marion County, is presented in
21 Appendix C.

22 23 **Federal and State Threatened and Endangered** 24 **Species**

25
26 Summaries of the overall range, habitat
27 requirements, threats to species, and the
28 potential to be present in the study area
29 for federally and state listed threatened and
30 endangered species and species under federal
31 review follow below.

32 33 Hell Creek Cave Crayfish

34
35 The Hell Creek Cave crayfish is an obligate
36 cave crayfish endemic to the White River
37 Basin in north-central Arkansas.^{3.45} Hell Creek
38 Cave, about 30 miles southeast of the study
39 area, was the only known location for this
40 species until a 2005 determination verified
41 its presence at Nesbitt Spring, about 34 miles

42
43 3.45 J. Stewart. *Endangered and threatened wildlife and*
44 *plants: Determination of endangered status for Cambarus*
45 *zophonastes*. Federal Register 52(66): 11170-11172.
46 (Washington, D.C.: U.S. Department of the Interior, Fish
and Wildlife Service, 1987).

47 southeast of the study area.^{3.46} In 2009, a
48 preliminary genetic analysis suggested the
49 species' presence at a groundwater upwelling
50 in the Town Branch in Yellville, about nine
51 miles north of the study area. The Hell
52 Creek Cave crayfish is found in caves with
53 abundant mud and passages that are flooded
54 during storms and wet seasons.^{3.47} The
55 primary threat to the species is groundwater
56 contamination, although its limited range
57 and apparently small number of individuals
58 makes it vulnerable to habitat disturbance
59 and disease.

60
61 Although the ANHC lists the Hell Creek
62 Cave crayfish as an occurrence in Marion
63 County, the USFWS did not list the species as
64 potentially being in the study area and the
65 NPSpecies database does not show it present
66 in Buffalo National River.^{3.48} Hell Creek Cave
67 crayfish has never been discovered in the
68 Buffalo River watershed, but the species could
69 be present in suitable habitat.^{3.49}

70 71 Rabbitsfoot Mussel

72
73 The rabbitsfoot is a medium to large fresh
74 water mussel that inhabits small to medium
75 sized rivers of moderate current with clear,
76 relatively shallow water and a mixture of
77 sand and gravel substrates.^{3.50} During its
78 larval stage, the species is parasitic and relies

79
80 3.46 *Hell Creek Cave Crayfish (Cambarus zophonastes)*
81 *5-Year Review: Summary and Evaluation*. (Conway: U.S.
82 Department of the Interior, Fish and Wildlife Service,
83 Southeast Region, Arkansas Ecological Services Field
84 Office, 2007a).

85 3.47 Stewart. *Determination of endangered status for Cambarus*
86 *zophonastes*.

87 3.48 U.S. Department of the Interior, National Park Service. *The*
88 *National Park Service biodiversity database*. IRMA Portal.
89 2017b.

90 3.49 Charles Bitting. Personal communication of Charles
91 Bitting, Geologist and Terrestrial Team Leader, Buffalo
92 National River, to Mary L. Powell, CORVUS Environmental
Consulting. February 15, 2018.

93 3.50 Kevin Roe. *Conservation Assessment - The Snuffbox,*
94 *Epioblasma triquetra*. (Saint Louis: U.S. Department of
95 Agriculture, National Forest Service, Eastern Region,
96 Undated).

1 on fish hosts to survive. Several species of
 2 minnows have been determined to be suitable
 3 larval host for the species. The decline of
 4 rabbitsfoot, and freshwater bivalves in
 5 general, has resulted from habitat destruction
 6 by creating impoundments, siltation, gravel
 7 mining, and channel modification; pollution;
 8 and the introduction of non-native species
 9 such as the Asiatic clam and the Zebra Mussel.
 10 Rabbitsfoot is known to occur on about 70
 11 miles of the Buffalo National River, including
 12 at the study area. The USFWS has designated
 13 the Buffalo River from downstream of the
 14 Town of Erbie, Arkansas as critical habitat for
 15 rabbitsfoot.

