



United States Department of the Interior

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March 24, 2014

Lieutenant Colonel John L. Hudson
Commander
Nashville District Corps of Engineers
P.O. Box 1070
Nashville, TN 37202

Subject: FWS #2008-B-0075; Final Biological Opinion on the Wolf Creek Dam/Lake
Cumberland Return to Historical Pool Level Operations, Russell County, Kentucky

Dear Lieutenant Colonel Hudson:

This document is the Fish and Wildlife Service's (Service) biological opinion based on our review of the U.S. Army Corps of Engineers (Corps) Wolf Creek Dam/Lake Cumberland Return to Historical Pool Level Operations (historical lake operations) and the proposed action's effects on the duskytail darter (*Etheostoma percnurum*). This biological opinion is provided pursuant to section 7 of the Endangered Species Act of 1973, as amended (Act or ESA) (16 U.S.C. 1531 *et seq.*). Your February 7, 2014 request for formal consultation was received on February 10, 2014 and formal consultation under the Act was initiated on February 13, 2014. The Service previously concurred with the Corps' "not likely to adversely affect" (NLAA) determination for 23 other federally-listed species (Table 1) and a "NLAA" determination for designated critical habitat (Table 2).

This biological opinion is based on information the Corps provided in its February 10, 2014 biological assessment (BA), supplemental information to the BA provided on February 26, 2014, the Corps' 2007 Wolf Creek Dam/Lake Cumberland Emergency Measures in Response to Seepage Final Environmental Impact Statement (EIS), telephone conversations with the Corps, meetings, field investigations, and other sources of information. A complete administrative record of this consultation is on file at the Service's Kentucky Ecological Services Field Office (KFO) in Frankfort, Kentucky.

Introduction

Wolf Creek Dam is located at Cumberland River Mile (CRM) 460.9 near Jamestown, Russell County, Kentucky. The dam impounds the Cumberland River and many of its tributaries upstream of Wolf Creek Dam in portions of Clinton, Russell, Wayne, Pulaski, and McCreary counties. The impoundment creates Lake Cumberland, the largest flood control reservoir east of the Mississippi River. As stated in the EIS, the Corps made the decision to immediately lower

Table 1. Species evaluated where the Service has concurred with a “not likely to be adversely affect” determination for the proposed action.

SPECIES	SCIENTIFIC NAME	STATUS
Mammals		
Indiana bat	<i>Myotis sodalis</i>	Endangered
gray bat	<i>Myotis grisescens</i>	Endangered
Fishes		
blackside dace	<i>Chrosomus cumberlandensis</i>	Threatened
palezone shiner	<i>Notropis albizonatus</i>	Endangered
Cumberland darter	<i>Etheostoma susanae</i>	Endangered
Mussels		
Cumberland bean	<i>Villosa trabilis</i>	Endangered
Cumberlandian combshell	<i>Epioblasma brevidens</i>	Endangered
Cumberland elktoe	<i>Alasmidonta atropurpurea</i>	Endangered
fluted kidneyshell	<i>Ptychobranchus subtentum</i>	Endangered ¹
littletwing pearlymussel	<i>Pegias fabula</i>	Endangered
oyster mussel	<i>Epioblasma capsaeformis</i>	Endangered
pink mucket	<i>Lampsilis abrupta</i>	Endangered
spectaclecase	<i>Cumberlandia monodonta</i>	Endangered ²
fanshell	<i>Cyprogenia stegaria</i>	Endangered
tan riffleshell	<i>Epioblasma florentina walkeri</i>	Endangered
purple catspaw	<i>Epioblasma obliquata obliquata</i>	Endangered
ring pink	<i>Obovaria retusa</i>	Endangered
rough pigtoe	<i>Pleurobema plenum</i>	Endangered
orangefoot pimpleback	<i>Plethobasus cooperianus</i>	Endangered
Plants		
Virginia spiraea	<i>Spiraea virginiana</i>	Threatened
Cumberland sandwort	<i>Arenaria cumberlandensis</i>	Endangered
Cumberland rosemary	<i>Conradina verticillata</i>	Threatened
white fringeless orchid	<i>Platanthera integrilabia</i>	Candidate

¹ Table 1 represents the current listing status for the species. At the time informal consultation was initiated, the fluted kidneyshell was a candidate for federal listing under the ESA. The fluted kidneyshell was listed as endangered on October 28, 2013 (78 FR 59269-59287). Because this species was considered during informal consultation and none were identified during aquatic species surveys, the Service believes that the change in federal listing status does not warrant additional consultation and the effects determination of “may affect – is not likely to adversely affect” remains appropriate for this species.

² Table 1 represents the current listing status for the species. At the time informal consultation was initiated, the spectaclecase was a candidate for federal listing under the ESA. The spectaclecase was listed as endangered on April 12, 2012 (77 FR 14914-14949). Because this species was considered during informal consultation and none were identified during aquatic species surveys, the Service believes that the change in federal listing status does not warrant additional consultation and the effects determination of “may affect – is not likely to adversely affect” remains appropriate for this species.

