



**US Army Corps
of Engineers**



DRAFT ENVIRONMENTAL ASSESSMENT

Draft Shoreline Management Plan Revision
Bull Shoals Lake

February 2018

U.S. Army Corps of Engineers Little Rock District
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DRAFT SHORELINE
MANAGEMENT PLAN REVISION
BULL SHOALS LAKE
ENVIRONMENTAL
ASSESSMENT

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DRAFT

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6 1.0 INTRODUCTION
7

8 The Bull Shoals Shoreline Management Plan (SMP) is the required U.S. Army Corps of Engineers
9 (Corps) approval document (Title 36, Section 327.30 and ER 1130-2-406) that protects and
10 manages shorelines of USACE Civil Works water resource development projects under Corps
11 jurisdiction in a manner that promotes safe and healthful public use of shorelines while maintaining
12 environmental safeguards. The objectives of management actions in this SMP are to balance
13 permitted private uses and natural resource protection for general public use. The Corps last
14 updated the Bull Shoals Lake SMP in March 2001 and the document is currently out of date.

15 The updated Bull Shoals SMP, once approved by the Southwestern Division Engineer, will become
16 an appendix to the Operation Management Plan (OMP) for the lake. The OMP was last updated in
17 June of 2011. The objectives of the SMP are to manage and protect the shoreline, to maintain
18 optimal fish and wildlife habitat, natural environmental conditions, and to promote the safe and
19 enjoyable use of the lake and shoreline for recreational purposes.
20

21 Activities covered by the shoreline management plan, such as placing private floating facilities or
22 modifying vegetation, on public lands require prior written approval, and/or a shoreline use permit
23 from the Operations Project Manager (OPM) at Bull Shoals Lake.
24

25 With the draft SMP update, the Corps is completing an Environmental Assessment (EA) that
26 evaluates existing conditions and potential impacts of proposed alternatives. The EA is prepared
27 pursuant to the National Environmental Policy Act (NEPA), Council on Environmental Quality
28 (CEQ) regulations (40 CFR, 1500–1517), and the Corps Policy and Procedures for Implementing
29 NEPA as directed by Engineer Regulation (ER) 200-2-2 (1988).

30 2.0 PURPOSE AND PROJECT BACKGROUND

31 2.1 Purpose
32

33 The Corps approved the original Bull Shoals Lake SMP (also known as the Lakeshore
34 Management Plan) in April of 1973; and the Little Rock District Engineer reviewed, updated
35 and approved the SMP in May of 1982. The SMP was again supplemented in 1988 and was
36 approved by the Southwestern Division Engineer in October of 1988. Revision of 36 CFR
37 327.30 in 1990 required the Little Rock district to convert its currently approved lakeshore
38 management plans to shoreline management plans. The District's draft operating policy for
39 shoreline management was discussed at a series of public workshops held at Forsyth, Missouri,
40 4 June 1991; Diamond City, Arkansas, 5 June 1991; and Mountain Home, Arkansas, 6 June
41 1991. The provisions of the finalized policy, SWLOM 1130-2-33, and the shoreline
42 allocations contained in the most recent approved lakeshore management plan have been

1 included in this Shoreline Management Plan for Bull Shoals Lake. The Shoreline
2 Management Plan was approved by the Southwestern Division Office on 1 April 1993.

3
4 In 1994, an update was conducted to recommendation changes in shoreline allocations at 18
5 scattered locations around the lake. A public workshop was held at the Mountain Home Project
6 Office on 23 May 1994 and at Forsyth Missouri on 24 May 1994 to notify the public of the
7 Shoreline Management Plan review. The Mountain Home Project Office evaluated 28 rezoning
8 requests, resulting in the approval of 18 requests. The plan was approved on 19 August 1994.

9
10 The last review, update, and approval process of the Bull Shoals Lake SMP took place in March
11 2001. During the update of this plan, a public workshop was held on 26 October 1999, announcing
12 the plan update and the process that would be followed. Applications for boat dock rezoning were
13 accepted until 1 December 1999. There were 65 rezoning requests received and evaluated, 32 were
14 approved. Other public workshops were held on 8, 9, 10 February 2000 to begin collecting issues
15 from the public regarding any changes desired in the Bull Shoals Shoreline Management Plan. The
16 written comment period closed on 11 March 2000. Comments received were used to prepare the
17 draft SMP and EA. A second series of public workshops were held in Mountain Home and Lead
18 Hill, Arkansas and Gainesville, Missouri on 23, 24, 25 January 2001. The Operations Manager and
19 Park Manager presented the draft Shoreline Management Plan and draft Environmental
20 Assessment. Three options were presented for public comment. The deadline for written
21 comments to the SMP and EA was 26 February 2001. A total of 83 persons attended and
22 submitted 49 written comments.

23
24 The 2006 administrative review implemented the required administrative changes to the previously
25 approved 2001 Bull Shoals SMP. These changes brought it in line with other Shoreline
26 Management Plans in the Little Rock District.

27
28 The Corps prepared the draft SMP revision in accordance with the following policies:

- 29 1) Corps Policy guidance ER 1130-2-406 of 31 October 1990 and 28 May 1999.
- 30
31 2) Title 36, Chapter III, Part 327, Code of Federal Regulations, "Rules and Regulations
32 Governing Public Use of Water Resource Development Projects Administered by the Chief
33 of Engineers."
- 34
35 3) SWLR 1130-2-48c1 (June 2007), Shoreline Management at Civil Works Projects.
- 36

37 2.2 Project Background

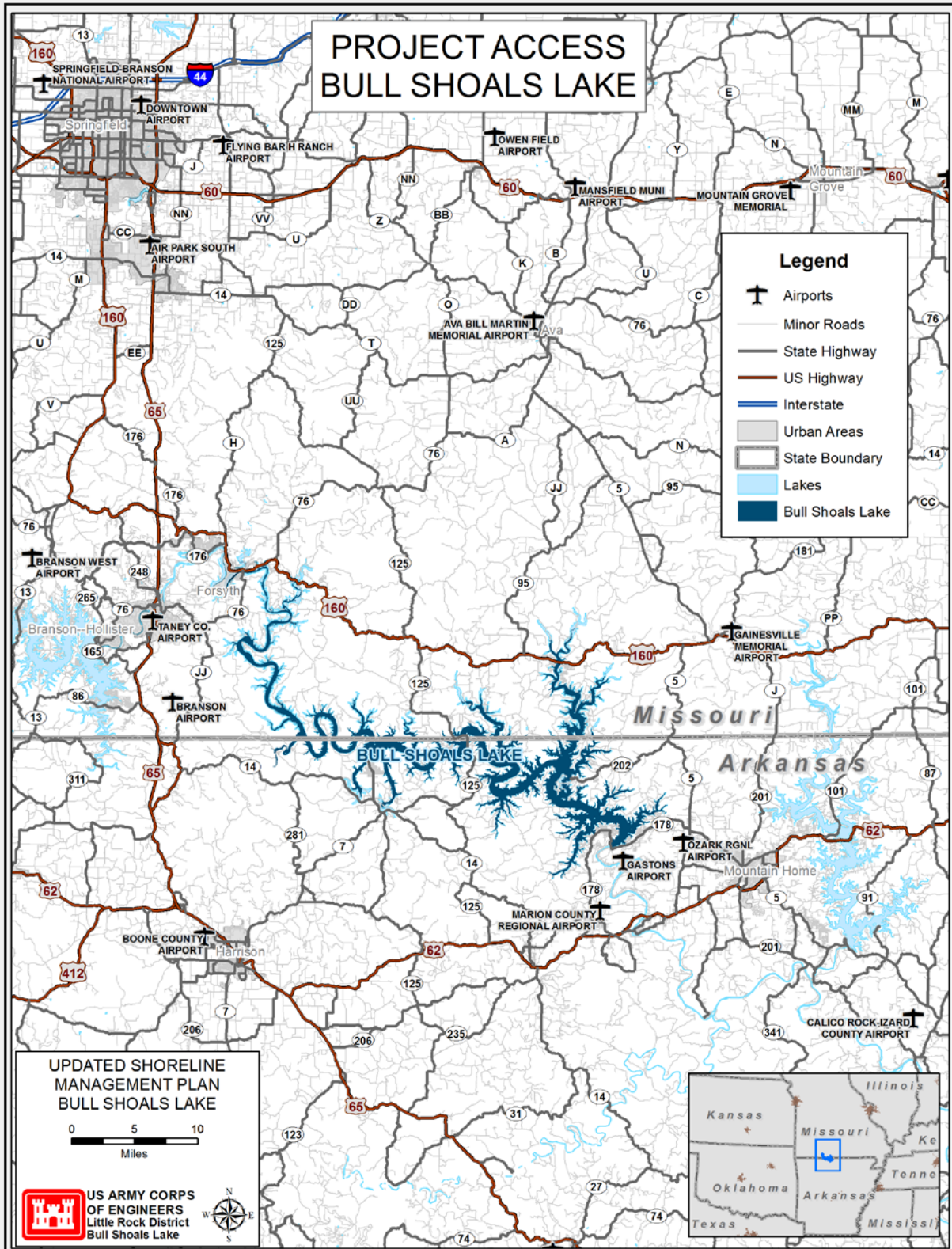
38

39 Bull Shoals Lake is a multiple purpose water resource development project initially authorized for
40 two purposes: flood control and hydropower generation. Subsequent authorized uses included:
41 water supply, including providing water storage to supply a minimum flow discharge (Section 132
42 of the FY 2006 Energy and Water Resources Development Act, Public Law 109-103); recreation;
43 and fish and wildlife (Flood Control Act of 1938, as amended in 1944, 1946, 1954, 1962, 1965 and
44 1968). Bull Shoals Lake is a major component of a comprehensive plan for water resource
45 development in the White River Basin of Arkansas and Missouri. The project is located in the
46 scenic Ozark Mountain region of southern Missouri (Taney and Ozark counties) and northern
47 Arkansas (Baxter, Boone and Marion counties) See Figure 2.1 for a general overview. The total

1 area contained in the Bull Shoals project, including both land and water surface, consists of
2 104,573.3 acres. Of this total, 20 acres are in flowage easement. The region is characterized by
3 narrow ridges between deeply cut valleys that are well wooded with deciduous trees and scattered
4 pine and cedar. When the lake is at the top of the conservation pool (elevation 659 feet above mean
5 sea level), the water area is 48,225.3 surface acres with 822 miles of shoreline within the lands
6 owned in fee. The shoreline is irregular with topography ranging from steep bluffs to gentle slopes.

7
8 Construction of Bull Shoals Dam was initiated in June 1947. The dam was completed in July of
9 1951, and the powerhouse and switchyard were completed in 1952. The lake was declared
10 operational for public use in 1952 under the authority of the Flood Control Act approved 28 June
11 1938 (Public Law No. 761, 75th Congress, 3rd Session) as modified by the Flood Control Act
12 approved 18 August 1941 (Public Law No. 228, 77th Congress, 1st Session) which included the
13 authorization of the project for flood control and generation of hydroelectric power. Section 4 of
14 the Flood Control Act approved 22 December 1944, as amended by Section 4 of the Flood Control
15 Act approved 24 July 1946, as amended by Section 209 of the Flood Control Act of 1962, as
16 amended by Section 2 of the Land and Water Conservation Fund Act of 1965, and as further
17 amended by Section 210 of the Rivers and harbors Flood Control Act of 1968, authorized the
18 Department of the Army to provide for recreational use of the lakes under its control. For a full list
19 of project authorizations, reference the *Bull Shoals Lake Master Plan*, dated January 2016. Table
20 2.1 provides pertinent construction and operations data for this lake.

1
 2 Figure 2.1: Bull Shoals Lake Map
 3



1
2
3

Table 2.1 Pertinent Data of Bull Shoals Dam and Lake
PERTINENT DATA OF THE DAM AND LAKE

<u>General Information</u>	
Purpose, Stream, States	FC, P, WS, R, F&W White R., Missouri & Arkansas(1)Missouri & Arkansas
Drainage area, square miles	6,036
Average annual rainfall over the drainage area, inches, approximately	45.4
<u>Dam</u>	
Length in feet	2,256
Height, feet above streambed	258
Top of dam elevation, feet above mean sea level	708
<u>Generators</u>	
Main units, number	8
Rated capacity each unit, kilowatts	45,000
Station service units, number	2
Rated capacity each unit, kilowatts	700
<u>Lake</u>	
Nominal bottom of power drawdown Elevation, feet above mean sea level	588
Area, acres	20,260
Nominal top of conservation pool Elevation, feet above mean sea level	659
Area, acres	48,225.3
Length of shoreline, miles	822
Nominal top of flood-control pool Elevation, feet above mean sea level	695
Area, acres	71,240
Length of shoreline, miles	1,050
<u>Five-Year frequency pool</u>	
Elevation, feet above mean sea level (flood pool)	695
Elevation, feet above mean sea level (drawdown)	628.5
<i>(1) FC – flood control, P – power, WS-water supply, MF-minimum flow, R-recreation, F&W-Fish and Wildlife</i>	

4

3.0 Alternatives

Three alternatives were evaluated for the draft EA:

- Alternative 1 (Conservative)
- Alternative 2 (Sustainable Conservation-Preferred)
- Alternative 3 (No Action)

Other alternative scenarios were evaluated during the alternatives formulation process, including an extreme conservative option which consisted of no new shoreline permits issued; this was the initial Alternative 1. Under this scheme there would be no net gain of permits, no additions or modifications to existing permits, maintenance of existing SMP permits only, and no new rezoning requests. An evaluation of public scoping comments indicated that the majority of the public would not favor these restrictions, so the initial Alternative 1 was screened out. A more liberal scenario (Alternative 5) was also evaluated during the process, with the following provisions: Rezoning requests will be considered, including an addition of Limited Development Areas, if within 200 feet of shoreline, wherever requested if in Low Density lands classification; parking on private lands allowed for lake access; path permits could be issued that did not go to a dock—could extend 200 feet to any point on lake shore in Low Density lands classification; would allow deck overs on boat slips and covered swim platforms. Again, based on the preponderance of public comments wanting the lake to remain as is, limiting development and growth, and maintenance of existing water quality, Alternative 5 was also screened out, primarily due to a potential addition of 12.9 more miles of LDA (19.4 miles currently exist in the preferred alternative). The alternatives carried forward for additional evaluation are numbered 1-3 and are discussed below.