16 17 Snuffbox Mussel

18
 19 Snuffbox mussel is a small triangular
 20 freshwater mussel found in small to medium
 21 sized, swiftly flowing rivers in shallow riffles
 22 with silt-free rubble and gravel substrates.^{3.51}
 23 During its larval stage, the species is parasitic
 24 and relies on several fish hosts to survive.
 25 The long-term survival of this species is
 26 dependent upon healthy populations of
 27 host fishes and the presence of suitable
 28 habitat. Factors considered detrimental to
 29 the persistence of this species are pollution,
 30 siltation, and habitat perturbation such as
 31 gravel mining or the construction of new
 32 impoundments. Snuffbox has only been
 33 found in Buffalo National River near the
 34 confluence of the Buffalo and White rivers,
 35 although several fish host species are
 36 common throughout Buffalo National River.
 37 A functioning mussel bed has been present
 38 in the first deep pool downstream from Rush
 39 Landing and, for the purposes of analysis in
 40 this EA, snuffbox mussels are assumed to be
 41 present.

42
 43
 44
 45 ^{3.51} Roe. *Conservation Assessment - The Snuffbox, Epioblasma*
 46 *triquetra*.

47 Western Fanshell

48
 49 The western fanshell is a freshwater
 50 mussel native to the Arkansas River system
 51 in Arkansas and is known only from
 52 approximately 20 localities in Big Piney Creek
 53 and Point Remove Creek. Western fanshell
 54 is found in gravel and soft mud bottoms in
 55 medium sized rivers with flowing water. It
 56 is generally confined to shallow riffles and
 57 runs in predominantly clean, moderately
 58 compacted gravel-sand substrata. The
 59 species is threatened by impoundments and
 60 channelization, gravel mining, agricultural
 61 practices (resulting in siltation and organic
 62 inputs), and the spread of the Zebra Mussel
 63 (*Dreissena polymorpha*) which now occurs
 64 in the Arkansas River drainage.^{3.52} While not
 65 known to be present in Rush Historic District,
 66 potentially suitable habitat is likely present.

67 68 Gray Bat

69
 70 According to the gray bat recovery plan, the
 71 gray bat occupies a limited geographic range
 72 in limestone karst areas of the southeastern
 73 United States.^{3.53} They roost and hibernate
 74 in caves and mines where they form few,
 75 but large, colonies of 5,000 to 250,000 or
 76 more individuals. The small number and
 77 large size of the colonies makes the species
 78 vulnerable to disturbance and disease. In
 79 winter, gray bats hibernate in deep, vertical
 80 caves with large rooms. In summer, gray bat
 81 caves are generally near streams or other
 82 water bodies such as reservoirs where they
 83 forage on insect hatches. Gray bat population
 84 declines are attributed primarily to habitat
 85 disturbance in the form of forest conversion
 86 to agriculture, destruction of riparian forest,

87
 88 ^{3.52} K. Cummings and J. Cordeiro. 2012. *Cyprogenia aberti*.
 89 The IUCN Red List of Threatened Species 2012:
 90 e.T6182A3107987. <http://dx.doi.org/10.2305/IUCN.UK.2012-1.RLTS.T6182A3107987.en>. Downloaded on 12
 91 April 2018.
 92 ^{3.53} J. Brady et al. Gray Bat Recovery Plan. (Denver: U.S.
 Department of the Interior, Fish Wildlife Service, 1982).

1 river impoundment, pesticides, river siltation,
2 and roost disturbance.^{3.54} Gray bats are also
3 vulnerable to white-nose syndrome, a fungal
4 infection that affects hibernating bats.

5
6 All of Buffalo National River is in the range
7 of gray bat. Research has identified caves
8 and abandoned mines known to support
9 gray bats during some part of each year at
10 Buffalo National River.^{3.55} Although they are
11 potentially present in other mines and caves
12 in the study area, Capps Mine (M11) has a
13 winter colony of gray bat and Morning Star
14 Mine (M1) has a transient summer colony.^{3.56}
15 It is likely that the study area is also a foraging
16 area for gray bat colonies outside of the study
17 area.

