

Appendix C

STATEMENT OF FINDING FOR FLOOD PLAIN ANALYSIS
FOR IMPROVEMENTS TO VISITOR FACILITIES PROJECTS

August 28, 2010

INTRODUCTION

Proposed Actions

Buffalo National River (BNR) proposes to improve vehicle and pedestrian access to the river at Rush and Hasty launch areas, provide parking space at the Spring Creek Trailhead, and improvements to the Lost Valley Trail for hiker safety and to ensure compliance with standards set by the Americans with Disabilities Act (ADA).

Specifically, at Rush launch area, trees and brush would be cleared along the side of the ramp exit road and a pedestrian trail would be constructed up the hill so that foot and vehicular traffic would not have to use the same roadway. Drainage culverts would be installed at the top and bottom of the ramp exit road. The road along the river that leads to Clabber Creek and the Bowman Tract past Rush launch area would be widened where needed to allow for proper traffic flow and a turnaround would be constructed approximately 75 to 100 yards down the road using the existing power line right of way. This would allow vehicles waiting to use the landing to line up in a location that does not block traffic coming into and leaving the landing area. The power line to the Bowman Tract would be removed and additional parking spaces for concessionaire buses would be created in the abandoned right-of-way. The original footprint of the existing parking lot would be restored and stockpiled gravel relocated offsite in a BNR storage area.

The Buffalo River Trail intercepts Spring Creek Road [Searcy County Road (Searcy CR 99)] just inside the Buffalo National River boundary. Hikers use this location as an access point for the trail. NPS proposes to construct a parking area that would accommodate up to four vehicles adjacent to the road just inside the boundary, to alleviate hikers parking along Searcy County Road 99/Spring Creek Road.

At Hasty launch area a canoe walkway would be constructed to alleviate social trailing, which would in turn reduce bank destabilization at the launch site. Area of social trailing would be restored and devices would be installed to direct foot traffic down canoe walkway. Two large trees in the parking area would be removed to improve vehicle maneuvering and increase parking space. The parking area would be slightly expanded and re-graded to improve control of stormwater runoff. A modern bathroom facility with better ventilation would be installed slightly uphill from the existing facility, out of the floodplain, and a pedestrian trail would be constructed in the woods beside the entrance road to facilitate easy access without impeding vehicular traffic coming into and out of the landing area.

At Lost Valley, the park proposes to update the 1st 0.25 mile of the trail and the amphitheater to meet modern ADA standards as well as extend the ADA portion of the existing trail up to another 0.4 mile where existing social trails have been created to view Clark Creek at a prominent stone fissure. These improvements may also include the use of other social trails leading to Clark Creek, including on the passes an old, hollow-out beech tree. Aside from improvements to meet ADA standards, additional benches would be added for visitor rest and reflection. The existing ADA portion of the trail has inadequate drainage crossings and numerous safety hazards. Safety hazards

include rock slides, sloping and uneven footing, exposed tree roots, loose, broken and missing native stone steps, and deteriorated rock retaining walls. The park also proposes to complete upgrades to the remaining trail which leads up to the Natural Bridge, past Eden Falls to Eden Falls Cave and the loop back to the main trail. This portion of the trail system would be improved and stabilized. Stone steps would be secured and trip hazards such as rocks and roots would be removed and water bars would be installed. Drainage crossings would be improved by the use of buried pipes or stone culverts. A handhold would be installed at the cave entrance to reduce the number of accidents that occur each year when visitors slip and fall down the steep slope below the cave entrance.

Both the proposed improvements to Lost Valley Trail and the construction of a parking lot at Spring Creek Trailhead are located outside of the 100 year floodplain for the Buffalo River and will therefore not be further analyzed.

At Hasty launch area, the proposed projects that would occur within the flood prone area (USGS 1975a) include the parking lot, canoe walkway and one of the possible restroom sites. At Rush launch area, the proposed pedestrian walkway, road improvements and turn-around would all occur within the flood prone area (USGS 1975b).

The current and proposed future construction footprint of each structure is as follows:

	Current Size in Square Feet	Proposed Size in Square Feet
Restroom Facility at Hasty	240	750
Parking Lot Improvements at Hasty	37500	40300
Canoe Walkway at Hasty	1800	2250
Parking Lot Improvements at Rush	8200	10600
Pedestrian Walkway at Rush	0	4050
Road Improvements and Turn-Around at Rush	0	19800
Additional Restroom Facility at Rush	0	750