3.1 Conservative (Alternative 1)

In this alternative, the most substantial difference in allocations from the No Action Alternative is the removal of 69.2 miles of LDA Unsuitable (for development), a reduction of Public Recreation Area from 139.4 shore line miles to 52.6 miles, and an increase in Protected lands to 751.2 miles from the 593.6 miles in the No Action Alternative. Components of this alternative include:

- No net gain of permits (maintenance of permit only);
- No new reallocation requests allowed;
- Parking for new docks required within 200 feet of the dock site;
- No PWC lifts allowed on outside of the dock;
- New docks will not be allowed;
- No dock modification allowed;
- No new mowing and path permits allowed;
- Only hand tools are allowed for vegetation modification;
- No new RE outgrants allowed;
- Only alternative power sources (e.g. solar) will be allowed for new facilities;
- Existing Vegetation modification limited to 99ft. (Mowing/under brushing/limbing 33ft, under brushing/limbing 33ft, and under brushing 33ft);
- No buoy conversions to docks;
- Seasonal deferral of accepting permit application (3 months, December through February);
- No new usable LDA/RLDA added (use elevation 654 to determine LDA use);

- No additions or modifications to facilities.

3.2 Sustainable Conservation (Alternative 2-Preferred)

Alternative 2 includes unique management measures, but also includes management measures shared by the other action alternatives. In this alternative, allocations are markedly different to the allocations in Alternative 4, No Change. The most substantial difference in allocations is the removal of all LDA Unsuitable lands, with conversion to Protected lands allocation. PRA lands have been reduced from 139.4 shore line miles (16.9%) to 52.6 miles, representing 6.4% of the shoreline. These PRA lands were converted to RLDA (6.9 miles), or Protected, which totals 740.9 miles, representing 90.1% of the shoreline in this alternative. Components of this alternative include:

- The top of conservation pool is changed from 654 msl to 659 msl due to White River Minimum Flows;
- Valid permits for private floating facilities or vegetation modifications will not be rescinded from the current permittees (Private Floating Facility or vegetation modification);
- Approximately 60 docks are brought into compliance through changes to Limited Development Areas (LDA) and Restricted Limited Development Areas (RLDA) zoning;
- 1-20 boat stalls for private floating facilities;
- 1.6 miles of unsuitable LDA is converted to useable LDA;
- Suitable LDA now totals 19.4 miles (was 17.8 miles); 69 miles of unsuitable LDA was removed;
- The shoreline allocations match land classifications identified in the *Bull Shoals Lake Master Plan*;
- Local policies are incorporated into the *SMP*;
- *SMP* now matches how the lake has been managed;
- Underbrush which consists of non-flowering trees or shrubs that are two inches or less in diameter at ground level are allowed to be removed through a permit;
- New permit applications only accepted during October through April;
- Rezoning requests will not be considered or accepted;
- Aligned with Scoping comments received during Scoping phase;
- Considered and evaluated 32 site specific comments received from Scoping phase.

Shoreline mileage changes from the No Action Alternative to the Preferred Alternative are displayed below in tabular form.

<u>NO ACTION</u>	<u>CONVERTED TO</u>	<u>PREFERRED</u>	<u>MILES</u>	<u>% of Preferred Zoning</u>	<u>PREFERRED</u>	<u>MILES</u>
LDA		LDA	15.92	82.0%	LDA	19.4
		LDA Unsuitable			LDA Unsuitable	0.0
		RLDA	0.72		RLDA	6.9
		Public Rec Area			Public Rec Area	52.8
		Protected	1.14	0.2%	Protected	740.9
		Prohibited			Prohibited	2.4
					Total	822.4
LDA Unsuitable		LDA	3.48	17.9%		
		LDA Unsuitable				
		RLDA	4.08			
		Public Rec Area	0.003	0.0%		
		Protected	61.66	8.3%		
		Prohibited				
RLDA		LDA				
		LDA Unsuitable				
		RLDA				
		Public Rec Area				
		Protected				
		Prohibited				
Public Rec Area		LDA				
		LDA Unsuitable				
		RLDA	0.45			
		Public Rec Area	49.18	93.1%		
		Protected	89.74	12.1%		
		Prohibited				
Protected		LDA	0.02	0.1%		
		LDA Unsuitable				
		RLDA	1.66			
		Public Rec Area	3.63	6.9%		
		Protected	588.32	79.4%		
		Prohibited				
Prohibited		LDA				
		LDA UNSUITABLE				
		RLDA				
		Public Rec Area				
		Protected				
		Prohibited	2.41	100.0%		
			822.41			

REASON CHANGED	NO ACTION TO PREFERRED	MILES
NO CHANGE	LDA -to- LDA	15.9
Within 200ft Of Boundary or Parking	LDA UNSUITABLE -to- LDA	3.5
Expanded spot zone to 100ft	PROTECTED -to- LDA	0.02
1/3 Width Of Cove	LDA -to- RLDA	0.1
Not Within 200ft of Boundary or Parking Dock Present	LDA -to- RLDA	0.6
1/3 Width Of Cove	LDA UNSUITABLE -to- RLDA	0.2
Existing Dock And Anchors	LDA UNSUITABLE -to- RLDA	3.9
Existing Dock And Anchors	PROTECTED -to- RLDA	1.7
Existing Dock And Anchors	PUBLIC RECREATION AREA -to- RLDA	0.4
NO CHANGE	PUBLIC RECREATION AREA -to- PUBLIC RECREATION AREA	49.2
Match to High Density Land Classification	LDA UNSUITABLE -to- PUBLIC RECREATION AREA	0.003
Extended to PUA Boundary	PROTECTED -to- PUBLIC RECREATION AREA	1.6
Match to High Density Land Classification	PROTECTED -to- PUBLIC RECREATION AREA	2.0
NO CHANGE	PROTECTED -to- PROTECTED	588.3
1/3 Width Of Cove	LDA -to- PROTECTED	0.4
Allowed Docks 2146 and 2774 to move around point	LDA -to- PROTECTED	0.1
Bluff	LDA -to- PROTECTED	0.1
Not Within 200ft of Boundary or Parking	LDA -to- PROTECTED	0.5
Sliver In ESA	LDA -to- PROTECTED	0.0002
Spot Zone LDA Less Than 100ft	LDA -to- PROTECTED	0.03
Utility Line	LDA -to- PROTECTED	0.02
1/3 Width Of Cove	LDA UNSUITABLE -to- PROTECTED	3.1
Allowed Docks 2146 and 2774 to move around point	LDA UNSUITABLE -to- PROTECTED	0.005
Bluff	LDA UNSUITABLE -to- PROTECTED	0.02
Not Within 200ft of Boundary or Parking	LDA UNSUITABLE -to- PROTECTED	58.4
Sliver In ESA	LDA UNSUITABLE -to- PROTECTED	0.001
Spot Zone LDA Less Than 100ft	LDA UNSUITABLE -to- PROTECTED	0.1
Utility Line	LDA UNSUITABLE -to- PROTECTED	0.003
No Longer PUA	PUBLIC RECREATION AREA -to- PROTECTED	74.0
Reduced to PUA Boundary	PUBLIC RECREATION AREA -to- PROTECTED	15.7
NO CHANGE	PROHIBITED -to- PROHIBITED	2.4
		822.4

1

2

3 3.3 No Action (Alternative 3)

4

5 The No-Action alternative is defined as the Corps continuing utilization of the current SMP, with
6 the inclusion of new policies enacted since 2006, which include the following policies:

7

8

9

10

11

12

13

14

- Parking for LDAs;
- Non-ambulatory Access;
- Solar Power for PFF;
- Alternative 3 would also include SWLR 1130-2-48.

Table 3.1
 Changes in Miles of Shoreline Allocated to Public Recreation Areas, Protect Areas and Prohibited Areas for each
 Proposed Alternative

Alternative 1 (Conservative)	Miles	Percent of Shoreline	Change in miles	Percent change in miles
Total Shoreline	822.4	100.0%	-	-
LDA	15.9	1.9%	-1.9	-0.2%
LDA Unsuitable	0.0	0.0%	-69.2	-8.4%
RLDA	0.0	0.0%	0.0	0.0%
Public Recreation Area	52.9	6.4%	-86.5	-10.5%
Protected	751.2	91.3%	157.6	19.2%
Prohibited	2.4	0.3%	0.0	0.0%
Alternative 2 (Sustainable Conservation-Preferred)	Miles	Percent of Shoreline	Change in miles	Percent change in miles
Total Shoreline	822.4	100.0%	-	-
LDA	19.4	2.4%	1.6	0.2%
LDA Unsuitable	0.0	0.0%	-69.2	-8.4%
RLDA	6.9	0.8%	6.9	0.8%
Public Recreation Area	52.8	6.4%	-86.6	-10.5%
Protected	740.9	90.1%	147.2	17.9%
Prohibited	2.4	0.3%	0.0	0.0%
Alternative 3 (No Action)	Miles	Percent of Shoreline	Change in miles	Percent change in miles
Total Shoreline	822.4	100.0%	-	-
LDA	17.8	2.2%		
LDA Unsuitable	69.2	8.4%		
RLDA	0.0	0.0%		
Public Recreation Area	139.4	16.9%		
Protected	593.6	72.2%		
Prohibited	2.4	0.3%		

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1 4.0 AFFECTED ENVIRONMENT

2 4.1 Project Setting

3
4 Bull Shoals Lake is a reservoir created by Bull Shoals Dam on the White River, which is
5 located approximately seven miles northwest of Mountain Home, Arkansas. The lake extends
6 from North Central Arkansas in Marion, Boone, and Baxter counties into South Central
7 Missouri in Taney and Ozark counties, as shown in Figure 2.1. A more detailed description of
8 the project location and area is provided in the following sub-sections.
9

10 4.2 Climate

11
12 Climate within the Bull Shoals Lake watershed is temperate, with summer extremes lasting for
13 longer periods throughout northern Arkansas, and winter temperatures being more influential in
14 the zone's northern reaches in Missouri. Extremes may vary from lows around 0°F in the winter
15 months to highs above 100°F occurring from southern Arkansas to central Missouri during the
16 summer months. Extreme temperatures may occur for short periods of time at any location
17 within the watershed. Heavy rainfall events are common. Average annual rainfall over the
18 watershed varies from 44 to 46 inches. Monthly rainfall varies from 2.5 inches in the winter
19 months to about 5 inches in the spring. Snowfall each year averages from 8 to 16 inches from
20 south to north across the watershed. Snow packs are usually short lived and are not commonly
21 a concern for flooding.
22

23 Climate change is an area of concern due to the potential for effects on many aspects of the
24 environment, especially those related to water resources. The U.S. Global Change Research
25 Program (USGCRP) summarized information regarding climate change and its potential effects
26 in regional assessments ([http://www.globalchange.gov/publications/reports/scientific-](http://www.globalchange.gov/publications/reports/scientific-assessments/us-impacts)
27 [assessments/us-impacts](http://www.globalchange.gov/publications/reports/scientific-assessments/us-impacts)). In the Midwest, which extends from Minnesota to Missouri, extreme
28 events such as heat waves, droughts and heavy rainfall events are projected to occur more
29 frequently. Should these events become significant enough to impact the operation of Bull
30 Shoals Lake, the Master Plan and associated documents (i.e. Operations Management Plan and
31 Shoreline Management Plan) would be reviewed and revised, if necessary.
32

33 4.3 Topography, Geology, and Soils

34
35 The topography in the Bull Shoals Lake region includes gentle slopes to steep inclines typical
36 of the Ozark Highlands. Bluffs of near vertical relief are present where the original White
37 River channel has eroded the residual limestone substrate. The upper reaches of several small
38 tributaries contain small flood plains and gentle slopes of less than five percent. Primary ridges
39 and connecting spur ridges have inclines as great as 10%, with side slopes ranging from 10 to
40 25% inclines. Aspect, or the direction a slope is facing, is generally described as easterly in
41 nature for all land occurring on the west side of the reservoir and westerly in nature for land
42 occurring on the east side of the reservoir, however due to the presence of many smaller
43 drainages and resulting ridges, aspects of all directions have been created, making the landform
44 around Bull Shoals very rugged in appearance.
45

1 The Ozark Highlands Physiographic Province is underlain mainly by Paleozoic sedimentary
 2 rocks composed mainly of limestone and dolomite with lesser amounts of sandstone and shale.
 3 Much of the region is underlain by carbonate rocks with extensive karst development, resulting
 4 with sink holes and caves being common in this region. Figure 4.1 depicts geological
 5 formations and fault lines located in this region.



6
 7 **Figure 4.1 Geology of Bull Shoals Lake Watershed**

8 The strata in the region of Bull Shoals Lake have a slight dip to the south. The region is on the
 9 southern flank of a large regional dome with its nucleus in the igneous rocks of the St. Francis
 10 Mountains, about 200 miles to the northeast. Locally, short anticlines and dome structures with
 11 as much as 90 feet of structural relief are noted in the exposures along the White River. Faults
 12 with small displacements are found in the vicinity. There is no record of any seismic activity
 13 originating in the Bull Shoals Lake area. It is believed that all faults in the region are static and
 14 no future movements are expected. Three rock formations of Ordovician age are present above
 15 the river level within the region. These formations include the Cotter, Powell, and Everton.
 16 The Jefferson City formation underlies the Cotter, and is present only a few feet below river
 17 level at Bull Shoals Dam. These formations consist largely of dolomite limestone with
 18 occasional lenses of sandstone and shale. The Everton and Powell formations are not present at
 19 the dam, but cap the nearby hills. The capped hills are remnants of the Springfield Plateau
 20 surface.