Table 2. Critical Habitat evaluated where the Service has concurred with a “not likely adversely affect” determination.

SPECIES	DESIGNATED CRITICAL HABITAT
Cumberland elktoe (69 FR 53136-53180)	Big South Fork, Marsh Creek, and Rock Creek, McCreary County, KY Sinking Creek, Laurel County, KY Laurel Fork, Whitley County
Cumberlandian combshell (69 FR 53136-53180)	Big South Fork, McCreary County, KY Buck Creek, Pulaski County, KY
Oyster mussel (69 FR 53136-53180)	Big South Fork, McCreary County, KY Buck Creek, Pulaski County, KY

Lake Cumberland to an elevation of 680 feet to ease stress on the dam’s foundation in January 2007 and hold that elevation for an indefinite period until repairs were completed.

The Corps invoked its authority under 33 CFR 230.8 “Emergency Actions” and declared an emergency, made decisions, and took necessary actions to prevent a possible dam failure at Wolf Creek Dam. The emergency decision to lower the pool behind Wolf Creek Dam on an interim basis was made prior to the completion of any necessary National Environmental Policy Act (NEPA) document (e.g., environmental assessment or environmental impact statement). Therefore, pursuant to 33 CFR 230.8 and 40 CFR 1506.11, the Corps sent a letter dated January 18, 2007 to the President’s Council on Environmental Quality (CEQ) seeking initiation of consultation with CEQ regarding alternative arrangements for NEPA compliance. As part of those arrangements, the EIS was written to address the impacts from the decision to lower the pool elevation at Lake Cumberland while the dam safety project was undertaken.

The EIS development process also included conducting informal ESA consultation with the Service to determine if adverse effects to federally-listed species were likely. During the informal consultation process, the Service concurred that lowering the pool elevation at Lake Cumberland and conducting the dam safety project was unlikely to result in adverse effects on federally-listed species; however, the Service also raised concerns in its February 12, 2007 letter to the Corps that the subsequent raising of Lake Cumberland, and a return to historical lake operations, could result in adverse effects on federally-listed aquatic species, Indiana bats, and/or gray bats, if habitat for these species was created or restored as a result of the draw-down. The Service was concerned that the pool reduction would likely expose caves or in-stream habitat (i.e., that would normally be inundated by Lake Cumberland) and federally-listed species would begin to occupy these habitats, especially if the draw-down of the lake lasted for an extended period of time.

Based on the Service’s concerns, the Corps’ Record of Decision on the EIS included a commitment to conduct species surveys in areas where habitat was created prior to returning to historical lake operations. These surveys would help determine if federally-listed species were present in areas that had previously been inundated by Lake Cumberland. In a February 26, 2013 letter to the Corps, the KFO determined that cave surveys for federally-listed bat species were not necessary. This determination was based on information provided by the Corps

showing that in-flow and water elevation data, during the interim draw-down, indicated that any potential caves exposed during the draw-down continued to be exposed to water fluctuations that resulted in periodic inundation of the caves. Therefore, it was unlikely that federally-listed bats would use any of these caves due to these water fluctuations, the periodic inundation of the caves, and the availability of other suitable summer roosting and/or hibernacula in the vicinity for both Indiana bats and gray bats.

Subsequent to the Service's February 26, 2013 letter, the northern long-eared bat (*Myotis septentrionalis*) (NLEB) was proposed for federal listing under the ESA on October 2, 2013. No critical habitat has been proposed for the NLEB at this time, and the final listing decision on this species is expected in October 2014. Pursuant to Section 7(a)(4) of the ESA, federal action agencies are required to confer with the Service if they determine that the proposed federal action is likely to jeopardize the continued existence of the NLEB (50 CFR 402.10(a)). The Service does not expect the proposed action to result in adverse effects on the NLEB, because no potential summer or winter habitat will be disturbed as a result of the action, and no indirect or other adverse effects on the species have been identified or are reasonably certain to occur. Therefore, the proposed action is not likely to result in jeopardy of the NLEB.

Also, subsequent to the Service's February 26, 2013 letter, critical habitat was designated for the endangered fluted kidneyshell (*Ptychobranthus subtentum*). This designation became effective on October 28, 2013. The majority of the newly designated critical habitat either: a) occurs outside of the project action area, or b) overlaps with the designated critical habitat previously considered in the Big South Fork during informal consultation for the three listed mussel species shown in Table 2 above. However, the designation also includes 40.7 river miles of the Little South Fork Cumberland River (Little South Fork) from its confluence with the Big South Fork Cumberland River, upstream to its confluence with Dobbs Creek in Wayne County, Kentucky. A portion of the designated critical habitat near the confluence of the Little South Fork with Big South Fork occurs within the action area. The lower portion of this reach has been continuously inundated by Lake Cumberland, including during the current draw-down, and, therefore, does not contain the Primary Constituent Elements for this designated critical habitat. The upper portion has historically been affected periodically and temporarily by increased lake levels during flood events and would receive the same types of effects after the return to historical lake operations. Based on this information, the Service believes the proposed action is not likely to adversely affect designated critical habitat for the fluted kidneyshell in the Big South Fork or Little South Fork.