HASTY LAUNCH SITE

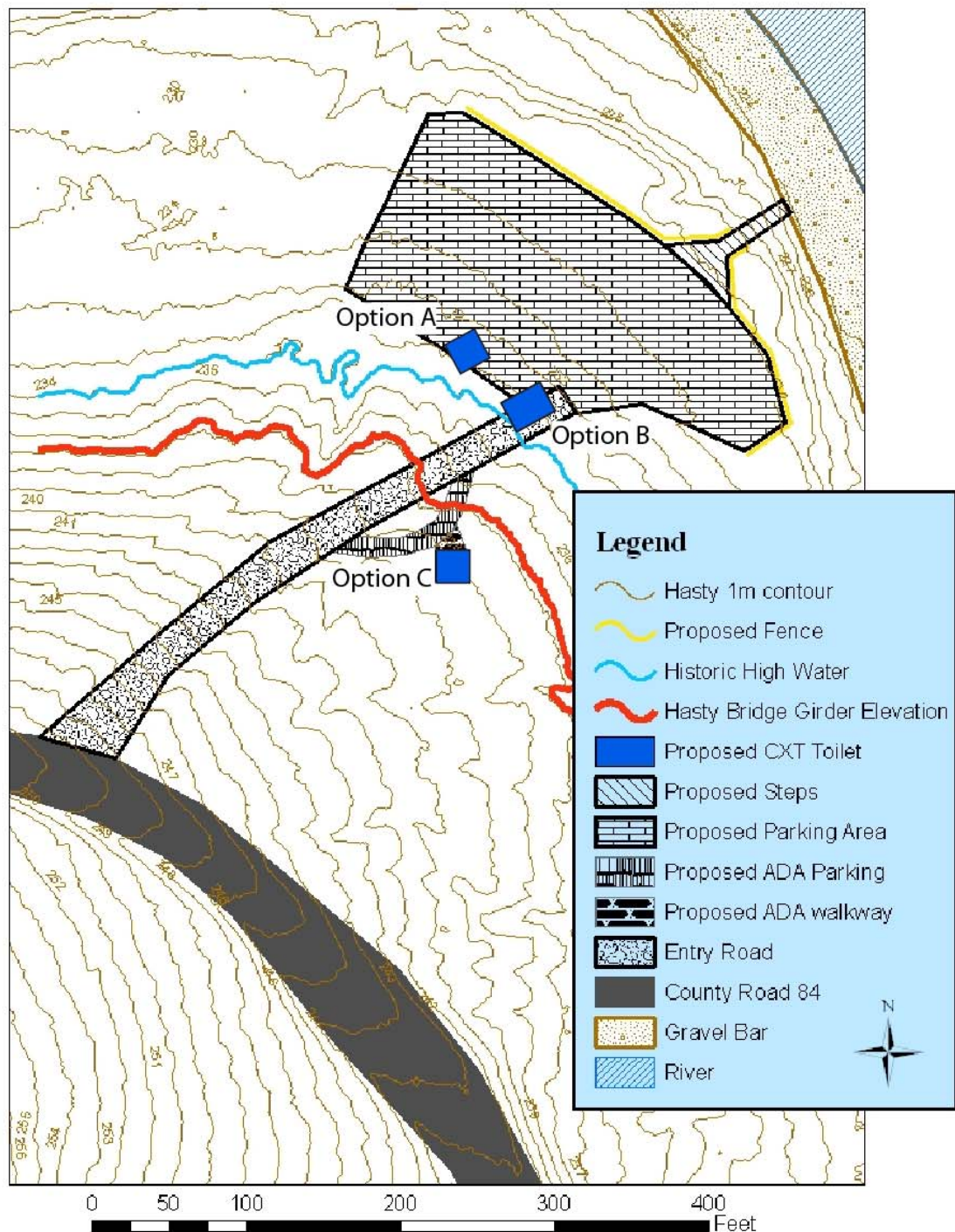
Restrooms

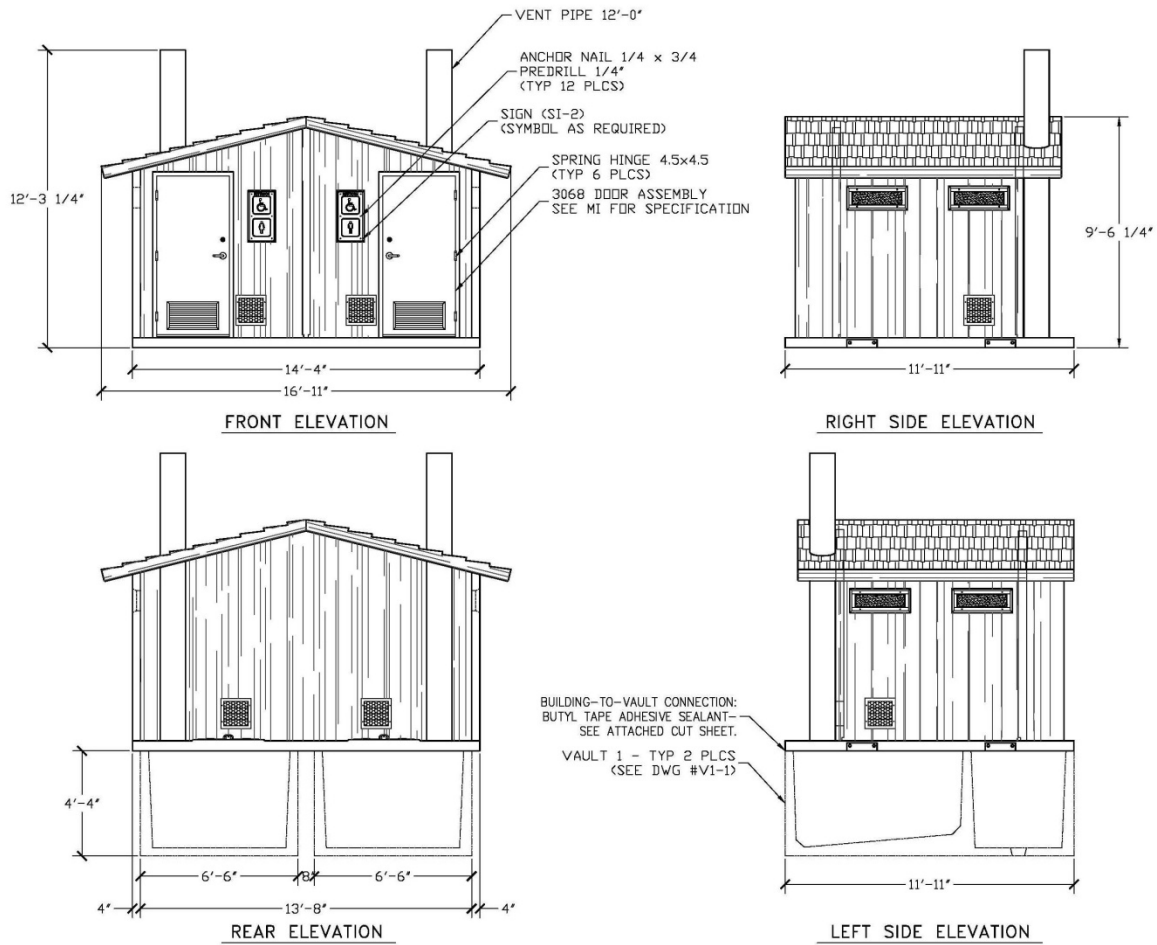
As currently planned, there are three proposed locations for the new restroom at Hasty Launch site; final site choice will be determined based geotechnical analysis completed during the design stage.