21 Bull Shoals Lake is located within two physiographic areas of the Ozark Highlands. The
 22

1 Salem Plateau is exposed across northern and central Baxter County, and is characterized by
2 gently sloping to rolling uplands, and steep, stony side slopes with outcrops of dolomite. The
3 elevation ranges from about 700 to 1,000 feet above sea level and there are a few broad areas
4 on uplands that have a gradient of one to eight percent.
5

6 The Springfield Plateau is exposed in parts of west central and across most of southern Marion
7 County and most of southern Baxter County, and the Missouri counties of Taney and Ozark,
8 and is adjacent to and higher in elevation than the Salem Plateau. This plateau has been
9 strongly dissected by streams. Steep, V-shaped valleys separated by gently sloping to
10 moderately sloping land characterize it. The side slopes have a gradient of 12 to 50 %. The
11 elevation atop the ridges ranges from about 1,000 to 1,200 feet above sea level. There are
12 areas on uplands where the gradient is one to eight percent and provides a more flat relief.
13

14 Ozark streams and rivers are frequently located in narrow, confined valleys and are affected by
15 stream bed elevations that are typically only a few meters above bedrock, which results in
16 stream valleys that are entrenched and commonly less than one-fourth mile wide. The chert
17 content of some limestone and dolomite areas can be relatively high. Formed by rock
18 dissolution and weathering, streams often contains large quantities of chert gravel, which
19 provides an available source of gravel sediment to the river system. For these reasons, most
20 flood plains are less than 1,000 feet wide.
21

22 Soil surveys as published by the Natural Resource Conservation Service (NRCS) are available
23 for Baxter, Ozark, and Taney counties, as well as Soil Conservation Service surveys for Boone
24 and Marion counties in Arkansas. These would be utilized for developing specific resource
25 management plans for the Operational Management Plan. In general, most soils adjacent to the
26 lake are classified by the NRCS as Clarksville, Nixa and Gasconade soils. Arkana, Doniphan,
27 Gassville, and Moko soils are the major soils on this plateau surface. Arkana-Moko which is:
28 moderately deep and shallow, gently sloping to steep, well drained, cherty, and stony soils that
29 formed in residuum of dolomite and limestone. Healing, Razort, Wideman, and Britwater soils
30 formed within flood plains of tributary streams.
31

32 Soil conservation and management are major considerations when planning natural resource
33 and recreation management practices. While soil movement is influenced by climate, soil type,
34 and topography, which are uncontrollable, it can also be negatively affected by compaction,
35 modification of vegetative cover, and very high lake pool elevations which increase wave
36 action and inundation of unprotected shoreline.
37

1 4.3 Aquatic Environment

2 4.4.1 Hydrology and Groundwater

3 Bull Shoals Lake is located on the White River and was formed by the construction of the Bull
4 Shoals Dam in Marion County, Arkansas, which began in 1947 and was completed in 1952.
5 The elevation of the top of the conservation pool is approximately 659 feet NGVD29 with the
6 flood pool being at 695 feet NGVD29. The conservation pool top area is approximately
7 48,225.3 surface acres and the flood pool top area is approximately 71,240 surface acres. The
8 shoreline length of the design conservation pool is approximately 822 miles, and the flood pool
9 is approximately 1,050 miles in length. Bull Shoals Lake is located within the White River
10 Drainage Basin, which drains approximately 27,765 square miles in northern Arkansas and
11 southern Missouri. Bull Shoals Lake drains approximately 6,036 square miles of the White
12 River Drainage Basin and has an average depth of 67 feet. With the implementation of the
13 White River Minimum Flow (WRMF) Project, the total water storage capacity of Bull Shoals
14 Lake is 5.408 million acre-feet, with 2.127 million acre-feet of flood control storage, 1.236
15 million acre-feet of conservation storage, and 2.045 million acre-feet of inactive storage.

16
17
18 Bull Shoals Lake is an impounded area of the White River which begins at an elevation of
19 approximately 2,050 feet Mean Sea Level (MSL) near the Ozark National Forest in northwest
20 Arkansas. The upper end of the lake begins at the tail waters of Powersite Dam, which forms
21 Lake Taneycomo, near Forsyth, Missouri. Major tributaries feeding the lake include Swan
22 Creek and Beaver Creek, entering the north side in Taney County, Missouri and Bear Creek,
23 entering from the south in Boone County, Arkansas.

24
25 Most ground water withdrawn from water wells occurs in the Quaternary alluvium in the Bull
26 Shoals Lake area, with most wells being completed at a depth of about 200 – 300 feet below
27 surface. The recharge (outcrop) area for this formation is in southern Missouri. The primary
28 porosity of these rocks has been greatly reduced by compaction and cementation, thus a
29 reduction in their ability to supply large withdrawal rates. Ground water occurs mainly in
30 fractures and joints in the sandstone and in solution openings in the limestone and dolomite.

31 4.4.2 Water Quality

32 Overall surface water quality in the Bull Shoals Lake area is very high and has been designated
33 as an Extraordinary Resource Water Body by the Arkansas Department of Environmental
34 Quality (ADEQ). Therefore the area surrounding the lake is subject to more stringent state
35 regulations controlling pollution discharge and in-stream activities. The waters of the Arkansas
36 portion of the White River watershed have all been designated by the ADEQ for fisheries,
37 primary and secondary contact recreation, and domestic, agricultural, and industrial water
38 supplies (ADEQ, 2012). Bull Shoals Lake is classified by ADEQ as a Type A water body,
39 which includes most larger lakes of several thousand acres in size, in upland forest dominated
40 watersheds, having an average depth of 30 to 60 feet, and having low primary production (i.e.,
41 having a low trophic status if in natural [unpolluted] condition). This is mainly due to
42 temperature stratification, which is natural and occurs in many deep reservoirs such as Bull
43 Shoals Lake. During the warmer months, lake waters of the upper layer (the epilimnion) are
44 warmer and contain more dissolved oxygen, while the denser, lower layer waters (the
45 hypolimnion) are colder and contain very little or no dissolved oxygen. As the stratified
46 epilimnion cools in the late fall and winter, the layers begin to mix (de-stratify) and dissolved
47 oxygen (DO) is more evenly distributed. This condition is more favorable to the fishery of the

1 lake and overall water quality.

2
3 In 2004, ADEQ placed the first three miles of the Bull Shoals tail water on the Water
4 Quality Limited Waterbodies list (303(d) list) due to violation of the 6 mg/L dissolved
5 oxygen (DO) standard. The listed source of the DO violation is hydropower (HP). Section
6 303(d) of the Clean Water Act requires states to list waters that do not meet Federal water
7 quality standards or have a significant potential not to meet standards as a result of point
8 source dischargers or non- point source run-off. Subsequent to listing on the 303(d) list, the
9 statute requires that the states develop and set the Total Maximum Daily Load (TMDL) for
10 water bodies on the list within 13 years. A TMDL establishes the maximum amount of a
11 pollutant that can enter a specific water body without violating the water quality standards.
12 Values are normally calculated amounts based on dilution and the assimilative capacity of
13 the water body. TMDLs have been established by ADEQ for the 3.0 miles of the White
14 River below Bull Shoals Dam. While the first three miles below the Bull Shoals dam is
15 listed on the 303 (d) as an impaired water body, Bull Shoals Lake is not a listed water body.
16 In January 2009, USACE completed the WRMF Study, which would increase the minimum
17 flow below the dam to 800 cfs to benefit the aquatic habitat and may result in water quality
18 improvements in the tail water.

19
20 For the Missouri portion of Bull Shoals Lake, the Missouri Department of Natural Resources
21 and the Clean Water Commission are responsible for setting and enforcing water quality
22 standards within the State of Missouri. Classified waters in the state are categorized according
23 to their beneficial water usage. Major reservoirs like Bull Shoals Lake are usually several
24 thousand acres in size and are classified by the state as L2 (comparable to Type A in Arkansas).
25 Bull Shoals Lake, in addition to maintaining L2 water quality standards, is also subject to four
26 other water quality standards: (1) livestock and wildlife watering; (2) protection of warm water
27 aquatic life and human health/fish consumption; (3) whole body contact recreation; and (4)
28 boating and canoeing water quality standards (MDNR, 1996b).

29 4.4.3 Fish Species and Habitat

30 The impoundment of the White River and other tributary streams and rivers which form Bull
31 Shoals Lake resulted in changes in the composition of the fish populations. Smallmouth bass
32 was the principal game fish found in the White River prior to impoundment. Arkansas Game
33 and Fish Commission (AGFC) and Missouri Department of Conservation (MDC) are the
34 agencies primarily responsible for managing the fishery and through their efforts, a variety of
35 fish species are well-established in the lake. Sport fish species currently found include:
36 largemouth bass, spotted bass, smallmouth bass, white bass, striped bass, hybrid white-striped
37 bass, walleye, flathead catfish, channel catfish, white crappie, black crappie, and various species
38 of sunfish. Due to the quality and diversity of the fishery, Bull Shoals Lake serves as a national
39 fishing destination, hosting many bass tournaments annually.

40
41 Bull Shoals Lake was first impounded in 1951 and much of the standing timber was cut prior to
42 the impoundment. Since impoundment, the few remaining native forests that were submerged
43 provided structure and forage habitat for fish. This limited habitat has degraded over time.
44 Therefore in 1986, USACE, MDC, and AGFC began a large scale artificial habitat
45 improvement project with the primary objective to improve fish habitat within Bull Shoals
46 Lake. Since 1987, 459 fish habitat structures known as “fish attractors” have been placed in
47 Bull Shoals Lake by AGFC and 95 attractors by MDC. Approximately 64,000 trees comprise
48 the attractors which cover over 124 acres of lake bottom, totaling 30 miles in length. AGFC
49 and MDC fund the maintenance of the attractors each year, adding fresh cover to keep the

1 attractors productive and increasing the habitat.

2
3 In 2013, MDC began a fish habitat enhancement project on Bull Shoals Lake using standing cut
4 cedar trees anchored in concrete to provide a vertical habitat structure. When the project is
5 completed, 62 structures would be constructed. Depending upon the structure, up to 300 trees
6 would be constructed parallel to the shore in shallower water and perpendicular to the shore in
7 deeper water to prevent possible boating obstacles. These structures would create
8 approximately 12 acres of fish habitat. In 2014, AGFC began a trial program of adding
9 commercially made artificial fish habitat structures to a small number of existing fish attractors.
10 These structures are being studied for visual esthetics, durability, and usage by fish to determine
11 if they can be used to enhance the existing fish habitat structure program.

12
13 The public is also encouraged to place natural fish attractors in Bull Shoals Lake. Each year 50
14 permits are issued to private individuals to cut cedar trees and place fish attractors at various
15 locations. In 1995, USACE began a program for the public to bring their discarded Christmas
16 trees to be used as fish attractors to enhance fish habitat. Since the program began, thousands of
17 these trees have been placed in the lake by USACE personnel and the public.

18
19 The impoundment of Bull Shoals Lake caused environmental changes in the tailwater portion of
20 the White River from the dam to 60 miles downstream. AGFC realized that the cold water
21 discharges from Bull Shoals Lake would necessitate a change in their fisheries management
22 program for the White River as it transformed from a warm water fishery to a cold water
23 fishery. Rainbow trout, cutthroat trout, brook trout, and brown trout were stocked in the White
24 River to replace the warm-water fishery. This cold-water fishery is a success. However, because
25 of the unfavorable environmental factors such as: lack of suitable substrate, the fluctuation of
26 water temperatures, dissolved oxygen levels, water levels and current, trout reproduction is very
27 limited.

28
29 In 1955, the Norfolk National Fish Hatchery was built by the U.S. Fish and Wildlife Service
30 (USFWS) at nearby Norfolk Lake to mitigate the loss of the warm water fishery and provide
31 trout for the cold water fishery below Bull Shoals and Norfolk Dams. Each year, an average of
32 approximately 1,184,000 rainbow trout, 105,000 brown trout, 150,000 cutthroat trout, and
33 34,500 brook trout from the Norfolk Hatchery and from the USFWS Fish Hatcheries at Greers
34 Ferry Lake and Mammoth Springs, AR and the Arkansas State Fish Hatchery at Mammoth
35 Springs, AR are stocked in the White River. Since the trout program began, the fishery has
36 flourished and is now known as a “world class trout fishery” and has become a popular
37 international trout fishing destination.

38
39 During periods when there is little or no power generation, the water flow in the tailwater area
40 is reduced, resulting in shallow depths and exposed river bottom perimeters. Concerns about
41 the degradation of aquatic habitats for the cold water fishery in the White River due to these
42 exposed areas lead to the implementation of “White River Minimum Flows”. Section 132(a) of
43 the FY06 EWDA authorizes and directs the implementation of plan BS-3 at Bull Shoals for
44 minimum flows in order to increase the wetted perimeter of the river and improve the habitat
45 for the cold water fishery. Plan BS-3 reallocates 5 feet of flood control storage at Bull Shoals
46 Lake for the minimum flows release of 800 cfs. The conservation pool elevation was raised by 5
47 feet from 654.0 to 659.0; and the seasonal pool held from May to July for water temperature
48 releases was raised by 5 feet from 657.0 to 662.0 ft.

1
2 Walleye, striped bass, hybrid white-striped bass, and rainbow trout have been introduced into
3 Bull Shoals Lake to add diversity to the fishery. Natural reproduction of striped bass and hybrid
4 white-striped bass does not occur in Bull Shoals Lake and natural production of walleye is
5 considered minimal. Since 2004, AGFC each year stocks approximately 200,000 walleye,
6 300,000 black crappie, 50,000 channel catfish, 45,000 blue catfish, and 20,000 rainbow trout
7 each year. However, AGFC discontinued stocking rainbow trout into Bull Shoals Lake in 2014.
8 MDC stocks approximately 352,000 walleye and 16,000 striped bass annually in Bull Shoals.
9 While natural reproduction occurs in white crappie, black crappie, largemouth bass, and spotted
10 bass, AGFC and MDC supplement this reproduction by occasional stockings of these species.
11 Historically, there have also been introductions of northern pike, blue catfish, lake trout, and
12 threadfin shad.

13
14 In 1963, AGFC constructed an 8 acre fish nursery pond on the west shore of the East Sugar
15 Loaf Creek arm of Bull Shoals Lake for the purpose of rearing game fish for stocking purposes.
16 In 1975, AGFC constructed a net pen fish hatchery in the Pot Shoals Arm of Bull Shoals Lake.
17 Typically over 10,000 Channel and blue catfish were raised in the summer months and 15,000
18 rainbow trout in the winter months for stocking purposes. In 2007, the AGFC replaced the 8
19 acre nursery pond on East Sugar Loaf Creek with the construction of the larger 21 acre Dr.
20 Ralph Bowers/Tommy Donohoe Bull Shoals Lake Nursery Pond located on the east shore of
21 the West Sugar Loaf Creek arm. This fish nursery pond is used to alternately rear black crappie
22 and walleye for stocking directly into the lake. In 2013, the Pot Shoals net pen operation was
23 discontinued and the facilities permanently closed in 2014 due to the possible spreading of
24 invasive zebra mussels to other bodies of water through the stocking program.

25 4.5 Terrestrial Resources

26 4.5.1 Wildlife

27 White-tailed deer and eastern wild turkey are common game animals found and hunted in the Bull
28 Shoals Lake area. Black bear have also become common in the area and are hunted on the
29 Arkansas side of Bull Shoals Lake. The principal small game species found in the open upland
30 areas include bobwhite quail, cottontail rabbit, and mourning dove. Gray and fox squirrels are
31 common in upland wooded areas and are also popular for sportsmen. Furbearing animals found in
32 the Bull Shoals Lake area include coyote, red fox, gray fox, otter, mink, muskrat, beaver, bobcat,
33 and raccoon. Habitat management that includes wildlife food plot plantings, mowing, soil
34 disturbance, removal of exotic species and application of prescribed fire provide benefit to these
35 populations.