18 19 Ozark Big-eared Bat

20
21 Ozark big-eared bats roost in caves and mines
22 year-round. Colonies are small, generally
23 under 1,000 individuals. They tend to roost
24 near the entrances of caves and mines and
25 have been found roosting in rock overhangs,
26 talus piles, and other fairly exposed
27 locations.^{3.57} These are large bats which
28 prefer to forage in open forests or on the
29 edge of forests.^{3.58} Ozark big-eared bats forage
30 over fields, streams, forest edges, mountain
31 slopes, cliff faces, and in clearings. They feed
32 primarily on small moths, though they will
33 also catch and eat beetles.^{3.59} Their summer
34 roost requirements are variable. They may
35 roost in caves, or in fractures in limestone or

36
37 3.54 Brady. *Gray Bat Recovery Plan*.

38 3.55 U.S. Department of the Interior, National Park Service,
39 Buffalo National River. *Facilities Improvements*
40 *Environmental Assessment*. (Harrison: 2010).

41 3.56 Charles Bitting. Personal communication with Mary L.
42 Powell. February 15, 2018.

43 3.57 Steve Hensley and Charles Scott. *Ozark Big-Eared Bat*
44 *Revised Recovery Plan*. (Tulsa: U.S. Department of Interior,
45 Fish and Wildlife Service, Oklahoma Ecological Services
46 Field Office, 1995).

47 3.58 Hensley and Scott. *Ozark Big-Eared Bat Revised Recovery*
48 *Plan*.

49 3.59 Hensley and Scott. *Ozark Big-Eared Bat Revised Recovery*
50 *Plan*.

51 sandstone bluffs. In winter they require a cave
52 which will act as a cold trap and maintain
53 a consistent temperature.^{3.60} The major
54 threats to the species are human disturbance
55 at maternity and hibernation sites, loss of
56 habitat, and white-nose syndrome. In 2011,
57 the total population of Ozark big-eared bats
58 was estimated at 1,800 individuals.^{3.61}

59 A number of caves and mines within Buffalo
60 National River have been known to house
61 one or two individuals of this species over
62 the past fifteen years. Winter roosts are also
63 known to have been within four miles of Rush
64 Landing.^{3.62} Within the study area, Ben Carney
65 Mine (M6) has contained one Ozark big-eared
66 bat and Ozark big-eared bat in the region may
67 use the study area for summer roosting and
68 foraging.^{3.63}

69 Indiana Bat

70 The Indiana bat is a temperate, insectivorous,
71 migratory bat that hibernates in mines
72 and caves in the winter and summers in
73 wooded areas. Indiana bats roost in caves
74 during the winter in colonies of up to
75 100,000 individuals. In the summer they
76 tend to roost and raise their young under the
77 sloughing bark of snags and under the bark
78 of shortleaf pine, white oak, hickory, and
79 other trees with large loose bark plates.^{3.64}
80 One study found that male Indiana bats in
81 the Ozark highlands exhibited flexibility in
82 roost tree selection, although they generally

83 3.60 Hensley and Scott. *Ozark Big-Eared Bat Revised Recovery*
84 *Plan*.

85 3.61 U.S. Department of the Interior, Fish and Wildlife Service,
86 Oklahoma Ecological Service Field Office. "Ozark Big-
87 Eared Bat." 2011. https://www.fws.gov/southwest/es/Oklahoma/Documents/TE_Species/Species%20Profiles/Ozark%20Big%20Eared%20Bat.pdf (accessed October 25, 2017).

88 3.62 NPS. *Facilities Improvements Environmental Assessment*.

89 3.63 Charles Bitting. Personal communication with Mary L.
90 Powell. February 15, 2018.

91 3.64 *Indiana Bat (Myotis sodalis) Draft Recovery Plan: First*
92 *Revision*. (Fort Snelling: U.S. Department of the Interior,
93 Fish and Wildlife Service, 2007b).