A modern, two-room double vault toilet facility with Sweet Smelling Technology would be installed in one of three locations; slightly uphill from the existing cabana style facility, about 150 - 200 feet uphill of the existing cabana style facility or directly across the access road from the

existing cabana style facility, at the edge of the parking lot. The exact location is dependent on the outcome of the geotechnical drilling. The facility restroom facility proposed for placement at Hasty would be a concrete building that with a plastic lined concrete vault. Site preparations for installing the new facility would require an area of approximately 25' by 30' to be graded to create a level site for the facility. The "Sweet Smelling Toilet" system principally relies on solar gain to warm the air within a 12" black vault flue pipe, creating positive air pressure in the pipe, and thus a draft is pulled from the negative air pressure within the vault (tank). The goal is to cause the air in the restroom to go down the riser (toilet), through the vault, and exit up the flue pipe, keeping odor out of the restroom. In order to achieve adequate air flow in the flue pipe it must be exposed to sunlight as much as possible. By orienting the building with the rear to the south and removing any shrubs and trees that would "shade" the pipe maximum solar gain can be achieved. Trees would need to be removed up to a distance of 50' from the east, south and west sides of the building to get sufficient exposure. Area cleared of trees will be planted with a variety of native grasses and forbs. This area will be mowed regularly to ensure trees do not re-sprout. Utilities will not be required. Vaults will need to be pumped as needed, but at least annually.

Hasty Launch Proposed Improvements





Figures of proposed restroom facilities in Tioga configuration, courtesy of CXT Precast Products (www.cxtinc.co)



Current Cabana Style Restroom



Proposed Restroom would be Similar Those at Other Launch Sites.



Social Trailing and Location
of Proposed Canoe Walkway



One of the Trees Impeding Traffic
Flow In Parking Lot

Canoe Walkway

A new canoe walkway would be constructed directly from the parking lot to the gravel bar, where excessive social trailing is causing deep bank erosion and destabilization. Additionally, the existing walkway at the downstream end of the parking area would be stabilized and barriers would be installed to prevent the use of existing social trails as well as prevent the development of new social trails. Area of social trails would be restored by revegetating them. Various devices like large rocks and fence railing would be installed to direct foot traffic down canoe walkway.

Parking Lot Improvements

Two large trees in the parking area would be removed to improve vehicle maneuvering and increase parking space. The parking area would be slightly expanded by squaring off the corners and re-graded to improve control of stormwater runoff.