36
37 The common goldeneye, hooded merganser, and bufflehead are the predominant migratory
38 waterfowl species visiting Bull Shoals Lake. Mallards, gadwall, and other duck species are also
39 present; however, they are only transient visitors as their characteristic feeding habits of obtaining
40 food from shallow waters discourage them from obtaining food from the deep, clear waters of Bull
41 Shoals Lake. Migratory geese common to the area are Canada geese of the Eastern Prairie
42 Population. Giant and Greater Canada geese were introduced to the area by the MDC in 1971 and
43 1972 and have become established as a resident population. Resident Canada geese are so
44 numerous in many coves and recreation areas that their presence has become a nuisance. Many of
45 the recreation areas on Bull Shoals Lake are closed to camping and opened for Canada goose
46 hunting during the hunting season to help control their population.

1 Ring-billed gulls frequent the Bull Shoals area. Bull Shoals has also become a popular place for
2 observation of bald eagles. Fifty or more birds commonly winter here and 6-8 breeding pairs can
3 be found during the nesting period of March to June. Greater and lesser yellow legs and large
4 flocks of horned grebes are also seen during their peak migration in the spring and fall. Bull
5 Shoals Lake is also one of the few places where visitors can see both the turkey vulture and the
6 black vulture at the same time in the winter. In fact, wintering black vulture numbers have become
7 so large, they have become a nuisance to the public and in causing destruction to the infrastructure
8 of Bull Shoals Dam. From 2012 to present day, it is estimated the vultures have done several
9 hundred thousand dollars in damage to the dam, including the roof of the powerhouse and
10 associated facilities. The vultures pick apart anything that resembles rubber and vulture droppings
11 on these facilities are very caustic. Lethal permits were obtained from the USFWS in 2013, 2014,
12 and 2015 when other measures, such as pyrotechnics, noise-making devices, and chemical
13 repellent were all found to be ineffective. The permits are required for compliance with the
14 Migratory Bird Treaty Act of 1918.

15 4.5.2 Vegetation

16 The Ozark Highlands Ecoregion is characterized as a high plateau dissected by deep rugged
17 valleys formed by streams and rivers. Vegetation types within this region include oak-hickory
18 forests, oak-hickory-pine forests, bluestem prairies and cedar glades. Post oaks, blackjack oaks,
19 and black hickory are the dominant species found in the dry upland forests. Sandstone bedrock
20 areas contain species such as shortleaf pine and various species of oak. The mesic slope forests
21 include species such as white oak, northern red oak, bitternut hickory, and flowering dogwood.
22 Dolomite/limestone glades, which are characterized by barrens-like communities of prairie type
23 native forbs and grasses, occur on the shallow soil over outcroppings of bedrock. USACE
24 conducts a prescribed fire program to help to maintain these specialized vegetative ecosystems in
25 the Bull Shoals Lake area. Along the rivers, streams, and lake shores the riparian habitats are
26 characterized by birch and silver maple. Normal operational water level fluctuation at Bull Shoals
27 Lake has created regions along the shoreline that has little or no vegetation, but upslope of these
28 regions the shoreline is generally undeveloped and heavily forested.
29

30 4.5 Threatened and Endangered Species

31
32 There are many species in the Ozarks that are considered either threatened, endangered, or state
33 species of concern. Species become listed for a variety of reasons including over-hunting, over
34 fishing, and habitat loss as a result of human development and pollution; of these, habitat loss is
35 the main contributor that imperils most species. A threatened species is one that is likely to
36 become endangered within the foreseeable future. An endangered species is one in danger of
37 extinction throughout all or a significant portion of its range. The bald eagle (*Haliaeetus*
38 *leucocephalus*) is common during the winter months around Bull Shoals Lake. In addition, several
39 bald eagle nests are located around the lake. Although the bald eagle was delisted by USFWS in
40 2007 due to recovery of the species, both the bald and golden eagles are still protected in
41 accordance with the Bald and Golden Eagle Protection Act. Transient populations of gray and
42 Indiana bats (*Myotis grisescens* and *Myotis sodalis*)- federally endangered species- are
43 documented in caves located on and near the Bull Shoals Lake area. In addition, populations of
44 the northern long-eared bat (*Myotis septentrionalis*), which has been proposed for federal listing,
45 also occur around the lake.
46

47 The Tumbling Creek cave snail (*Antrobia culveri*), is a small crustacean known to exist only in the

1 Tumbling Creek Cave and in the karst groundwater system that connects the cave to the springs on
 2 Big Creek and Bear Cave Hollow located in the Bull Shoals Lake area in Taney County, Missouri.
 3 USACE works closely with the U.S. Fish and Wildlife Service to protect the 100 acres of USACE
 4 owned cave recharge area and manage the project lands and waters of Bull Shoals Lake to protect
 5 the cave snail and aid in its recovery.

6 Table 4-1 lists species known to occur on project lands as reported from the U.S. Fish and Wildlife
 7 Service’s federally classified status list of species and the Arkansas and Missouri Natural Heritage
 8 data sets. There are other threatened and endangered species that are known to be in the general
 9 area.

10 **Table 4-1 Threatened, Endangered, and Species of Concern**

Common Name	Scientific Name	Federal/State Status	State/Global Rank
Bald Eagle	<i>Haliaeetus leucocephalus</i>	*Protected under Bald and Golden Eagle Protection Act	
Gray Bat	<i>Myotis grisescens</i>	E/E	S3/G3
Indiana Bat	<i>Myotis sodalis</i>	E/E	S3/G3
Tumbling Creek cave snail	<i>Antrobia culveri</i>	E/E	S2/G3

11 E = Endangered; S2: Imperiled: Imperiled in the state because of rarity or because of some factor(s) making it very
 12 vulnerable to extirpation from the nation or state (1,000 to 3,000)-typically 6 to 20 occurrences or few remaining
 13 individuals (1,000 to 3,000); S3: Vulnerable: Vulnerable in the state either because rare and uncommon, or found only
 14 in a restricted range (even if abundant at some locations), or because of other factors making it vulnerable to
 15 extirpation. Typically 21 to 100 occurrences or between 3,000 and 10,000 individuals; G3: Vulnerable: Vulnerable
 16 globally either because very rare and local throughout its range, found only in a restricted range (even if abundant at
 17 some locations), or because of other factors making it vulnerable to extinction or elimination. Typically 21 to 100
 18 occurrences or between 3,000 and 10,000 individuals.

19 4.5.1 Invasive Species

20 In accordance with Executive Order (EO) 13112, an invasive species means an alien species whose
 21 introduction does or is likely to cause economic or environmental harm or harm to human health.
 22 Invasive species can be microbes, plants, or animals that are non-native to an ecosystem. In
 23 contrast, exotic species, as defined by EO 11987, include all plants and animals not naturally
 24 occurring, either presently or historically, in any ecosystem of the United States. Invasive species
 25 can take over and out- compete native species by consuming their food, taking over their territory,
 26 and altering the ecosystem in ways that harm native species. Invasive species can be accidentally
 27 transported or they can be deliberately introduced because they are thought to be helpful in some
 28 way. Invasive species cost local, state, and federal agencies billions of dollars every year.

29 The Bull Shoals Project is not protected from the spread of invasive species. Locally the project

1 office works with its partners, AGFC, MDC, University of Arkansas Extension Services and
2 United States Department of Agriculture, to help stop the spread of some of the Ozarks most
3 unwanted species. Invasive species include feral hogs (*Sus scrofa*), zebra mussels (*Dreissena*
4 *polymorpha*), sericea lespedeza (*Lespedeza cuneata*), gypsy moth (*Lymantria dispar*) and the
5 emerald ash borer (*Agilus planipennis*). Project rangers post signage in all the recreation areas to
6 communicate the dangers of spreading invasive species on project lands and waters. Rangers also
7 place emerald ash borer and gypsy moth traps on project lands to monitor any infestations of this
8 species.

9 4.6 Archaeological and Historic Resources

10 4.6.1 Paleontology

11 North central Arkansas and south central Missouri are located on the Salem Plateau. Geologically
12 the plateau is made up of relatively flat-lying Paleozoic age strata consisting of dolostones,
13 sandstones, and limestones. The Ordovician aged Cotter and Jefferson City Dolomite is the
14 primary outcropping formation in the area. Few fossils are known to exist in the Jefferson City
15 Dolomite. Fossils from the Cotter Dolomite are rare but include gastropods, cephalopods, and
16 reef-building algae. The Ordovician aged Powell Dolomite and Everton Formation also outcrop in
17 the general area although to a lesser extent.

18 4.6.2 Cultural Resources

19 The following is a brief history of the human occupation of the Bull Shoals Lake area:

20
21 **Paleo-Indian (12,000-8,000 B.C.)** – The earliest documented archeological manifestation in
22 the Ozark area relates to what the Paleo-Indian or Early Hunting Horizon. There is evidence
23 of Paleo-Indian inhabitants in the Ozark Highlands indicated by the presence of Clovis,
24 Cumberland, and Folsom bifaces in isolated instances in Boone and Newton Counties,
25 Arkansas. No Paleo-Indian sites have been excavated in the Ozarks, only surface sites and
26 multi-component shelter sites are present.

27
28 **Archaic (8,000-500 B.C.)** - Around 8,000 years ago, the climate began to change. The
29 Pleistocene epoch gave way to the Holocene. Warmer temperatures, along with increased
30 hunting efficiency, brought about the extinction of the megafauna that the Paleo-Indians had
31 followed. Archaic people relied on the animals and plants that we see today. Settlement patterns
32 were seasonal, with bands of people staying in one area for entire seasons before moving on to
33 the next settlement. From these base camps, hunting parties were sent out, sometimes for days,
34 to kill game. Archaic period hunting camps abound in the White River area.

35
36 **Woodland (500 B.C. – A.D. 900)** - One major technological change marked the beginning of
37 the Woodland period- pottery. Ceramics had begun to appear during the Archaic period, but
38 their proliferation marked the beginning of the Woodland period. Pottery signified an
39 increasing reliance on domesticated plants. Horticulture had now spread throughout most of the
40 Eastern Woodlands, with the White River area being no exception. The bow and arrow became
41 a part of the tool assemblage, further increasing the efficiency of hunting game. For the most
42 part, however, the Woodland period is very poorly understood in the White River area.
43 Unfortunately, only a few sites containing Woodland period components have been studied.

44
45 **Mississippian (A.D. 900 – 1541)** - The Mississippian period generally marked the transition to
46 full-scale agriculture and a chiefdom level of politics. An influence of religion from

1 Mesoamerica spread rapidly throughout the southeastern U.S. Large mound sites were
2 constructed, elaborate trade networks were established, and populations dramatically increased.
3 Ozark adaptations, however, were unique during the Mississippian period. Domesticated crops
4 were grown in the river valleys, but hunting and gathering likely made up the bulk of the food
5 supply. Small Mississippian period mound sites did exist in the White River area, such as the
6 Loftin Site, inundated by Table Rock Lake. Other Mississippian sites in the area included open-
7 air village sites and rock shelters. It had been speculated that these communities were
8 “outposts” of the Caddo culture located to the southwest. Recently, however, researchers have
9 demonstrated that these societies simply interacted with one another on a frequent basis, with no
10 evidence of Caddo colonization.

11
12 **Protohistoric / Historic Periods (A.D. 1541 –1865)** - The Protohistoric period began with the
13 De Soto expedition into the Southeastern United States. Generally speaking, De Soto did not
14 enter the Ozarks, but the aftermath of his expedition definitely did enter the area. Diseases the
15 Spaniard and his men brought with them, such as smallpox and influenza, had a devastating
16 effect. The tribes inhabiting the area had no immunity against these diseases, and up to 90
17 percent of the populations were decimated. During this time period, the Ozarks were primarily
18 being used as a hunting ground for the Osage, who were centered more to the north.

19
20 Euro-American settlement began in the Ozarks in the late 18th century. People generally
21 subsisted on a combination of hunting wild game and herding domesticated animals. With the
22 creation of the Arkansas Territory in 1819, people from the upland South, or Appalachia, began
23 to move into the Ozarks. These people brought with them many aspects of their culture,
24 including fundamentalist religion, unique architectural styles, and an aptitude for farming rocky
25 terrain. Although slave holding was not unheard of, it certainly was not the norm. A few major
26 battles of the Civil War, such as Pea Ridge, were fought in the area. Theoretically, the battle of
27 Pea Ridge solidified Union control over southern Missouri. In reality, the entire Ozark region
28 was hostage to Bushwhackers, or outlaws that roamed the land and robbed people
29 indiscriminately.

30 31 **Previous Investigations in the Bull Shoals Lake Area**

32
33 The most recent broad cultural resources inventory for Bull Shoals Lake was conducted in
34 1988 for the *Cultural Resources Priority Plan for the U.S. Army Engineer District, Little Rock*
35 (Blakely and Bennett, Jr., 1988). Table 4-2 lists previous surveys performed along the Bull
36 Shoals Lake. Table 4-2 includes the most up to date survey information according the records
37 of the Arkansas Archeological Survey and the Missouri Department of Natural Resources.

1
2

Table 4-2 Previous Archeological Investigations on Bull Shoals Lake

Author	Title	Year
Howard, Lynn E	Archeological Survey in Bull Shoals Region of Arkansas	1963
Spears, Carol, Nancy Myer, Hester Davis	Watershed Summary of Archeological and Historic Resources in the White River Basins, Arkansas and Missouri.	1975
Novick, Lee and Charles Cantlry	Bull Shoals Lake: An Archeological Survey of a Portion of Bull Shoals Lake Shoreline.	1979
Lee, Aubra Lane	Cultural Resources Investigations at Bull Shoals Lake, Arkansas	1986
Blakely, Jeffrey A. and W.J. Bennett Jr.	Cultural Resources Priority Plan for the U.S. Army Engineer District	1988

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Recorded Cultural Resources in the Bull Shoals Lake Area

Today, the Bull Shoals Project is home to approximately 138 identified archeological sites made up of camp sites, shelter and cave sites, rock cairns, and earthen mound sites. A vast majority of these sites were submerged by impoundment of the White River. Less than five percent of the known sites within the lake area were investigated any further than documentation. Table 4.3 summarizes the previously recorded resources at Bull Shoals Lake.