1 selected pine snags and trees.^{3.65} The summer
 2 roosts for males and females tend to be in
 3 lowland habitats near water, with direct
 4 sun exposure for half the day or more.^{3.66}
 5 The maternity roosts are usually found in
 6 larger diameter trees. Threats to the Indiana
 7 bat include modifications to caves, mines,
 8 and surrounding areas that change airflow
 9 and alter microclimate in the hibernacula;
 10 human disturbance and vandalism; natural
 11 catastrophes that can have a significant effect
 12 because of the concentration of individuals
 13 in relatively few sites, habitat degradation,
 14 and white-nose syndrome. USFWS estimates
 15 that the 2017 range-wide population of
 16 Indiana bat was 530,705, of which 1,722 were
 17 estimated to reside in Arkansas.^{3.67}

18
 19 Indiana bats are found in four hibernacula
 20 at Buffalo National River, two of which are
 21 within five miles of Rush Landing. Although
 22 Indiana bat has not been captured at Buffalo
 23 National River in the summer months and
 24 there are no confirmed maternity colonies
 25 in Arkansas, the presence of suitable
 26 habitat and potential roost trees for this
 27 species throughout the study area provides
 28 a reasonable likelihood that Indian bat
 29 is present in the study area during the
 30 summer.^{3.68}

31 32 Northern Long-eared Bat

33
 34 The northern long-eared bat is a federally
 35 threatened species and Arkansas endangered

36
 37 3.65 Roger W. Perry, S.C. Brandebura, T.S. Risch. "Selection of
 38 Tree Roosts by Male Indiana Bats During the Autumn
 39 Swarm in the Ozark Highlands, USA". *Wildlife Society
 Bulletin* 40(1) (2016):78-87.

40 3.66 *Indiana Bat (Myotis sodalis) Draft Recovery Plan.*

41 3.67 U.S. Department of the Interior, Fish and Wildlife
 42 Service, Indiana Field Office. "2017 Indiana Bat
 43 (Myotis sodalis) Population Status Update". [https://
 44 www.fws.gov/Midwest/Endangered/mammals/inba/
 45 pdf/2017IBatPopEstimate5July2017.pdf](https://www.fws.gov/Midwest/Endangered/mammals/inba/pdf/2017IBatPopEstimate5July2017.pdf) (accessed
 46 October 26, 2017).

45 3.68 NPS. *Facilities Improvements Environmental Assessment*,
 46 and Charles Bitting. Personal communication with Mary L.
 Powell. February 15, 2018.

47 species.^{3.69} This species occurs in forested
 48 habitat across much of the eastern and north-
 49 central United States; occupying habitat in 37
 50 states and all Canadian provinces.^{3.70} As with
 51 other bats, white-nose syndrome has recently
 52 reduced the number of northern long-eared
 53 bat significantly enough that the species
 54 was listed as threatened under the ESA in
 55 2015.^{3.71} During summer, northern long-eared
 56 bats roost singly or in colonies underneath
 57 bark, in cavities, or in crevices of both live
 58 and dead trees.^{3.72} They only occasionally
 59 roost in human structures.^{3.73} Males and
 60 nonreproductive females may also roost
 61 in cooler places like caves and mines. They
 62 appear to be opportunistic in selecting roosts,
 63 using tree species based on suitability to
 64 retain bark or provide cavities or crevices.^{3.74}
 65 In winter, they hibernate in small crevices
 66 or cracks within caves and mines.^{3.75} The
 67 primary threat to northern long-eared bat is
 68 white-nose syndrome, which is exacerbated
 69 by human disturbance during hibernation. To
 70 prevent the spread of white-nose syndrome
 71 and reduce human disturbance, grates have
 72 been installed over many cave openings in
 73 Buffalo National River and elsewhere. At least
 74 three hibernacula are within three to six miles
 75 of the study area and northern long-eared bat
 76 roosts and forages in the study area during
 77 the summer.^{3.76}

78
 79 3.69 *Endangered and Threatened Wildlife and Plants; 12-Month
 80 Finding on a Petition to List the Eastern Small-Footed
 81 Bat and the Northern Long-Eared Bat as Endangered
 82 or Threatened Species; Listing the Northern Long-Eared
 83 Bat as an Endangered Species.* Federal Register 78(191):
 61046-61080. (Washington, D.C.: U.S. Department of the
 84 Interior, Fish and Wildlife Service, 2013).