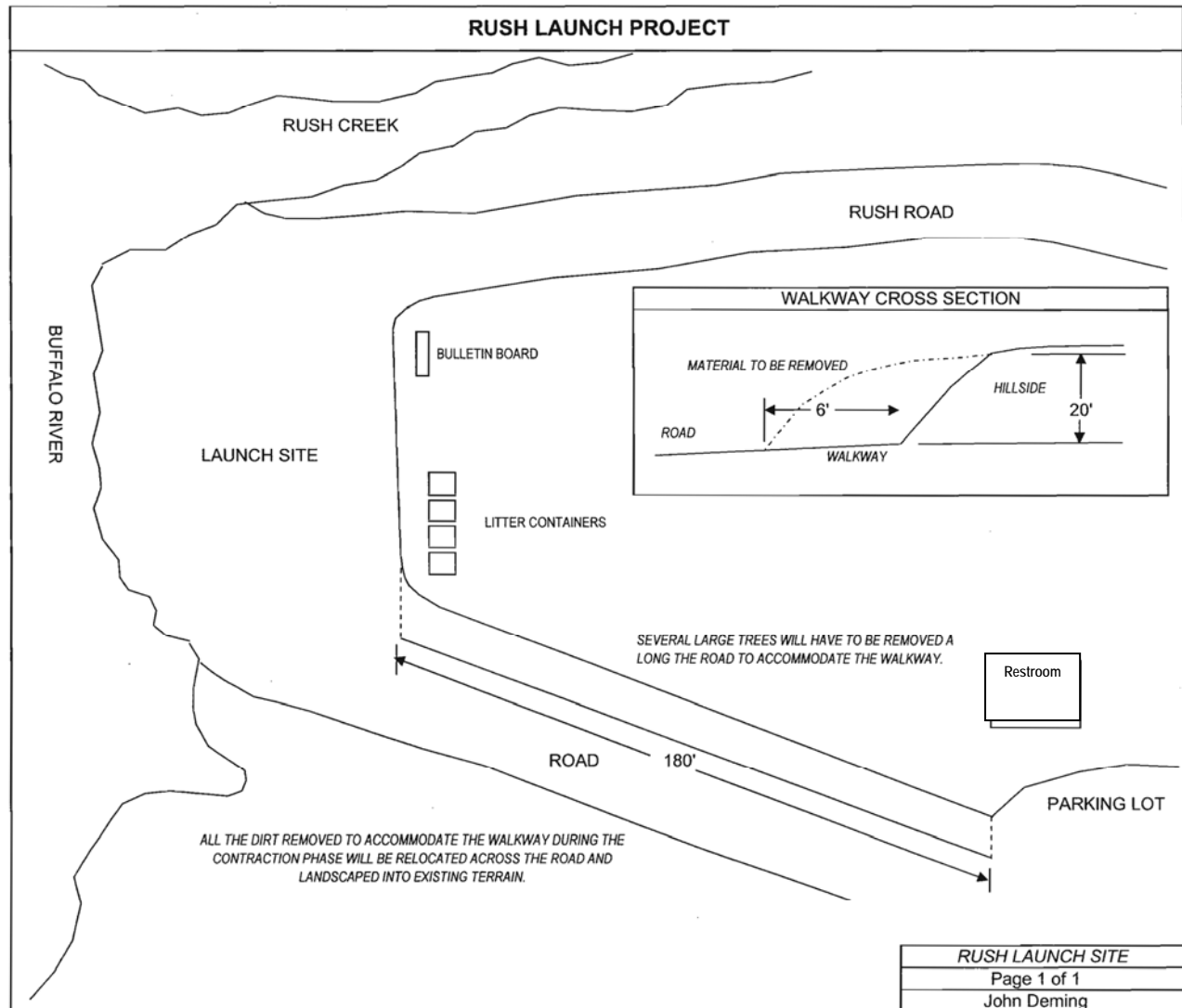
RUSH

Pedestrian Walkway

Trees and brush would be cleared along the side of the ramp exit road and a pedestrian trail would be constructed up the hill so that foot and vehicular traffic would not have to use the same roadway.

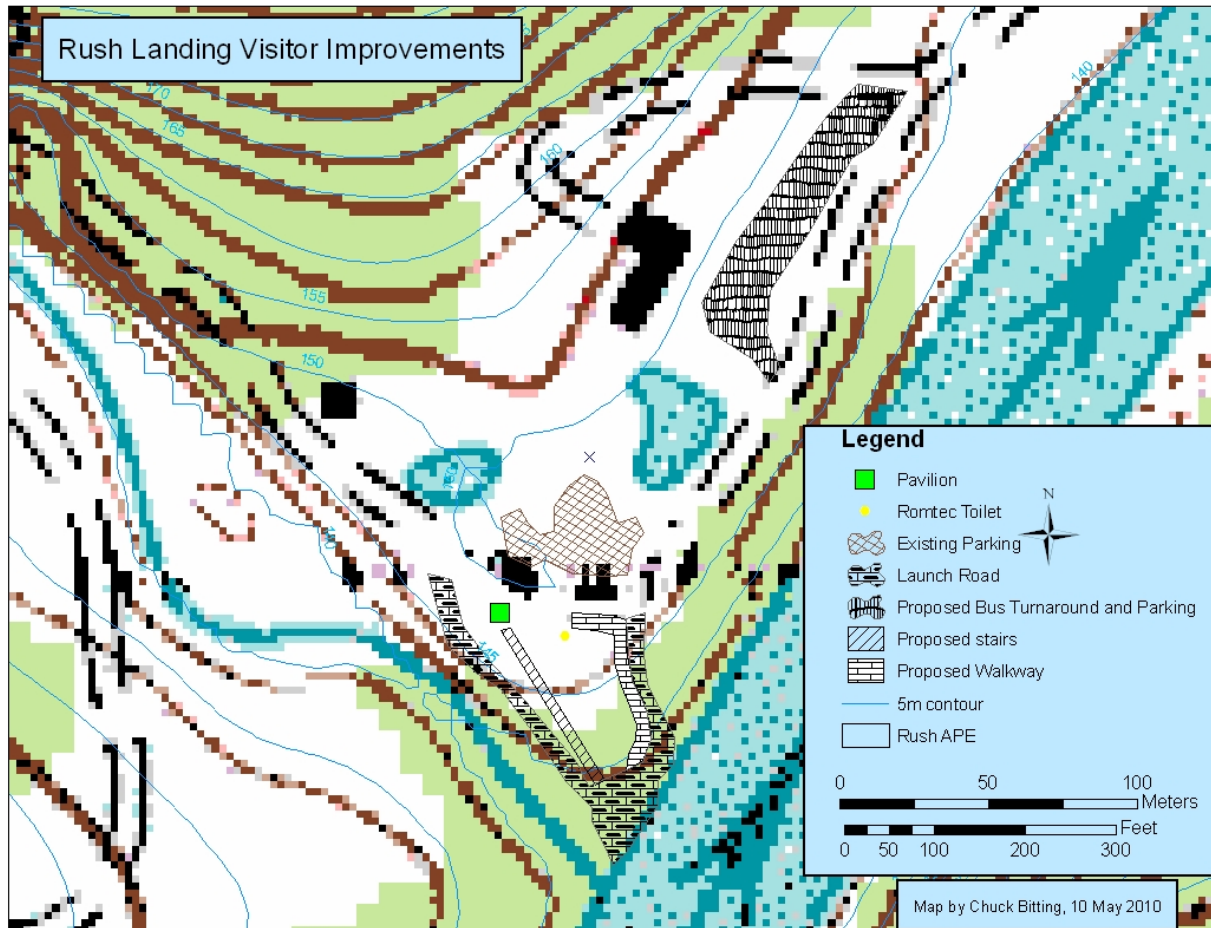
Restroom

An additional restroom would be added next to the existing restroom facility. This restroom would be essentially the same design as proposed for Hasty Launch Ramp.