Table 4.3 Previously Recorded Resources at Bull Shoals Lake

Type of Site	Number of Sites
Historic	4
Prehistoric	114
Multicomponent	20
Total	138
National Register Eligibility Status	
Not Evaluated	132
Not Eligible	5
Eligible	1

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4.7 Air Quality

Bull Shoals Lake is located in the Ozark Mountains, remote from heavy emission-producing industry or large mining operations. The air is clean with low levels of air emissions below local emission thresholds. There have been no violations of the current National Ambient Air Quality Standards (NAAQS) established by EPA. Air monitoring requirements are established by EPA and are dictated under their guidance and monitoring objectives. Monitoring sites are placed in areas believed to have higher concentration of pollutants, which generally consist of the state's larger metropolitan areas. These areas, called Metropolitan Statistical Areas (MSA's) are defined by the larger population centers and surrounding counties. Based on these guidelines, the Branson MSA has one air quality monitoring site, with ozone the only constituent being monitored. The ozone concentration is consistently below the 75 parts per billion (ppb) established by EPA for this pollutant.

4.8 Socio-Economic Resources

There are five counties that surround Bull Shoals Lake, three in Arkansas and two in Missouri. Table 4.4 provides a comparative summary of population trends within those five counties that are adjacent to the project area. The total population of those counties in 2010 was 156,467, with the 2013 population estimated at 148,368. The 2013 population represents a -5.45% decrease since 2010. During the same time period the United States of America had population increase of 2.33%.

Table 4.4 Population Trends

	Population 2013	Population 2010	Percent Change (2010-2013)
Boone County, AR	37,396	36,903	1.3%
Marion County, AR	16,430	16,653	-1.3%
Baxter County, AR	40,957	41,513	-1.3%
Ozark County, MO	9,560	9,723	-1.7%
Taney County, MO	53,575	51,675	3.7%
Total	148,368	156,467	0.70%
Data from www.census.gov			

Table 4.5 portrays selected housing characteristics related to number of units, median value, vacancy rate and size of household. In 2010 there were a total of 83,672 housing units within the surrounding counties according to the 2010 U.S. Census. Approximately 74% of the housing units are owner occupied, with the average household size being approximately 2.3 people per unit.

As indicated in Table 4-5 the median value of owner-occupied housing in 2010 was \$106,400.

1 **Table 4.5 Housing Characteristics, 2010**

	Total Housing Units	Percent Owner Occupied	Median Value (owner occupied)	Average Household Size (owner occupied)
Boone County, AR	16,831	72.6	106,400	2.43
Marion County, AR	9,354	79.5	92,700	2.34
Baxter County, AR	22,580	76.5	120,000	2.24
Ozark County, MO	5,652	79.1	89,900	2.35
Taney County, MO	29,255	63.2	129,100	2.45
Total	83,672	74.1	106,400	2.36
Data from www.census.gov				

2
3 Median household incomes from 2009-2013 was \$35,343 in the five counties surrounding Bull
4 Shoals Lake according to the U.S. Census American Community Survey. Almost 22% of the
5 population within those counties was considered to be below the poverty level in 2010
6 according to the 2010 U.S. Census (Table 4.6). The relative share of the population below the
7 poverty level for the project area is higher than for the State of Arkansas (19.7%), and the State
8 of Missouri (15.9%). Around 84% of the population from the counties surrounding the lake
9 have at least a high school diploma, and 15% have a bachelor’s degree or higher.

10
11 **Table 4.6 Income and Education, 2009-2013**

	Median Income	Persons Below Poverty Level (percent)	High School Graduates (percent)	Bachelors or Higher (percent)
Boone County, AR	38,506	21.2	85.4	15.4
Marion County, AR	34,494	21.4	83.6	12.9
Baxter County, AR	35,343	17.7	87.6	16.5
Ozark County, MO	32,078	25.2	82.8	12.5
Taney County, MO	38,461	19.9	84.7	18.6
Total	35,343	21.08	84.7	15.4
Data from www.census.gov				

12
13 According to the 2010 U.S. Census, 3.6% of the population within the project area consisted of
14 demographic minority populations in 2010 as compared to 20% for the State of Arkansas and
15 16% for the State of Missouri (Table 4.7).

16
17 **Table 4.7 Population by Race and Origin, 2010**

	White	Black	Other	Hispanic or Latino Origin
Boone County, AR	96.5	0.2	.03	1.8
Marion County, AR	95.9	0.2	2.2	1.7
Baxter County, MO	96.9	0.2	1.2	1.7
Ozark County, MO	97.4	0.1	1.2	1.3
Taney County, MO	93.6	0.9	0.7	4.8
Total	97.0	0.3	1.05	2.26
Data from www.census.gov				

1 4.9 Recreation Resources

2 The recreational resource of the Bull Shoals Lake is considered to be of great importance to this
3 Ozark Mountain region. Tourism and lake visitation is a major source of income for the counties
4 surrounding this lake. The Project offers many recreational activities such as swimming,
5 SCUBA diving, boating, water skiing, fishing, picnics, and camping, as well as hiking and
6 biking trails. There are 38 public recreation areas around Bull Shoals Lake. Nine campgrounds
7 and six access points on the lake are operated by the Corps of Engineers. In 2012, a district lead
8 Recreation Adjustment Plan evaluated all the parks on Bull Shoals Lake and for budgetary
9 reasons, leased the camping portion of Dam Site Park and Pontiac Park. In both cases, the boat
10 ramps continue to be operated and maintained by the Mountain Home Project Office. There are
11 twelve parks and ten access points operated by city, county, or state agencies, marinas, church
12 groups, or schools around the lake.

13
14 For a detailed description of the recreational resources, as well as visitation data at Bull Shoals
15 Lake, see Chapter 2 of the Bull Shoals Revised Master Plan.
16

17 4.9 Health and Safety

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19 Safety of project visitors and project staff are the highest priority in daily project operations.
20 Facilities and recreational areas are routinely evaluated to ensure sites are safe for visitor use.
21 Project staff conducts numerous water safety programs and public announcements to educate
22 children and project visitors about ways to be safe on the lake.
23

24 In coordination with the Missouri State Highway Patrol (MSHP), no wake zones are marked
25 with buoys. Park Rangers provide visitor assistance and work with county law enforcement
26 agencies to ensure public safety. Park Rangers, MSHP, and Arkansas Game and Fish
27 personnel provide water safety and enforcement patrols on the lake as their budgets allow.
28

29 4.10 Aesthetics

30
31 Management objectives include maintaining scenic vistas while limiting impacts that would
32 negatively affect aesthetics. Natural landscapes and views of undeveloped lands are an
33 important feature that enhances the recreational experience. The perimeter lands around Bull
34 Shoals Lake provide a natural setting that is aesthetically pleasing as well as buffering the lake
35 from development and negative impacts such as erosion and storm water runoff. However, there
36 are problems in maintaining these aesthetic qualities. Project resource staff is continually
37 investigating trespasses that include activities such as timber cutting and land destruction by
38 unauthorized off road vehicles. In addition, litter and illegal trash dumping both on project lands
39 and project waters are continual problems. Vandalism within recreation areas also occurs. Other
40 concerns that impact aesthetics are demands put upon project resources for uses such as road and
41 utility line corridors.

1

2 5.0 ENVIRONMENTAL CONSEQUENCES

3 Table 5.1 summarizes the resources that are likely to be affected by each of the alternatives for an
4 update of the Bull Shoals Shoreline Management Plan including the No Action alternative. A
5 detailed discussion of the potential impacts of each of the alternatives follows the synopsis
6 provided in the table.

7

8 From draft to final, the Preferred Alternative has remained basically unchanged. Under this
9 alternative, Limited Development Area allocated lands total 19.4 miles of shoreline; Restricted
10 Limited Development lands total 6.9 miles; Public Recreation Area lands encompass 52.6
11 shoreline miles; Protected Area lands allocation consists of 740.9 miles of shoreline, and
12 Prohibited lands make up 2.4 miles.

13

14 The increase in protected lands allocation is primarily in response to the public’s concerns for
15 maintaining the lake in its pristine condition, maintenance of existing good water quality, and
16 with limited development being allowed. Additional boat ramps and launch sites, especially
17 during high water events, were requested during the scoping process. Four high water ramps and
18 sites have been proposed at the following Corps parks: Dam Site, HWY 125, Buck Creek, and
19 Beaver Creek. In addition, High Density acreage was added back to the future use Elbow Park.
20 Slight boundary line adjustments were also made at Beaver Creek and the Blackwell Ferry Area.

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Table 5.1 Resource Impact with Implementation of Alternatives

Resource Category	Alternative 1 Conservative	Alternative 2 Sustainable Conservation- Preferred	Alternative 3 No Action
<p>Climate, Topography, Geology and Soils</p>	<p>The Conservative Alternative would be more protective than the No Action Alternative in terms of potential impacts on climate, topography, geology and soils due to a reduction in LDA and PRA shoreline allocations.</p>	<p>The Sustainable Conservation Alternative would have less potential impacts on climate, topography, geology and soils than the No Action Alternative due to a conversion of 69.2 miles of LDA Unsuitable lands to a Protected lands allocation. This would eliminate potential vegetation modification, allowing more oxygen production from undisturbed vegetation, and also more shading and temperature reduction along the shoreline of the lake.</p>	<p>The No Action Alternative is used as the base line for comparison with the other action alternatives. This alternative represents the current conditions that exist and the potential for additional development under the current regulations. There is no documentation of significant environmental concerns on climate, topography, geology and soils from current activities on and around the lake.</p>
<p>Aquatic Environment</p>	<p>The Conservative Alternative is similar to the No Action Alternative in terms of potential impacts to the hydrology and groundwater components of the aquatic environment, but water quality would be enhanced due to reduced potential for new development and a reduction in PRA shoreline lands allocation.</p>	<p>The Sustainable Conservation Alternative would result in some positive benefits to the hydrology and groundwater components of the aquatic environment due to having 90.1% of the shoreline allocated as Protected lands. Water quality improvements would likely occur due to reduced erosion from the natural wooded shoreline. This vegetation would also reduce runoff, thereby increasing groundwater recharge.</p>	<p>The hydrology and groundwater components of Bull Shoals Lake would not change from the existing condition due to the implementation of the No Action Alternative. Water quality may be minimally impacted due to a greater amount of boating activity due to the existing 139.4 miles of PRA lands and 17.8 miles of LDA lands.</p>

Resource Category	Alternative 1 Conservative	Alternative 2 Sustainable Conservation- Preferred	Alternative 3 No Action
Terrestrial Resources	Implementation of the Conservative Alternative would have a positive impact on terrestrial resources in comparison to the No Action Alternative. The reallocation of 69.2 miles of Unsuitable LDA and 86.6 miles of PRA to Protected lands result in preservation of most of the natural vegetation along the lake's shoreline.	The Sustainable Conservation Alternative would be similar to the Conservative Alternative, however 3.5 miles of additional LDA and a 10.3 mile reduction in Protected lands may result in minimal impacts to wildlife and vegetation due to the land conversion and potential for additional development.	Implementation of the No Action Alternative could potentially have a negative impact on terrestrial resources due to a potential for continued development, and the retention of 139.4 miles of PRA lands. Vegetation modification and damage would likely occur under this alternative.
Threatened & Endangered Species	The Conservative Alternative would likely have no significant on any listed Threatened, Endangered, or Protected Species. Two Species of State Concern, Red River and Common Mudpuppy, are located within 200 feet of LDA allocated lands in this alternative.	The Sustainable Conservation Alternative would likely offer positive benefits for species listed as Threatened, Endangered and Protected. Two Species of State Concern, Red River and Common Mudpuppy, are located within 200 feet of LDA allocated lands in this alternative.	The No Action Alternative would have no significant impact on any listed Threatened, Endangered or Protected species. Two Species of State Concern, Red River and Common Mudpuppy, are located within 200 feet of LDA allocated lands in this alternative.

Resource Category	Alternative 1 Conservative	Alternative 2 Sustainable Conservation- Preferred	Alternative 3 No Action
Archaeological & Historic Resources	Under the Conservative Alternative there is a reallocation of 69.2 miles of Unsuitable LDA therefore possibly less potential for impacts to cultural resources and historic properties. There are no identified cultural resource sites are located in any LDA allocated lands.	Under the Sustainable Conservation Alternative, the LDA lands allocation would increase by 1.9 shoreline miles, but no identified cultural resource sites are located in any LDA allocated lands.	Under the No Action Alternative there are 69.2 miles of Unsuitable LDA. There is one identified cultural resource site located in LDA allocated lands in this alternative.
Socio-economics	The Conservative Alternative would likely have minimal impact on the socio-economic situation in the counties surrounding Bull Shoals Lake since this alternative generally reflects how the lake is currently managed and operated.	The Sustainable Conservation could have some positive effect on the socio-economic situation in the counties surrounding Bull Shoals Lake due to the potential for future development in the 1.9 miles of additional Limited Development Area lands allocation.	The No Action Alternative would have some positive socioeconomic impacts in the counties surrounding Bull Shoals Lake due to the potential for future development in the existing 17.8 miles of LDA lands, and continued use of the 139.4 miles of lands currently allocated as PRA.
Recreation Resources	The Conservative Alternative would reduce the LDA shoreline miles by 1.9 miles, as compared to the No Action Alternative which could cause a potential decrease in recreational boating due to the reduction of potential slips. Other land based recreational activities may increase under this alternative. Continued utilization of marinas, parks and public launching ramps will occur under this alternative. Potential positive impacts on the recreation experience could occur due to reduced boating congestion.	The Sustainable Conservation Alternative would have some positive recreation impact as potential boat dock construction opportunities would be increased, due to an increase in Limited Development Area lands, and a 147 mile increase in Protected lands allocation would enhance hunting, hiking, and other terrestrial recreation opportunities.	The No Action Alternative could have some positive recreation impact as new docks and slips will continue to be placed in LDAs. Potential negative impacts on the recreation experience could occur due to oversaturation of boaters due to the additional impact from the 139.4 miles of shoreline allocated as Public Recreation Areas.