85 3.70 *Endangered and Threatened Wildlife and Plants; 4(d) Rule
 86 for the Northern Long-Eared Bat.* Federal Register 81(9):
 1900-1922. (Washington, D.C.: U.S. Department of the
 87 Interior, Fish and Wildlife Service, 2016).

88 3.71 *4(d) Rule for the Northern Long-eared Bat.*

89 3.72 *Listing the Northern Long-eared Bat as an Endangered
 90 Species.*

91 3.73 *4(d) Rule for the Northern Long-eared Bat.*

92 3.74 *Listing the Northern Long-eared Bat as an Endangered
 Species.*

3.75 *Listing the Northern Long-eared Bat as an Endangered
 Species.*

3.76 *Facilities Improvements Environmental Assessment.*

1 Tricolored Bat

2
3 The tricolored bat is relatively small
4 compared to other North American bats
5 and is the smallest bat found throughout
6 the eastern and Midwestern states.^{3.77} The
7 tricolored bat ranges across most of eastern
8 North America and into eastern Central
9 America, and it occurs over much of the
10 Midwestern United States. It is known to
11 occur throughout the year in northwestern
12 Arkansas, including in the study area.^{3.78}
13 As with other cave bats, the availability
14 of suitable hibernacula for tricolored bat
15 apparently influences, and limits, the
16 species' geographic range. The species has
17 been considered a relatively short-distance
18 migrant, with summer roosting areas
19 generally within 100 km of hibernacula.^{3.79}
20 The tricolored bat tends to occupy the
21 deepest part of caves where temperature is
22 highest and least variable, the walls of the
23 cave are warmer, and humidity levels are
24 higher. The advent of white-nose syndrome
25 has precipitated a dramatic drop in tricolored
26 bat populations throughout much of its range.

27
28 **State Threatened Species**

29
30 In addition to species that are both federally
31 and state-listed as threatened or endangered,
32 the ANHC documents three state-only
33 threatened plant species that occur on Marion
34 County - Alabama snow-wreath (*Neviusia*
35 *alabamensis*), false gaura (*Stenosiphon*
36 *linifolius*), and royal catchfly (*Silene regia*).
37 Species descriptions are from NatureServe
38 Explorer.^{3.80}

40 3.77 Center for Biological Diversity and Defenders of Wildlife.
41 Petition to List the Tricolored Bat *Perimyotis Subflavus* as
42 Threatened or Endangered Under the Endangered Species
43 Act. June 14, 2016.

43 3.78 *The National Park Service biodiversity database*, and
44 Charles Bitting. Personal communication with Mary L.
45 Powell. February 15, 2018.

45 3.79 Center for Biological Diversity and Defenders of Wildlife.
46 Petition to List the Tricolored Bat.

3.80 NatureServe. "NatureServe Explorer: An online
encyclopedia of life [web application]." Version 7.1.
NatureServe. Available <http://explorer.natureserve.org>.
(accessed: October 26, 2017).

47 Alabama snow-wreath is a 3- to 4-foot tall,
48 deciduous, thicket-forming shrub with bright
49 green leaves and is considered critically
50 imperiled in Arkansas. It is typically found on
51 forested bluffs, talus slopes, and streambanks
52 on a variety of geologic substrates, soil types,
53 and aspects, and under open- to completely
54 closed-canopy conditions. Most typical
55 habitat may be within forested areas on thin
56 soil over limestone that is moist for part of
57 the year (seasonal streambeds, margins of
58 sinkholes, riverbluffs). According to the NPS,
59 although the species is not documented to
60 occur in Buffalo National River, it is probably
61 present.^{3.81} Areas with characteristics of
62 suitable habitat for Alabama snow-wreath are
63 present in the study area.