Drainage culverts would be installed at the top and bottom of the ramp exit road to improve drainage and reduce surface erosion and water quality degradation. The road along the river that leads to Clabber Creek and the Bowman Tract, past Rush Landing, would be widened where needed to allow for two-way traffic flow. The power line to the Bowman Tract would be removed and additional parking spaces for concessionaire buses would be created in the right-of-way. A turnaround would be constructed approximately 75 to 100 yards down the road using the old power line right of way. This would allow vehicles waiting to use the landing to line up in a location that does not block traffic coming into and leaving the landing area. All excavated material would be removed and stored offsite. The only existing utility in the area is the power line that currently leads to the

Bowman tract. Since the houses on the Bowman tract are no longer occupied, the power line is no longer necessary; therefore, it would be removed to make room for additional parking. The existing trees in the project area would be preserved to the extent possible; however, up to one-tenth acre of trees and undergrowth may be removed during construction. All areas disturbed by construction of the improvements would be re-vegetated and re-contoured to the style of the native landscape. Native vegetation, rocks, or other natural features would be used, as appropriate. To implement this alternative, the existing parking lot and power line right-of-way would be used for construction staging, material stockpiling, and equipment storage. This work would be performed during the winter when visitor use is lowest. Access to the river would be maintained at all times during construction. Temporary signs would be used to direct vehicle and pedestrian traffic around areas under construction. As required by the Clean Water Act (CWA), the NPS will obtain all required Storm water Construction permits, which include the requirement to complete an erosion control plan and use Best Available Technology to ensure the project does not contribute sediments and oily run-off from construction vehicles to the river. The original footprint of the existing parking area would be restored to make more effective use of the space. Additional parking would be added within the power line right-of-way in order to alleviate some of the demand for the existing space. The existing parking area, new parking space in the power line right-of-way, access road to Clabber Creek and the Bowman tract, the new turnaround, and new trail to the restroom facility would be graded and surfaced with approximately 190 CY of local, crushed gravel. Access to the new parking areas would come from two locations along the road to the Bowman tract. Gravel presently stored in the parking lot would be removed and stockpiled at an offsite storage area by BNR.



SITE DESCRIPTION & NATURE OF FLOODING:

Physiography of Project Areas

The Buffalo River has cut deeply into the native bedrock, leaving tall, vertical bluffs standing at river bends. In some areas the river is confined by bedrock; in others it meanders through alluvial bottoms. The channel is vertically stable as the bedrock is either exposed or covered with a thick layer of gravel and sand (Adamski et al., 1995). The river is characterized by quiet pools separated by short riffles. From Pruitt to Highway 65 (the portion of the river that encompasses the Hasty launch area) the average gradient is 5 feet per mile, and from there to the mouth (the portion of the river that encompasses the Rush launch area) it is about 3 feet per mile (NPS 2004). The elevations within the Buffalo River watershed range from 2,576 feet above sea level in the Boston Mountains to 351 feet above sea level where the Buffalo River empties into the White River. The hills or ridge tops surrounding the river are usually narrow and winding, the sides alternative in steep slopes and vertical escarpments (Scott and Smith, 1994). The project locations are located within two of the three physiographic regions that encompass the park; the Hasty launch area is located in the Springfield Plateau, and the Rush launch area is located in the Salem Plateau (Adamski et al., 1995). The Springfield Plateau is underlain by limestone and cherty limestone of Mississippian age. Land surface altitudes range from 1,000 to 1,700 ft but locally topographic relief rarely exceeds 200 to 300 ft (Adamski et al., 1995). Sinkholes and springs are common in the region. The Salem Plateau is underlain by rocks of the Cambrian and Ordovician age although the Cambrian rocks are not surficially exposed within the watershed. The upland is characterized by gently rolling hills and local relief is 50 to 100 ft in the upland area (Adamski et al., 1995).

Geology

The rocks of the Buffalo National River are entirely sedimentary, laid down in an ancient marine basin. Over its 300-million year history was variously uplifted and eroded and then again submerged below the sea to receive more deposits. Today the rocks are again uplifted and superimposed on them are high bluffs, waterfalls, springs and hundreds of solution pits and caves. Most of the river is underlain by the St. Peter Sandstone and Everton Formations.

Surface Waters

There are 91 sub-basins in the Buffalo River watershed. Each of these watersheds drain into the Buffalo River and some of the developed areas are located adjacent or very near these outlets, including the Rush launch area, where one side is bounded by Rush Creek.

Water levels in the Buffalo and its tributaries are considered "flashy". With rapid rises and falls in the hydrograph on daily and monthly scales. The Buffalo River basin contains fewer springs than most other Ozark streams, and during dry periods surface flow is discontinuous in some reaches. However, during heavy rains, the steeper slopes and shale bedrock can result in faster-rising floods than other Ozark streams. The speed in the rise of flood waters generally takes between 12 hours after the start of a rain event in the upper third of the river and 36 hours after the stage started increasing in the lower third (NPS 2004).

Flood Warning System

There is a network of discharge and staff gages within the Buffalo River watershed. The nearest gaging station to Hasty launch area is located at the Highway 7 bridge near Pruitt launch area. The nearest gaging station to Rush launch area is located on the Highway 14 bridge near Dillard's Ferry launch area. Currently the park and USGS have partnered to manage 5 river gages that work as a flood warning system. Flood events are made available to park staff and the public on the following website:

<http://ar.water.usgs.gov/buffaloriver/>. This website shows real time changes to water flow levels for each of the river gages. Flooding conditions are determined based on volume of water and slope at the gaging station site. When water flow exceeds the bank full level, flooding conditions have occurred. The park dispatch office (Midwest Region Ozark Communications Center) monitors this website on a 24-hour basis and provides verbal warning to on-duty law enforcement staff. They in-turn provide warnings to the staff and members of the public through an Incident Command System approach. While the Buffalo River is to a certain extent prone to flash flooding, the topography generally allows sufficient time to move staff and visitors out of harm's way. Additionally, green concrete pillars have been erected at most of the launch sites and information is posted to the effect that if the water is anywhere near the top of these pillars, the river is in flood stage and caution is advised.