Resource Category	Alternative 1 Conservative	Alternative 2 Sustainable Conservation- Preferred	Alternative 3 No Action
Air Quality	Implementation of the Conservative Alternative would result in some reduction in negative air quality impacts as compared to the No Action Alternative due to a decrease in LDA and PRA lands allocation, thereby creating a potential decrease in future development and subsequent boating activity.	Implementation of the Sustainable Conservation Alternative would result in less potential impact to existing air quality compared to the No Action Alternative due to a decrease in Low Density acreage and thereby a decrease in future development.	Under the No Action Alternative, the air quality around the lake would remain the same as currently exists. There could be an increase in vehicular exhaust emissions due to localized development, and associated construction equipment. No violations of the current National Ambient Air Quality Standards (NAAQS) established by the EPA would be expected under this alternative.
Health and Safety	The Conservative Alternative would still allow potential shoreline development opportunities, with a potential to decrease boat congestion and water related accidents, due to reduced number of potential slips. Potential decrease in dock owner conflict due to a reduction in available LDA and PRA lands.	The Sustainable Conservation Alternative would be similar to Alternative 1 and allows potential shoreline development opportunities, with a potential to increase boat congestion and water related accidents, due to a potential increase of private slips, but potential impact is lessened by a reduction of PRA lands by 86.6 miles.	The No Action Alternative allows potential shoreline development opportunities, with a potential to increase boat congestion and water related accidents, due to a potential increase of slips.
Aesthetics	Under the Conservative Alternative, the wide panorama of Bull Shoals Lake and the nearby shore would continue to convey a sense of enormity of the lake, and the limited development would continue to promote the sense of a relatively pristine shoreline. The developed areas are, for the most part, shielded from the lake view, which preserves the view-scape of those recreating on the lake. With a decrease in mowing area, there would be more natural vegetation retained along the shoreline.	Under the Sustainable Conservation Alternative the unspoiled and untamed aesthetic of this landscape will not be significantly impacted. This alternative would maintain the area of pristine shoreline and preserve regions of boulders, bluffs, and mature forest flora that currently dominate views.	The No Action Alternative would allow more potential development, but not to a degree that would significantly impact the scenic beauty and/or aesthetics of the lake.

1

2 5.1 Climate

3 5.1.1 Conservative (Alternative 1)

4 The Conservative Alternative is more protective than the No Action Alternative in terms of
5 potential impacts on air and water temperature modification. A conversion of both LDA and
6 LDA Unsuitable lands to Protected lands would reduce the potential for development, which
7 reduces the potential impact on climate due to vegetation removal. This reallocation would
8 provide a better buffering effect which would result in storm water velocity reduction and act as
9 a filtering mechanism. This would help reduce erosion and sediment deposition in the lake.

10 5.1.2 Sustainable Conservation (Alternative 2)

11 There could be some potential impact to climate as a result of implementation of the Preferred
12 Alternative. While 19.4 miles of shoreline is allocated as LDA, with a potential for development
13 that could modify the vegetation component near the shoreline, the reduction of PRA by 86.6
14 miles and reallocation to Protected lands would preserve 90.1% of the shoreline in its natural
15 state. Greater temperature fluctuations generally occur when woody vegetation is removed from
16 an area so undisturbed vegetative cover typically reduces temperature fluctuations and results in
17 cooler near shore water temperatures due to shading. The potential impact could come from
18 development of lands in LDA, but are anticipated to be minimal.

19 5.1.3 No-Action (Alternative 3)

20 The No Action Alternative could have potential impacts on air and water temperatures due to
21 continued development, with its associated vegetation modification and removal. This
22 development activity could remove shoreline shading, causing air and water temperature
23 increases, and possible increases in storm water runoff velocity. This would increase the
24 potential for erosion and sediment deposition in the lake which could increase the turbidity of
25 the water, resulting in a possible slight increase in water temperature.

26 5.2 Topography, Geology and Soils

27 5.2.1 Conservative (Alternative 1)

28 The Conservative Alternative is more restrictive than the No Action Alternative in terms of
29 potential impacts to topography, geology and soils. There would be similar impacts on the
30 existing conditions regarding these features as those noted in the Conservative Alternative.
31 Sixteen miles of LDA would be retained in this alternative, providing some potential for
32 development, but 751.2 miles of shoreline are allocated to Protected lands, representing 91.3%
33 of total shoreline miles. These lands would provide a natural vegetated lake buffer area. This
34 vegetation helps to reduce storm water velocity and acts as a filtering mechanism. This would
35 help reduce erosion and sediment deposition in the lake.

36 5.2.2 Sustainable Conservation (Alternative 2)

37 The Sustainable Conservation Alternative may result in potential minimal impacts on
38 topography, geology, and soils due to vegetation modification resulting from additional dock
39 permits issued in LDA. This alternative adds 1.6 shoreline miles of LDA to the existing 17.8
40 miles in the No Action Alternative, representing an increase of 0.2 percent of total shoreline
41 miles. However this alternative will have less impact to topography, geology, and soils due to the
42 increased LDA mileage being located where there are existing docks. In this alternative there is a

1 potential decrease in vegetation modification areas due to the restriction of mowing distance as
2 compared to the No Action Alternative.

3 5.2.3 No Action (Alternative 3)

4 Soil erosion would persist due to development being allowed under this alternative. Issuance of
5 additional vegetation and dock permits requires soil disturbance, vegetation removal and
6 transforming pervious surfaces to impervious areas. This promotes erosion due to previous
7 unmodified vegetative areas being modified and increased runoff velocity after modification is
8 completed. The remaining pervious surfaces around these developed areas will become more
9 impervious due to increased foot traffic to boat docks, along with AAV permitted use to boat
10 docks.

11 5.3 Aquatic Environment

12 5.3.1 Hydrology and Groundwater

13 **5.3.1.1 Conservative (Alternative 1)**

14 The Conservative Alternative is different than the No Action Alternative in terms of potential
15 impacts to the hydrology and groundwater components of the aquatic environment. The
16 hydrology and groundwater conditions are generally a function of the watershed drainage and
17 existing geology of the area, but having only 6.4% of the shoreline allocated as PRA in the
18 Conservative Alternative, as compared to 16.9% in the No Action Alternative, would enhance
19 rainfall absorption and slow runoff velocity due to retention of Protected lands (91.3%)
20 shoreline vegetation.

21 **5.3.1.2 Sustainable Conservation (Alternative 2)**

22 The Sustainable Conservation Alternative is would have a positive impact on the hydrology
23 and groundwater components of the aquatic environment as compared to the No Action
24 Alternative. The PRA lands allocation has been reduced to 52.8 miles, representing 6.4% of
25 available shoreline, RLDA allocation contains 6.9 miles (0.8%), while Protected lands occupy
26 740.9 miles, representing 90.1% of shoreline. The natural vegetation in this allocation will
27 enhance hydrology and groundwater conditions and function.

28 **5.3.1.3 No Action (Alternative 3)**

29 The hydrology and groundwater components of Bull Shoals Lake would not change from the
30 existing condition due to the implementation of a No Action Alternative. The potential for
31 additional development under this alternative would have some effect on reducing percolation
32 through the soil layers due to ground cover removal, and potentially increasing storm water
33 velocity. Wetland areas are relatively limited within Bull Shoals Lake and throughout the
34 adjacent government property surrounding the lake and would not undergo any significant
35 change from existing conditions due to implementation of the No Action Alternative.

36 5.3.2 Water Quality

37 **5.3.2.1 Conservative (Alternative 1)**

38 Implementation of the Conservative Alternative may result in positive benefits to water quality due
39 to a reduction in both LDA and PRA lands, as well as the elimination and reallocation of 69.2
40 miles of LDA Unsuitable lands, as compared to the No Action Alternative. There is a
41 corresponding major increase in Protected lands, from 593.6 miles to 751.2 miles, which represents

1 a gain of 157.8 shoreline miles. These land reallocations would serve to limit development on
2 these lands, thereby reducing impacts to ground disturbance and subsequent increased erosion.
3 These factors would reduce erosion sedimentation and pollutants scoured from reduced impervious
4 surfaces, with additional benefits of retention of more shoreline vegetation, better fishery habitat,
5 increased water clarity and cooler water temperature conditions due to the decrease of turbidity and
6 sediment deposition.

7 **5.3.2.2 Sustainable Conservation (Alternative 2)**

8 The Sustainable Conservation alternative would reduce the PRA lands allocation by 86.6 miles
9 and reallocating 69.2 miles of LDA Unsuitable lands to Protected lands. While the LDA lands
10 allocation increases by 1.8 miles, providing some additional development potential in some
11 areas, the 740.9 shoreline miles of Protected lands (90.1%) will provide a positive effect on
12 lake water quality due to the rainwater filtering benefits from natural shoreline vegetation
13 buffer associated with this allocation.

14 **5.3.2.3 No Action (Alternative 3)**

15 Lake fluctuations, associated with power production and flood control procedures, result in
16 changes in the environment along the shoreline of the lake. Turbidity from heavy rainfall has a
17 temporary, adverse effect on Bull Shoals Lake. During these periods of increased runoff, urban
18 areas and other parts of the terrain, especially those that have had the protective vegetation
19 removed, contribute silt and other suspended particles to the tributaries. While implementation
20 of the No Action Alternative is relatively independent of the existing watershed drainage on the
21 lake water quality, potential continued development around the lake shoreline would exacerbate
22 existing water quality issues due to potential increased erosion, localized increases in turbidity
23 and increased sedimentation in the lake following storm events. Under the No Action
24 Alternative, PRA lands allocation would be 139.4 miles (16.9% of total available shoreline),
25 LDA lands would be 17.8 miles (2.2%), LDA Unsuitable lands include 69.2 miles (8.4%),
26 Protected lands total 593.6 miles (72.2%), while 2.6 miles, representing 0.3%, are allocated as
27 Prohibited lands. Based on the current allocations, the potential exists for continual degradation
28 of shoreline vegetation due to potential increased development and subsequent vegetation
29 removal and mowing activities. This would result in negative impacts to water quality due to
30 increased storm water velocity, scour and sedimentation.

31 **5.3.3 Fish Species and Habitat**

32 **5.3.2.1 Conservative (Alternative 1)**

33 Implementation of the Conservative Alternative would have a positive effect on the lake fishery
34 resource as compared to the No Action Alternative. There is a reduction in both LDA and PRA
35 lands, as well as the elimination and reallocation of 69.2 miles of LDA Unsuitable lands, as
36 compared to the No Action Alternative. There is a corresponding major increase in Protected
37 lands, from 593.6 miles to 751.2 miles, which represents a gain of 157.6 shoreline miles. These
38 land reallocations would serve to limit development on these lands, thereby reducing impacts to
39 ground disturbance and subsequent increased erosion. These factors would reduce erosion
40 sedimentation and pollutants scoured from reduced impervious surfaces, with additional benefits of
41 retention of more shoreline overhanging vegetation which provides cover for fish, increased water
42 clarity and cooler water temperature conditions due to the decrease of turbidity and sediment
43 deposition, and a reduction in storm flow velocity. These factors improve spawning habitat,
44 thereby potentially enhancing fish population dynamics in the lake.

1 **5.3.2.2 Sustainable Conservation (Alternative 2)**

2 The Sustainable Conservation Alternative is similar to the Conservative Alternative in terms of
3 potential positive benefits to the lake fishery. A comparison with the No Action Alternative
4 shows a reduction in both LDA and PRA lands, as well as the elimination and reallocation of 69.2
5 miles of LDA Unsuitable lands. In this alternative, 90.1% of the available shoreline miles would
6 be allocated as Protected lands, preserving a majority of the natural shoreline vegetation along
7 the shoreline. Similar to the positive effects discussed in the Conservative Alternative, this
8 alternative should have a beneficial effect on the fish and fish habitat of Bull Shoals Lake.

9 **5.3.2.3 No Action (Alternative 3)**

10 The fishery of Bull Shoals Lake may have potential minor impacts from the implementation of
11 the No Action Alternative. Under the No Action Alternative, PRA lands allocation would be
12 139.4 miles (16.9% of total available shoreline), LDA lands would be 17.8 miles (2.2%), LDA
13 Unsuitable lands include 69.2 miles (8.4%), Protected lands total 593.6 miles (72.2%), while 2.6
14 miles, representing 0.3%, are allocated as Prohibited lands. Based on the current allocations,
15 the potential exists for continual degradation of shoreline vegetation due to possible increased
16 development and subsequent vegetation removal and mowing activities. Development often
17 results in vegetation removal down to water's edge, which impacts shoreline stability, removes
18 fish cover provided by overhanging vegetation, tree trunks and roots, and exacerbates storm
19 water erosion and sedimentation. During the spring spawning season, this sedimentation has the
20 potential to disrupt spawning activity and productivity in the coves and lake arms where
21 spawning commonly occurs.

22 **5.4 Terrestrial Resources**

23 **5.4.1 Wildlife**

24 **5.4.1.1 Conservative (Alternative 1)**

25 Implementation of the Conservative Alternative would have a positive effect on terrestrial
26 resources, when compared to the No Action alternative. There is a reduction in both LDA and
27 PRA lands, as well as the elimination and reallocation of 69.2 miles of LDA Unsuitable lands, as
28 compared to the No Action Alternative. There is a corresponding major increase in Protected
29 lands, from 593.6 miles to 751.2 miles, which represents a gain of 157.6 shoreline miles. These
30 land reallocations would serve to limit development on these lands, thereby reducing impacts to
31 ground disturbance and subsequent increased vegetation modification. The increases in lands
32 allocated as Protected would provide additional protection for lakeside vegetation, and
33 preservation of habitat for wildlife and migratory bird species. The buffer of natural vegetation
34 that remains along the shoreline from this designated acreage would potentially enhance
35 migration and feeding activities for many species of wildlife.

36 **5.4.1.2 Sustainable Conservation (Alternative 2)**

37 The Sustainable Conservation Alternative is more similar to the Conservative Alternative than
38 the No Action Alternative in terms of potential effects to the terrestrial resources and land use
39 patterns. A proposed 1.6 mile increase in LDA lands would result in 19.4 miles (2.4%) of
40 available shoreline being potentially be available for development. This amount of LDA land
41 would likely have some, but still insignificant effect, on wildlife species and activity. In spite
42 of this increase in LDA lands allocation, the majority of natural shoreline vegetation (740.1
43 miles) would remain in the Protected lands allocation. Good habitat for wildlife would still be
44 abundant under this alternative.

1 **5.4.1.3 No Action (Alternative 3)**

2 The terrestrial resources of Bull Shoals Lake may have potential minor impacts from the
3 implementation of the No Action Alternative. Under the No Action Alternative, PRA lands
4 allocation would be 139.4 miles (16.9% of total available shoreline), LDA lands would be 17.8
5 miles (2.2%), LDA Unsuitable lands include 69.2 miles (8.4%), Protected lands total 593.6
6 miles (72.2%), while 2.4 miles, representing 0.3%, are allocated as Prohibited lands. Based on
7 the current allocations, the potential exists for continual degradation of shoreline vegetation due
8 to potential increased development and subsequent vegetation removal and mowing activities.
9 This would result in negative effects to wildlife due to potential removal of trees and understory
10 vegetation (with the highest potential in the LDA allocated lands), thus altering food sources
11 and migratory patterns of insects, birds and mammal species.