64
65 Royal catchfly is a perennial herb with a
66 scarlet-crimson flower. In Arkansas, royal
67 catchfly is found in prairies and on rock
68 outcrops and along roadsides and railroad
69 rights-of-way in cherty, well-drained soils.
70 ANHC documents the species as occurring in
71 three counties in the state, including Marion
72 County. According to the NPS, although the
73 species is not documented to occur in Buffalo
74 National River, it is probably present.^{3.82} Little
75 to no suitable habitat for royal catchfly in the
76 study area exists.

77
78 False gaura is a tall, slender, perennial herb
79 that is found on rocky limestone glades in
80 Arkansas. While documented by ANHC in
81 Marion County, the species is not known
82 to occur in Buffalo National River.^{3.83} The
83 presence of limestone glade habitat in the
84 study area leaves the possibility that false
85 gaura may be present.^{3.84}

86
87
88

89 3.81 *The National Park Service biodiversity database*.

90 3.82 *The National Park Service biodiversity database*.

91 3.83 *The National Park Service biodiversity database*.

92 3.84 Charles Bitting. Personal communication with Mary L.
Powell. February 15, 2018.

1 In general, because little to no suitable
 2 habitat in the study area for the species exists,
 3 it is unlikely Alabama snow-wreath and
 4 royal catchfly are present in the study area.
 5 Although not known to be present, false gaura
 6 may be present in suitable limestone glade
 7 habitat in the study area.

8

9 **State Inventory Elements**

10

11 Aside from species listed as threatened or
 12 endangered, ANHC lists numerous Inventory
 13 Elements as occurring in Marion County,
 14 many of which occur or are likely occur in
 15 Buffalo National River and some of which may
 16 occur in the study area. Swainson's warbler
 17 is an Inventory Element found in small
 18 numbers using canebrake and other riparian
 19 habitat in Buffalo National River and may
 20 use a small area of canebrake along Buffalo
 21 River in the study area.^{3.85} A survey performed
 22 for proposed facility improvements at Rush
 23 Landing identified one small population
 24 of Ozark cornsalad in one location near
 25 the powerline right-of-way to Clabber
 26 Creek.^{3.86} Any Inventory Element species
 27 could be affected by activities such as trail
 28 construction, maintenance, and habitat loss.

29

30 **Other Protected Species**

31

32 While no longer federally listed under the
 33 ESA, bald eagle is protected under the Bald
 34 and Golden Eagle Protection Act. Bald eagles
 35 occur throughout the year as migrants and
 36 winter residents at Buffalo National River
 37 and at least two nests are present along the
 38 river.^{3.87} At present no bald eagle nests or
 39 winter roosts are known to occur in the study
 40 area, although it is likely bald eagle move
 41 through, forage in, and perch in the study area
 42 at any time of the year.

43

44 ^{3.85} *Facilities Improvements Environmental Assessment.*

45 ^{3.86} *Facilities Improvements Environmental Assessment.*

46 ^{3.87} Charles Bitting. Personal communication with Mary L.
 Powell. February 15, 2018.

47 Migratory birds, their eggs, and nests are
 48 protected under the Migratory Bird Treaty
 49 Act (MBTA). Most wild birds commonly found
 50 in the United States are protected by the
 51 MBTA, with exception of introduced species
 52 such as house sparrow (species), rock dove
 53 (or common pigeon), common starling, and
 54 Eurasian collared dove. Species that are
 55 not typically thought of as migratory and
 56 are present throughout the year, including
 57 great horned owl, black-billed magpie, and
 58 American crow are also protected by the
 59 MBTA. Abundant nest substrate (trees, tree
 60 cavities, shrubs, etc.) is present in the study
 61 area and a corresponding abundance of
 62 birds and active bird nests are present as
 63 well. While sensitivity to the proximity and
 64 intensity of disturbance varies by species, all
 65 birds are sensitive to the presence of humans,
 66 vehicles, noise, and night lighting and will
 67 change their breeding, nesting, foraging, and
 68 resting behaviors in response.

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