Flood Plain Analysis

There are no current Federal Emergency Management Administration (FEMA) flood plain maps available for either Rush or Hasty launch areas. There are Flood Prone Area maps created by the U.S. Department of the Interior, Geological Survey for these launch areas. These maps, which were created in 1975, were delineated through the use of readily available information on past floods rather than from detailed field surveys and inspections. While neither the 100-year nor the 500-year flood plain has been identified for the project launch areas. In reviewing current flood history and gage station information for the Buffalo River, the park staff has determined that the Flood Prone areas delineated on the 1975 maps approximate the 100-year flood plain. The flood depth ranges from 47 feet at Hasty launch site to 60 feet at Rush launch site and again are dependent on the variable of slope and width of the river at these sites.

Figure 1 - Hasty Launch Area Flood Prone Zone identifies that the canoe walkway, the parking lot improvements and all of Restroom Site A and a portion of Restroom Site B will all be located within the 100-year floodplain.

Figure 2 - Rush Launch Area Flood Prone Zone identifies that the all improvements, including the proposed parking lot improvements, the proposed pedestrian walkway, the proposed additional restroom and the proposed vehicle turn around are all located within the 100-year flood plain.

JUSTIFICATION FOR USE OF THE FLOODPLAIN

The areas in which the existing launch sites are located have been in continuous use at least since 1972 when the park was created. It is likely these sites were in use for a much longer period. Both these launch sites are two of the most heavily visited areas on the park during the busy visitor season.

Hasty and Rush Launch Sites - Class 1 - Class I Actions are subject to the floodplain policies and procedure if they lie within the 100-year floodplain.

All structures and facilities are designed to be consistent with the intent of the standards and criteria of the National Flood Insurance Program (44 CFR Part 60).

Hasty

The canoe walkway will provide for direct access to the gravel bar. This area is currently being used as a social trail and significant erosion and down cutting is occurring. Constructing a hardened surface that provides a direct route to the gravel bar, as well as restoration of other social trails will help retard the destructive social trailing. The materials used to create the walkway will be as environmentally compatible as possible. While it is likely that in extreme flood events the walkway may be destroyed and portions end up in the river, this is of less concern than stopping erosive processes that could destabilize the entire bank at the launch site.

Improvements to the parking lot include removing trees that impede traffic flow, reshaping to better support organized parking and regarding to direct storm water runoff away from launch site. The current parking lot is located within the flood zone and currently all the storm water runoff and an in extreme flooding events, a significant amount of gravel ends up in the river, along with pollution carried by these rain events. This project will help ensure much less gravel ends up in the river due to extreme flooding events and the storm water the enters the river from the parking lot has an opportunity to be filtered by a vegetation buffer.

The current cabana style restroom is located within the 100-year flood plain. It consists of a plastic building and unlined concrete vault that is not designed to withstand wind or rising water. It also is not of sufficient size for the expected visitor use and the unlined vault is subject to stress cracks, which may allow human waste to leach into the ground water. It also does not use the latest Sweet Smelling technology and therefore is a source of odor most of the year.

The placement of the proposed restroom will depend greatly on the geotechnical drilling that will be conducted as part of the final design. The whole area is underlain by bedrock which the park staff wishes to avoid due to increased cost and time for construction that would be involved. Site A which is located at the top of the existing parking lot, would be wholly in the 100-year floodplain. Site B which would be located on the existing restroom site is partially located within the 100-year floodplain. Site C which is located 400 feet up the access road from the gravel bar is wholly located outside the floodplain.

The proposed restrooms include the installation of a plastic lined concrete vault, a concrete floor over the vault, a raised toilet, bolted to the floor with the lining extended to the opening and a heavy building that is bolted to the concrete floor. These types of restrooms have been very successfully used in other locations throughout the park and have been subjected to flood waters in recent years. While the level and speed of the water during past flood events have removed other facilities, these types of restrooms were not permanently damaged. In extreme flood events, waste from the proposed

restroom may come up through the toilet opening and into the river. It would be greatly diluted by the volume of water.

Rush

Because all the facilities in this area are below the 100-year floodplain, all improvements would result in less gravel and polluted storm water run-off entering the river. The parking lot improvements at Rush are designed to improve flow into and out of the lot and to accommodate more efficient parking spaces. The pedestrian walkway would be constructed out of a durable environmentally friendly material. During significant flood events, portions or all of the walkway could become dislodged and enter the river. While there isn't a walkway currently, the proposed project would allow much needed separation of pedestrians and vehicles. The proposed turn around and road improvements are designed to increase efficiencies of traffic flow in the area. Installation of culverts would direct storm water runoff away from launch ramp and towards vegetation buffer, which would allow some removal of pollutants prior to entering the river.

SUMMARY

Hasty and Rush launch areas have been in their current locations since at least the early 1970's. Most of the proposed improvements and upgrades will help correct significant storm water runoff pollution issues including oily fluids from vehicles and gravel from roads and parking lots. New restroom facilities will be built to withstand significant flooding events, allowing recovery from such events to happen more rapidly and less building materials to end up in the river. Relocating these facilities out of the flood plain would be exorbitant in cost, reduce essential service to visitors, and reduce operational efficiencies.