12 **5.4.2 Vegetation**

13 **5.4.2.1 Conservative (Alternative 1)**

14 Implementation of the Conservative Alternative would have a positive effect on the shore line
15 vegetation, when compared to the No Action alternative. There would be 15.9 miles (1.9%)
16 allocated to LDA, but a 86.6 mile reduction in PRA lands and a reallocation of 69.2 miles of
17 LDA Unsuitable lands to Protected lands (91.3% of available shoreline) will provide
18 additional protection for lakeside vegetation and subsequent preservation of habitat for wildlife
19 and migratory bird species. The buffer of natural vegetation that remains along the shoreline
20 from this designated acreage would enhance migration and feeding activities for many species of
21 wildlife, as well as mediate storm water velocity and scour.

22 **5.4.2.2 Sustainable Conservation (Alternative 2)**

23 The Sustainable Conservation alternative is more similar to the Conservative Alternative in
24 terms of potential effects to the lakeshore vegetation than that of the No Action Alternative. A
25 proposed 1.6 mile increase in LDA lands would result in 19.4 miles (2.4%) of available
26 shoreline being potentially be available for development. This amount of LDA land would
27 likely have some, but still insignificant effect, on the vegetation composition of the shoreline.
28 In spite of this increase in LDA lands allocation, the majority of natural shoreline vegetation
29 (740.1 miles) would remain in the Protected lands allocation. Good habitat for wildlife, due to
30 the 90.1% of naturally vegetated shoreline, would still be abundant under this alternative.

31 **5.4.2.3 No Action (Alternative 3)**

32 The No Action Alternative is used as the base line for comparison with the other action
33 alternatives. This alternative represents the current conditions that exist. Currently 17.8 miles of
34 shoreline (2.2percent) is allocated for LDA uses, which may include additional development
35 and vegetation modification. Continuous issuing of vegetation permits will have a minor
36 negative impact on the existing vegetation resources. Based on this, the potential exists for
37 continued degradation of shoreline vegetation due to increased development and subsequent
38 vegetation removal and mowing activities. Unsuitable LDA (69.2 miles) may eventually
39 become potentially developable, resulting in 10.8% of the shoreline acreage subject to possible
40 increased or new development. This would result in potential negative effects to the natural
41 shoreline vegetation composition due to potential removal of trees and understory vegetation,
42 thus possibly altering food sources and migratory patterns of insects, birds and mammal species,
43 as well as increasing a potential for increased storm water erosion effects.

1 5.5 Threatened and Endangered Species

2 5.5.1 Conservative (Alternative 1)

3 Of the species listed in Table 4.1 of Section 4.0, AFFECTED ENVIRONMENT, no
4 Threatened, Endangered or Protected species will be negatively impacted by this alternative, but
5 two state species of concern could be potentially affected by implementation of the
6 Conservative Alternative. The Red River Mudpuppy *Necturus maculosus louisianensis* and
7 the Common Mudpuppy *Necturus maculosus maculosus* are located in within 200 feet of two
8 LDA areas. Potential development could occur in this land allocation that might have a
9 potential impact on the habitat of these two species of mudpuppy. Due to the reallocation of
10 69.2 miles of LDA Unsuitable lands and 86.6 miles of PRA lands to Protected lands, there may
11 be potential positive benefits to any or all the listed species, and possibly other yet undiscovered
12 species that may exist in the area.

13 5.5.2 Sustainable Conservation (Alternative 2)

14 Similar to Alternative 2, the Sustainable Conservation Alternative would likely have little to no
15 effects on any listed Threatened, Endangered or Protected species based on the proposed
16 reduction of potentially developable shoreline mileage from the amount listed in the No Action
17 Alternative. Two state species of concern could be potentially affected by implementation of
18 the Sustainable Conservation Alternative. The Red River Mudpuppy *Necturus maculosus*
19 *louisianensis* and the Common Mudpuppy *Necturus maculosus maculosus* are located in within
20 200 feet of two LDA areas. Potential development could occur in this land allocation that might
21 have a potential impact on the habitat of these two species of mudpuppy. Due to the
22 reallocation of 69.2 miles of LDA Unsuitable lands and 86.6 miles of PRA lands to Protected
23 lands, there may be potential positive benefits to any or all the listed species, and possibly other
24 yet undiscovered species that may exist in the area.

25 5.5.3 No Action (Alternative 3)

26 Of the Of the species listed in Table 4.1 of Section 4.0, AFFECTED ENVIRONMENT, no
27 Threatened, Endangered or Protected species will be negatively impacted by this alternative, but
28 two state species of concern could be potentially affected by implementation of the No Action
29 Alternative. The Red River Mudpuppy *Necturus maculosus louisianensis* and the Common
30 Mudpuppy *Necturus maculosus maculosus* are located in within 200 feet of two LDA areas.
31 Potential development could occur in this land allocation that might have a potential impact on
32 the habitat of these two species of mudpuppy.

33 5.6 Archaeological and Historic Resources

34 5.6.1 Conservative (Alternative 1)

35 Under the Conservative Alternative, there have been no cultural resource sites identified in
36 any LDA lands allocation. Any new ground disturbing activities on USACE lands that has
37 the potential to impact a cultural resource site would require a survey to be completed prior
38 to commencement of the activity. Through the site review process prior to issuance of a
39 permit or any federal action, unknown sites would be identified, and known sites would be
40 evaluated for their significance and eligibility for the National Register of Historic Places
41 pursuant to 36 CFR Part 800 of the National Historic Preservation Act. Potential mitigation
42 for impact to cultural or historic sites could be a requirement for a cultural or historic
43 resource site evaluation. If evaluation of site identifies a cultural or historic resource,
44 avoidance of the action would be recommended.

45

1 5.6.2 Sustainable Conservation (Alternative 2)

2 Under the Sustainable Conservation Alternative, there have been no cultural resource sites
3 identified in any LDA lands allocation. Any new ground disturbing activities on USACE
4 lands that has the potential to impact a cultural resource site would require a survey to be
5 completed prior to commencement of the activity. Through the site review process prior to
6 issuance of a permit or any federal action, unknown sites would be identified, and known
7 sites would be evaluated for their significance and eligibility for the National Register of
8 Historic Places pursuant to 36 CFR Part 800 of the National Historic Preservation Act.
9 Potential mitigation for impact to cultural or historic sites could be a requirement for a
10 cultural or historic resource site evaluation. If evaluation of site identifies a cultural or
11 historic resource, avoidance of the action would be recommended.

12 5.6.3 No Action (Alternative 3)

13 Under the No-Action Alternative there would be one cultural resource site located within an
14 existing LDA tract. Any new ground disturbing activities on USACE lands that has the
15 potential to impact a cultural resource site would require a survey to be completed prior to
16 commencement of the activity. Through the site review process prior to issuance of a permit
17 or any federal action, unknown sites would be identified, and known sites would be
18 evaluated for their significance and eligibility for the National Register of Historic Places
19 pursuant to 36 CFR Part 800 of the National Historic Preservation Act. Potential mitigation
20 for impact to cultural or historic sites could be a requirement for a cultural or historic
21 resource site evaluation. If evaluation of site identifies a cultural or historic resource,
22 avoidance of the action would be recommended.

23 5.7 Socio-Economic Resources

24 5.7.1 Conservative (Alternative 1)

25 The modified Conservative Alternative would likely have less of a positive effect on the socio-
26 economic situation in the counties surrounding Bull Shoals Lake than the No Action Alternative.
27 Population would be expected to stay the same or decline slightly due to the decreased LDA
28 shoreline miles from 17.8 to 15.9. Total housing units may stay the same or decrease due to the
29 potential decreased availability of recreation at the lake, but it is unlikely that housing values
30 would change as a result of the alternative. The economy of the area would likely stay the same
31 or have a slight decline if this alternative is implemented.

32 5.7.2 Sustainable Conservation (Alternative 2)

33 The Sustainable Conservation Alternative would result in a similar socio-economic situation as
34 Alternative 2, but possibly would have less of a positive effect as compared to the No Action
35 Alternative due to reallocation of 86.5 miles of PRA lands to Protected lands. LDA lands are
36 increased by 1.6 miles over the No Action Alternative, providing a potential for some additional
37 docks on the lake. The economy in the area could possibly grow slightly due to a potential
38 increased opportunity for recreation, both on the water and on the 740.9 miles of Protected
39 shoreline miles.
40

41 5.7.3 No Action (Alternative 3)

42 The No Action Alternative may have the most effect on the socio-economic situation in the
43 counties surrounding Bull Shoals Lake due to the fact that 19.1% of the available shoreline miles
44 are allocated as LDA and PRA lands. While the potential for some development exists around
45 the lake, current population growth and the demographic makeup of the population are expected

1 to remain similar to the current rates and percentages the area experiences now. Housing units
2 and their values would not be affected if the No Action alternative is implemented. It is likely
3 that changes in the socio-economic conditions of the Bull Shoals area would be the result of
4 outside influences, and not those created by the No Action alternative.

5 5.8 Recreation Resources

6 5.8.1 Conservative (Alternative 1)

7 Under the Conservative Alternative, LDA lands are reduced to 15.9 shoreline miles,
8 representing 1.9%, PRA lands occupy 52.9 miles (6.4%) and Protected lands include 751.2
9 miles, representing 91.3% of the shoreline. The reduction in PRA lands and increase in
10 Protected lands tend to favor fishing, hunting and wildlife viewing as the dominant recreational
11 activities on the lake. The proposed increase in Protected lands would provide an opportunity
12 for enhancement of forging partnerships between public and private entities for recreational and
13 wildlife conservation opportunities. The retention of a major percentage of the natural shoreline
14 vegetation would lead to improved water quality, due to the buffering and filtering capability of
15 this vegetation.

16 5.8.2 Sustainable Conservation (Alternative 2)

17 The Sustainable Conservation Alternative would not deviate significantly from the Conservative
18 Alternative in terms of provision of recreational opportunities on the lake. The 740.9 miles of
19 shoreline that would be reallocated to Protected lands from PRA and Unsuitable LDA lands,
20 and the addition of 1.6 miles and 6.9 miles of LDA and RLDA, respectively, in this alternative
21 would allow for the potential to have additional private boat docks for fishing and lake access,
22 as well as the potential to develop nature trails and wildlife viewing areas, thus potentially
23 increasing recreational traffic along Bull Shoals and its adjacent lands.

24 5.8.3 No Action (Alternative 3)

25 Provision of recreational facilities and services would continue at Bull Shoals Lake without an
26 update to the Bull Shoals Lake Shoreline Management Plan. However, the plan by which the
27 Resource Manager and staff operate would not accurately reflect the current status of project
28 facilities. Nor would there be additional measures in place, such as trail corridors and
29 additional land use designations, to better accommodate recreational needs while protecting
30 the natural resources. Currently, there are several boat docks outside of areas currently zoned
31 for them and under the No Action Alternative. The preferred alternative would correct these
32 situations, as well as a reallocation of 69.2 miles of Unsuitable LDA lands.
33

34 5.9 Air Quality

35 5.9.1 Conservative (Alternative 1)

36 Implementation of the Conservative Alternative would also result in no change in air
37 quality impacts as noted under the No Action Alternative. Since this alternative would
38 incorporate more shoreline mileage into the Protected lands allocation, there would likely
39 be a reduction in potential development, local vehicular exhaust emissions, and
40 construction equipment activity, which would avoid or reduce potential impacts on
41 localized air quality. No violations of the current NAAQS established by EPA would be
42 expected as a result of the implementation of this alternative.

1 5.9.2 Sustainable Conservation (Alternative 2)

2 Mirroring the Conservative Alternative, the Sustainable Conservation Alternative would result
3 in fewer air quality effects as compared to the No Action Alternative. This alternative would
4 reallocate less LDA lands to Protected lands than Alternative 2, but having 90.1% of the
5 shoreline in an undevelopable state will enhance existing air quality around the lake. No
6 violations of the current NAAQS established by EPA would be expected as a result of the
7 implementation of this alternative.

8 5.9.3 No Action (Alternative 3)

9 Under the No Action alternative, the air quality around the lake would remain the same as
10 currently exists. There would likely be increases in vehicular exhaust emissions due to
11 localized development, and the associated construction equipment and traffic in the area.
12 However, no violations of the current National Ambient Air Quality Standards (NAAQS)
13 established by EPA would be expected as a result of the implementation of this alternative.

14 5.10 Health & Safety

15 5.10.1 Conservative (Alternative 1)

16 The recreational opportunities, balanced with conservation of natural environment could lead
17 to better health, both mental and physical, of the visiting population. Implementation of the
18 Conservative Alternative would likely result in reduced traffic congestion on the water, and a
19 lower potential for water related incidents. The increase in Protected lands could potentially
20 increase exposure to insects and animals, which is generally understood by the public who
21 utilize these lands.

22 5.10.2 Sustainable Conservation (Alternative 2)

23 The Sustainable Conservation Alternative could also create a potential for additional boat docks
24 being built due to an LDA allocation of 19.4 miles, compared to the 17.8 miles of the No Action
25 Alternative. This alternative would potentially result in a small increase of traffic congestion
26 on the water, thus water related incidents could potentially become an issue under this
27 alternative, but to a lesser potential in comparison to the No Action Alternative. Again, the
28 increase in Protected lands, from 593.3 shoreline miles to 740.9 miles, could potentially
29 increase exposure to insects and animals during land based recreational activities, which is
30 generally understood by the public who utilize these lands.

31 5.10.3 No Action (Alternative 3)

32 Safety of project visitors and project staff are highest priority in daily project operations.
33 The No Action Alternative would have 27.5% of available shoreline miles allocated for LDA,
34 Unsuitable LDA, and PRA lands, would allow for the highest potential for a reduction in lake
35 water quality, as described in Section 5.3.2. There could potentially be an increase in boat
36 traffic on the lake and a possible increase in congestion, creating additional safety issues. The
37 lake could experience increased user conflict, for example, boats vs. personal watercrafts.
38 Under the No Action Alternative, populations who recreate at the lake could be exposed to
39 greater health risks associated with impaired water quality, such as *E. coli*, and potential
40 hazardous run off due to the overall potential for increased recreation at the lake.