The current communication and warning system will be maintained in order to evacuate visitors and their personal property in the event of a severe storm over the Buffalo River Drainage.



Rush Launch Area Flood Prone Zone



- Flood Prone Zone
- Proposed parking lot Improvements
- Proposed Restroom Locations
- Proposed Canoe Walkway
- Proposed Tree Clearance Area for Restroom
- Gravel Bar





Hasty Launch Area Flood Prone Zone



- Flood Prone Zone
- Proposed parking lot Improvements
- Proposed Restroom Locations
- Proposed Canoe Walkway
- Proposed Tree Clearance Area for Restroom
- Gravel Bar

0 90 180 360 Feet



References

U.S. Department of the Interior, Geological Survey, Map of Flood-Prone Areas, Cozahome, Ark, 7.5 Minute Quadrangle, 1975.

U.S. Department of the Interior, Geological Survey, Map of Flood-Prone Areas, Hasty, Ark, 7.5 Minute Quadrangle, 1975.

National Park Service, Water Resource Management Plan, Buffalo National River, Harrison, Arkansas, 2004.

Adamski, J.C., J.C. Peterson, D.A. Freiwald, J.V. Davis, 1995. Environmental and Hydrologic Setting of the Ozark Plateaus Study Unit, Arkansas, Kansas, Missouri, and Oklahoma, USGS, Water Resources investigation report: 94-4022, Little Rock, Arkansas.

Buffalo National River – Facilities Improvements – Impairment Determination

The following four impact topics were retained for detailed analysis in the EA and are park resources that could potentially be subjected to impairment as a result of park actions:

1. Floodplains
2. Water Resources
3. Special Status Species
4. Archaeological Resources

An impairment finding is not necessary for Visitor Use and Experience because impairment findings relate back to park resources and values and this impact topic is not generally considered to be a park resource or value according to the Organic Act; therefore, it cannot be impaired the same way that an action can impair park resources and values.

Floodplains

Floodplains are an important part of any river system's ability to transport large, well above normal volumes of water downstream toward its ultimate discharge point. Floodplain protection is important for many reasons, the three most important of which are: 1) maintenance of water quality in the river; 2) maintenance of the riparian ecosystems that typically depend on floods, and; 3) prevention of property damage that can be caused by an abnormally high flow rate that results from an altered floodplain. Buffalo National River was initially established as a measure to prevent flood control structures, i.e., dams, from being constructed that would permanently impair the natural quality and character of the river [Public Law 92-237 (86 Stat. 44)].

Consequently, it is commonly subjected to floods. In addition to dams, some examples of activities that could potentially impair floodplains include, but are not limited to, grading, construction, deforestation, mining, recreation, and dumping.

The park's establishing legislation describes the river thus:

"Because it is a pure, free-flowing stream which has not been significantly altered by industry or man, it is considered to be one of the country's last significant natural rivers. It is not one single quality, but the combination of its size, its completeness, its wild qualities, and its associated natural, scenic, and historic resources that makes the Buffalo River worthy of national recognition". (Public Law 92-237)

The park's Master Plan (1977) emphasizes the importance of the river as the unifying feature of the park.

"The river's natural setting must be maintained. Recreation facilities and support structures must be situated where they will blend with their surroundings...the natural riverbank cover of trees and shrubs will be maintained where presently intact and allowed to re-vegetate where denuded".

"...continuation of the river in its pure and attractive state depends upon the entire watershed; activities and industries upslope affect the water quality..."

The preferred alternative analyzed in the EA includes grading and construction activities within the 100-year floodplain; however, because these activities would be completed during the late summer and fall months when floods are rare, employ standard best management practices for erosion control, and actually serve in the long-term to decrease sediment runoff into the river, slightly improve the health of the riparian ecosystem, and not result in any change to the existing flow rate of the river during floods, it is determined that there would be no impairment of floodplains at BNR as a result of the preferred alternative.

Water Resources

The primary water resource characteristic potentially affected by the preferred alternative in this EA is surface water quality. The preferred alternative does not include any activities, such as drilling, or the establishment of seepage basins, that could result in any effect to ground water. Maintenance of high water quality in the river is directly related to the health of the ecosystem that depends upon it. Water quality data from the river have been collected since 1985 (NPS 2004), although the sampling schedule did not become consistent until 1991. Data have been collected for fecal coliform bacteria, nutrients (fixed forms of nitrogen), turbidity, dissolved oxygen, and specific conductance.

The preferred alternative does not include any activities that could potentially alter levels of fecal coliform bacteria, nutrients, dissolved oxygen, or specific conductance in the river; therefore, these factors are not considered further. Turbidity is the only water quality characteristic that could potentially be affected by the preferred alternative. Generally, base-flow turbidity of the Buffalo River is between one and three Nephelometric Turbidity Units (NTUs). Turbidities as high as 420 NTUs have been recorded in association with rain events (NPS 2004). The dominant source of turbidity during high flow is from erosion of road surfaces and ditches, cattle pastures and other cleared land, and unprotected rapidly eroding cut-banks.

The number one threat to water quality in the river is the conversion of forest within the Buffalo river watershed to pasture (NPS 2004). The primary pollutants that result from this conversion are fecal coliform bacteria and nutrients; however, common agricultural practices include clearing and tilling, which contribute to increased turbidity in the river during storm events.

The preferred alternative includes grading activities, which are similar to tilling activities for agricultural purposes and, therefore, could potentially contribute to increased turbidity in the river; however, because these activities would be completed in a short period of time, employ best management practices for erosion control, and be conducted during late summer and fall months when heavy rains and flooding are least likely, and because the completed grading activities would reduce sediment transport into the river over the long-term, it is determined that there would be no impairment of water quality at BNR as a result of the preferred alternative.

Special Status Species

Surveys for special status plants were conducted in the spring of 2010 at the four proposed improvement locations by the BNR botanist. No State or federally protected plant species were found in these locations. One federal candidate plant species was located at the Spring Creek Trailhead adjacent to the proposed parking area and the Ozark Highland Trail extension. Four State-listed Inventory Element plant species (one at Rush Landing and three at Lost Valley) were identified in the area of potential effect during the surveys.

The species at Rush Landing would be marked by flagging prior to and during construction. Construction crews would be instructed to avoid activities that could damage any of the plants at this location. One species at Lost Valley grows up in the crevices of large rocks, cliffs, and boulders. Trail construction activities would not affect it. The other two species at Lost Valley are co-located. These two species are commonly poached; therefore, they would not be marked for avoidance during trail construction activities. Instead, the trail crew would be trained to identify them and shown where they are so that they would be able to avoid damaging these plants. Because there are no State or federally protected plant species at the proposed improvement locations and appropriate avoidance measures would be used to prevent damage to State-listed Inventory Element plant species, it is determined that there would be no impairment of special status plant species at BNR as a result of the preferred alternative.

The Indiana bat is the only special status animal species known to occur in the park with potential for occurrence within the area of potential effect for the proposed improvements. This species is federally endangered and is listed by the State as an Inventory Element. Females of this species roost and raise their young under the sloughing bark of snags and under the bark of shagbark hickory (*Carya ovata*), green ash (*Fraxinus pennsylvanica*), elm (*Ulmus* sp.), cottonwood (*Populus deltoides*) and other trees with large loose bark plates. These summer roosts tend to be in lowland habitats near water, with direct sun exposure for half the day or more (NPS 2010). The colonies are most commonly located in bottomland or riparian areas, but have also been found in pastures and upland hardwoods. The maternity roosts are usually found in larger diameter trees.

The location of Rush and Hasty Landings in the riparian zone of the river creates a potential for the presence of this species in the area of potential effect; however, because the proposed improvements at these locations do not include the removal of trees with the appropriate bark characteristics necessary for this species and would generally take place after the summer roosting season, it is determined that there would be no impairment of this animal species at BNR as a result of the preferred alternative.

The snuffbox mussel may be present in the river near Rush and Hasty Landings. Surveys in August 2010 will provide more detailed information about the presence of this species in the river. This species is currently a candidate for listing by the USFWS as endangered under the ESA. Grading activities proposed by the preferred alternative could result in increased turbidity in the river, which could potentially adversely affect this species. Further, until vegetation becomes re-established, embankment stabilization activities at Rush could also potentially contribute to increased turbidity in the river during rain events. Because, however, these activities would be completed during late summer and fall months, when heavy rains are rare, employ standard best management practices for erosion control, be of limited duration, and ultimately result in improved drainage control and reduced turbidity in the river, it is determined that there would be no impairment of this animal species at BNR as a result of the preferred alternative.

In conclusion, therefore, no special status species would be impaired as a result of the preferred alternative.

Archaeological Resources

Rush is a 1,300-acre area on the National Register of Historic Places and is entered on the NPS cultural landscape inventory as one of the designated cultural landscapes at BNR. Forty-seven historic surface structures, ranging from ruins to standing buildings, are visible in various locations in the Rush Historic District. Roadways and zinc mines are also considered part of the structural listing. Buried historic and prehistoric archaeological resources likely occur almost anywhere in the Rush Landing area where proposed improvements would be made. The proposed location of the walking trail from the launch ramp up to the restroom was investigated for archaeological resources in April 2009 (Vawser 2009). The results of this investigation led to the conclusion that trail can most likely be constructed without affecting intact resources.

Uplands within BNR located well away from the river like the area proposed for the Spring Creek Trailhead parking lot are generally devoid of cultural resources (Clark 2010). Both historic and prehistoric settlements typically occurred closer to the river and its tributaries. Easy access to a source of surface water was a critical component of site selection for settlers before technologies for drilling deep wells or pumping water through pipes became available. A cultural survey was conducted of the proposed Spring Creek Trailhead parking lot area on April 2, 2010, by the BNR archaeologist. No cultural resources were found. No cultural resources are likely to exist at the proposed location for the parking lot at the Spring Creek Trailhead.

A prehistoric site was recorded at Hasty Landing in 1970 as a 10-acre lithic scatter. No other information is known about this location, although the landing's location on a river terrace suggests potential for buried archeological deposits. Since no other investigations have been made to identify cultural resources at Hasty Landing, no documented archaeological sites have been identified there.

The cultural resources of concern at Lost Valley pertain to the historic State Park facilities, and for this project, the trail in particular. There are no known Native American remains within the area of potential effect at Lost Valley and no other cultural resources recorded for the area (Clark 2010a).

Ground disturbing activities, such as grading, clearing and grubbing are the primary threats to archaeological resources at the proposed improvement locations. Excavation for the proposed pedestrian trail at Rush could also present a potential adverse effect to archaeological resources; however, because recent testing by park archaeologists in the proposed trail area indicates that a trail can most likely be constructed without affecting intact archaeological resources, additional testing would be conducted prior to construction at Rush and Hasty Landings in the areas of potential effect, no archaeological resources were found at the proposed parking area for Spring Creek Trailhead during a recent survey by the park archaeologist, and activities at Lost Valley would not affect any cultural properties or resources, it is determined that there would be no impairment of archaeological resources at BNR as a result of the preferred alternative.

References

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