41 5.11 Aesthetics

42 5.11.1 Conservative (Alternative 1)

43 The wide panorama of Bull Shoals Lake and the nearby shore conveys a sense of enormity to

1 the lake, and the conversion of 751.2 of the 822.4 total shoreline miles to Protected lands
2 allocation would continue to preserve the sense of relatively pristine shoreline. The natural
3 vegetation along the shoreline would enhance the views of the people recreating on the
4 lake, while potentially impeding the view of the lake from the shore. Under this alternative,
5 property owners could work with Corps staff to determine the appropriate vegetation
6 management measures for their specific property location adjacent to the shoreline of the lake.
7

8 5.11.2 Sustainable Conservation (Alternative 2)

9 Similar to Alternative 2, the conversion of 740.9 of the 822.4 total shoreline miles to Protected
10 lands allocation would continue to preserve the sense of relatively pristine shoreline, while still
11 allowing some limited development around the lake. The natural vegetation along the shoreline
12 would enhance the views of the people recreating on the lake, while potentially impeding
13 the view of the lake from the shore. Public Recreation Area lands have been reduced by 86.6
14 miles, thereby allowing more natural shoreline vegetation to remain in an unaltered state.

15 5.11.3 No Action (Alternative 3)

16 Aesthetics is an important feature that enhances the recreational experience. Lands around Bull
17 Shoals Lake provide a natural setting that is aesthetically pleasing as well as buffering the lake
18 from views of development and clearings. Under the No-Action Alternative the visual character
19 of the landscape would slowly change due to potential continued development increasing the
20 amount of land with views of development and human structures. This would increase the
21 amount of visual contrast between the natural and developed landscapes around the lake.
22 Visual contrast is a measure of impact on visual quality and aesthetics. Dock development
23 would eliminate the unspoiled and untamed aesthetic of this landscape. Road and utility line
24 corridors also impact aesthetics and visual resources at Bull Shoals. In many instances, requests
25 for new shoreline use permits are in areas where the natural vegetation and landscape would be
26 disturbed.

27 5.12 Cumulative Impacts

28 Cumulative impacts are those that may result from the incremental impact of the evaluated
29 alternatives added to those of other past, present, or reasonably foreseeable future actions in the
30 local area. The Shoreline Management Plan for Bull Shoals Lake was last approved in 2001.
31 During the time that has elapsed since then, public use patterns have remained similar, but
32 trends, facility and service demands have shifted due to the need for alternative experiences in
33 recreation and tourism. Visitation to the lake has decreased from 2000 to 2010; however, the
34 demand for high quality recreational experiences remain. Bull Shoals Lake receives pressure
35 for both private shoreline and public recreation use, resulting in management concerns
36 regarding the overall sustainability of the lake. With public use at project facilities changing,
37 reallocations of services at these facilities need to be addressed. Changes involving recreation
38 area closures and improvements have occurred during the last two decades to meet the evolving
39 public use. In addition, cooperative agreements are being considered in order to operate and
40 maintain facilities, which would reduce the financial burden on the tax payers.

41
42 Two main themes came out of the scoping process, which was an exercise involving
43 private and public entities, and local, state and federal agencies—improved water quality
44 and maintenance of the environmental setting around the lake. Preservation of the natural
45 shoreline and lack of extensive development has enhanced and maintained good water

1 quality since the lake was constructed. The Arkansas Department of Environmental
2 Quality has classified Bull Shoals Lake as an Extraordinary Resource Water and the
3 Missouri Department of Natural Resources has designated it as a Class A waterbody.
4 Existing conditions at the lake allow for some continued development around the lake, but
5 it should be noted that reallocation of lands under the Preferred Alternative would enhance
6 water quality by reducing available LDA and PRA shoreline miles and converting 69.2
7 miles of Unsuitable LDA lands to the Protected lands allocation, thereby retaining more of
8 the natural shoreline vegetation. Approximately 90.1% of the linear shoreline would have a
9 natural vegetated shoreline due to these land reallocations identified in the Preferred
10 Alternative. There would be insignificant impacts to climate, topography, geology and
11 soils under this alternative. The aquatic environment of the lake should benefit from a
12 potential reduction in storm water runoff velocity, reduced sedimentation, improved water
13 quality, and a cleaner substrate for macroinvertebrate production and fish spawning
14 activity. This alternative would also enhance wildlife foraging and movement patterns,
15 offer more protection for threatened and endangered species that inhabit the area, and result
16 in minimal impacts to cultural resources. A provision for additional potential development
17 opportunities coupled with an abundance of lands remaining in their natural condition
18 would balance and enhance recreational experiences, which would potentially stimulate the
19 socio-economics of the area. This balanced approach should provide a safe and
20 aesthetically pleasing recreational experience for the public that visits and/or lives at Bull
21 Shoals Lake.

22
23 Continued collaboration and coordination with state and federal resource agencies, as well
24 as local agencies and watershed groups, is necessary to monitor, evaluate and remediate
25 aging infrastructure, failing septic systems around the shoreline, and potential water quality
26 impacts. Coordination with these entities could also evaluate and promote watershed
27 enhancement programs that would serve to institute stream bank stabilization, land
28 improvement and conservation programs, and implementation of best management
29 practices to reduce watershed runoff and erosion.

30
31 As management of Bull Shoals Lake ensues, the Corps would continue to coordinate with
32 Federal, State, and local agencies to avoid, minimize or mitigate potential impacts.
33
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38

1 6.0 ENVIRONMENTAL COMPLIANCE

2
3 Compliance with Federal Acts and Executive Orders are summarized in the following table.

4
5 **Table 6: Federal Act/Executive Order Compliance**

6

Act/Executive Order	Status	Compliance
Wetlands (EO 11990)	No effect	C
Prime/Unique Farmlands	N/A	N/A
Floodplain Management (EO 11988)	N/A	N/A
Clean Water Act		C
Section 404	No effect	N/A
Section 401	No effect	N/A
NPDES	No effect	N/A
Fish and Wildlife Coordination Act	No effect	C
Endangered Species Act	No effect	C
National Historic Preservation Act	No effect	C
Environmental Justice (EO 12898)	No effect	C
Clean Air Act	No effect	C
Comprehensive Environmental Response Compensation and Liability Act (CERCLA)	N/A	N/A
Resource Conservation and Recovery Act (RCRA)	N/A	N/A
Wild and Scenic Rivers Act	N/A	N/A
Rivers and Harbors Act	N/A	N/A
N/A—not applicable C—Compliant		

7
8 6.1 Fish and Wildlife Coordination Act

9 The Corps is required to coordinate with the USFWS and MDNR under the Fish and Wildlife
10 Coordination Act (FWCA) (48 Stat. 401, as amended; 16 USC 661 et. seq.).
11 Coordination was initiated with a scoping notice; no concerns were raised by these
12 agencies. Review of the Environmental Assessment will be completed during the
13 draft release.
14

15 6.2 Endangered Species Act

16 The Endangered Species Act (ESA) requires the determination of possible effects on species or
17 degradation of habitat critical to Federally-listed endangered or threatened species.
18 Implementation of an updated Shoreline Management Plan is not likely to affect
19 threatened or endangered species. Individual requests for use of project lands would be
20 evaluated to ensure compliance with this Act.
21

22 6.3 Environmental Justice

23 Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority*
24 *Populations and Low Income Populations* requires Federal agencies to promote
25 “nondiscrimination in Federal programs substantially affecting human health and

1 environment". In response to this directive, Federal Agencies must identify and
2 address a disproportionately high and adverse human health and environmental
3 effects of their programs, policies, and activities on minority and low-income
4 populations. The final step in the environmental justice evaluation process is to
5 evaluate the impact of the project on the population and to ascertain whether
6 target populations are affected more adversely than other residents.

7
8 Implementing the Shoreline Management Plan Revision would not disproportionately affect
9 minority or low-income populations.
10

11 6.4 Cultural Resource Requirement

12 Section 106 of the National Historic Preservation Act of 1966 requires the Corps to identify
13 historic properties affected by the Preferred Alternative and to evaluate the eligibility of those
14 properties for the National Register of Historic Places. Section 110 of the Act requires the Corps
15 to assume responsibility for the preservation of historic properties in its ownership. The Act
16 also requires Federal agencies to provide the Advisory Council on Historic Preservation an
17 opportunity to comment on undertakings through the process outlined in the Council's
18 regulations (36 CFR 800).

19
20 There would be no effect on cultural resources with implementation of an updated Shoreline
21 Management Plan. Individual requests for use of project lands would be evaluated on a case-
22 by-case basis to ensure compliance with this act.
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1 7.0 SCOPING AND PUBLIC REVIEW AND COMMENT PERIODS

2 7.1. Introduction

3
4 No single agency has complete oversight of stewardship activities on the public lands and waters
5 surrounding Bull Shoals Lake. Responsibility for natural resource and recreation management
6 falls to several agencies that own or have jurisdiction over these public lands and waters.

7
8 Increasingly, competition for the use of these lands and waters and their natural resources can
9 create conflicts and concerns among stakeholders. The need to coordinate a cooperative
10 approach to protect and sustain these resources is compelling. Many opportunities exist to
11 increase the effectiveness of Federal programs through collaboration among agencies and to
12 facilitate the process of partnering between government and non-government agencies.

13 To sustain healthy and productive public lands and water with the most efficient approach
14 requires individuals and organizations to recognize their unique ability to contribute to
15 commonly held goals. The key to progress is building on the strengths of each sector, achieving
16 goals collectively that could not be reasonably achieved individually. Given the inter-
17 jurisdictional nature of Bull Shoals Lake, partnering opportunities exist and can promote the
18 leveraging of limited financial and human resources. Partnering and identification of innovative
19 approaches to deliver justified levels of service defuse polarization among interest groups, and
20 lead to a common understanding and appreciation of individual roles, priorities, and
21 responsibilities.

22
23 To the extent practical, this Shoreline Management Plan and a proactive approach to partnering
24 will position Bull Shoals Lake to aggressively leverage project financial capability and human
25 resources in order to identify and satisfy customer expectations, project and sustain natural and
26 cultural resources and recreational infrastructure, and programmatically bring Corps
27 management efforts and outputs up to a justified level of service. Public involvement and
28 extensive coordination within the Corps of Engineers and with other affected agencies and
29 organizations is a critical feature required in developing or revising a Project Shoreline
30 Management Plan.

31
32 Agency and public involvement and coordination has been a key element in every phase of the
33 Bull Shoals Lake Shoreline Management Plan revision.

34 7.2. Scoping

35
36 One agency workshop and five public scoping workshops were held in August 8-12, 2016, with
37 221 people in attendance. The public scoping comment period was held from August 1, 2016 to
38 September 2, 2016, which provided a 33-day comment period. All interested people were
39 provided opportunities to submit written comments at the three open houses as well as via email,
40 fax, or mail. The comment cards distributed at the public open houses were designed to facilitate
41 return of written comments either at the open house or via mail later during the public comment
42 period. Editable comment forms were available on the Bull Shoals Lake SMP webpage and
43 could be directly submitted upon completion. Email comments could be sent to a project-specific

1 email address, which was included on the SMP webpage as well as on all of the notice materials
2 distributed. Many open house participants took multiple comment cards to distribute to friends
3 and family who were not able to attend an open house in person. In total, approximately 68
4 comment submittals (letters, emails, comment cards, or oral comments made to a court reporter)
5 were received from members of the public and five comment submittals from agencies were
6 received by the end of the comment period.
7

8 To prepare for the scoping workshops, the Corps contracted with CDM-Smith. From the
9 scoping process, a Scoping Report was finalized in January 2017. The report summarizes the
10 public participation process for, and the public comments resulting from, the Bull Shoals Lake
11 SMP Revision public scoping workshops and comment period. “Scoping” is the process of
12 determining the scope, focus, and content of a NEPA document. Scoping workshops are a useful
13 tool to obtain information from the public and governmental agencies. For a planning process
14 such as the SMP revision, the scoping process was also used as an opportunity to get input from
15 the public and agencies about the vision for the SMP update and the issues that the SMP should
16 address where possible. The Scoping Report is located in Appendix B, Summary of Public
17 Comments.

18 7.3. Draft Shoreline Management Plan/Draft Environmental Assessment

19
20 Currently scheduled for release February 2018 with public workshops scheduled for
21 February/March 2018.
22

23 7.4. Final Shoreline Management Plan/Final Environmental Assessment

24
25 Currently scheduled for summer 2018 with public workshops immediately following to present
26 the final SMP and final EA.
27
28

1 8.0 CONCLUSIONS

2
3 The Shoreline Management Plan for Bull Shoals Lake was last approved in 2001. During this
4 time, public use patterns and trends have changed. With population growth in southwestern
5 Missouri and northwestern Arkansas increasing tremendously, Bull Shoals Lake receives
6 constant pressure for both private shoreline use and public recreation use.

7
8 The Shoreline Management Plan is not intended to address the specifics of regional water
9 quality or water level management; these areas are covered in a project’s water management
10 plan. However, specific issues identified through the Shoreline Management Plan revision
11 process can still be communicated and coordinated with the appropriate internal Corps
12 resource (i.e., operations for shoreline management) or external resource agency (Arkansas
13 Department of Environmental Quality and Missouri Department of Natural Resources for
14 water quality, Arkansas Game and Fish Commission and Missouri Department of
15 Conservation on land and fisheries management, AGFC and Missouri State Highway Patrol
16 for boater safety) responsible for that specific area. To facilitate this action, the current
17 Shoreline Management Plan development evaluated three alternatives relative to their
18 potential impacts on the land and water resources of Bull Shoals Lake.

19
20 These alternatives spanned the gamut of increased shoreline protection to increased shoreline
21 development and the potential effects on the human, terrestrial, and aquatic environment
22 from their implementation. The No Action Alternative looked at leaving the lake as it
23 currently exists in terms of developable areas and protected areas. Of the 822.4 miles of
24 shoreline available land around the lake, 27.5 percent of this mileage is allocated as LDA,
25 Unsuitable LDA or PRA lands, with a potential for allowing public facilities expansion and
26 more intensive development, including structures such as community docks.

27
28 The action alternatives included a Conservative Alternative, and a Sustainable Conservation
29 Alternative. The Conservative Alternative would increase the protected shoreline distance by
30 19.2 percent, which represents 751.2 of the 822.4 total shoreline miles. Existing docks and
31 vegetation modification permits would remain on the lake as long as compliance with permit
32 conditions is maintained. An increase of LDA by 1.6 miles (0.2 percent) would occur from the
33 Sustainable Conservation Alternative, with an increase of 147.2 miles (90.1%) of protected
34 shoreline. Although there is an increase in LDA compared to existing conditions, this
35 alternative reallocates 69.2 miles of Unsuitable LDA, and 86.6 miles of PRA lands to the
36 Protected lands allocation. This has the potential to slow development and reduce potential
37 localized boat congestion.

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Appendix A: Public Comments

Part 1: Scoping Report

Part 2: Draft Release Public Comment

Appendix B: Local, State, and Federal Agency Coordination Letters

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Part 1: Agency Scoping Letters

Part 2: Draft Release Public Comment

Appendix C: Alternative Maps