In the February 26, 2013 letter to the Corps, the Service maintained its request that surveys for listed aquatic species should be conducted in the Big South Fork between river miles 44 and 33.5. The aquatic surveys requested by the Service were completed by the Corps in November 2013, once Big South Fork flows were conducive. No federally-listed mussels were identified; however, the endangered duskytail darter was observed at 8 of 15 survey sites (i.e., sites 1-8 that were identified in the Corps' 2013 Survey report). Suitable, but unoccupied, habitat for the species was identified at an additional site (i.e., site 9 in the Corps' 2013 Survey report). These areas are likely to be temporarily-to-permanently re-inundated by a return to historical lake operations. Therefore, the Corps developed a BA for the return to historical lake operations that included a "may affect – is likely to adversely affect" determination and associated effects

analysis for the duskytail darter. For all other federally-listed species previously considered during the informal consultation process associated with the dam safety project (Table 1), the KFO's January 22, 2010 concurrence with the Corps' 2008 "may affect – is not likely to adversely affect" determinations is still valid. As a result, the species and critical habitat identified in Tables 1 and 2 above will not be adversely affected by the Corps' proposed action and, therefore, will not be discussed further in this biological opinion. In addition, the information provided in this biological opinion relating to the Northern long-eared bat and designated critical habitat for the fluted kidneyshell shows they will not be adversely affected by the Corps' proposed action and, therefore, also will not be discussed further in this biological opinion.

Consultation History

- | | |
|-------------------|---|
| February 2, 2007 | The Corps requested comments on the rehabilitation of Wolf Creek Dam in the Federal Register (72 FR 5020-50201) |
| February 12, 2007 | The KFO provided the Corps with a list of federally-listed species and designated critical habitats that could be affected by the proposed project. |
| March 23, 2007 | The Corps solicited comments from the public; federal, state, and local agencies and officials; Indian tribes; and other interested parties on the preparation of the Draft Environmental Impact Statement (DEIS) |
| October 9, 2007 | The KFO received a copy of the DEIS for comment and review. |
| December 7, 2007 | The KFO, in coordination with the Tennessee Ecological Services Field Office (TFO), provided the Corps with comments on the DEIS. |
| December 21, 2007 | The KFO received notice that the Final EIS (FEIS) was available for review and comment. |
| February 28, 2008 | The KFO and Corps conducted a conference call regarding the FEIS to address the KFO's December 7, 2007 comment letter on the DEIS. |
| December 22, 2008 | The Corps responded to the KFO's December 7, 2007 comment letter on the DEIS, committed to conducting surveys for federally-listed mussel species, and requested concurrence that the proposed project was "not likely to adversely affect" federally-listed species. |
| August 3, 2009 | The KFO issued a response letter to the Corps' December 22, 2008 response requesting additional information on the indirect and cumulative impacts associated with the project. |
| August 19, 2009 | The Corps issued a response to the KFO that provided the additional information requested. |

January 22, 2010 The KFO concurred with the Corps' "not likely to adversely affect" determinations for 24 federally-listed species and designated critical habitat in the vicinity of the action area.

November 5, 2010 The EIS was completed and Record of Decision signed.

February 11, 2013 The Corps sent correspondence to the KFO stating that: (1) the dam repairs were ahead of schedule; (2) the Corps would like to return Lake Cumberland to historical pool during the summer of 2014; (3) cave surveys for endangered bat species were not warranted due to documented water fluctuations within the caves; and (4) aquatic species surveys would begin when conditions were favorable.

February 26, 2013 The KFO responded to the Corps' February 11, 2014 correspondence and agreed that cave surveys were not warranted and that aquatic surveys were warranted and should be conducted when conditions were favorable.

November 2013 The Corps completed aquatic surveys and identified the presence of the duskytail darter at 8 of the 15 survey sites (sites 1-8) and suitable, but unoccupied, habitat at 1 site (Site 9) in the Big South Fork.

December 11, 2013 The Corps submitted the final report for the aquatic surveys in the Big South Fork.

January 8, 2014 Representatives from the Corps, Tennessee Valley Authority (TVA), TFO, KFO, and National Park Service's (NPS) Big South Fork National River and Recreation Area (BSFNRRRA) met to discuss the preparation of the BA and need for formal consultation.

January 9, 2014 The KFO and Corps had numerous informal and formal discussions via teleconference and exchanged numerous formal and email correspondence related to the proposed project that began on January 9, 2014 and continued through March 24, 2014. These discussions and correspondence are part of the Service's administrative record held at the KFO.

February 10, 2014 The Corps submitted the final BA for the project.

February 13, 2014 The Corps submitted supplemental information for the BA to the KFO via email correspondence.

February 13, 2014 The KFO initiated formal consultation on the Corps' proposed action to return Wolf Creek Dam to historical lake operations.

February 26, 2014 The Corps submitted supplemental BA information regarding it proposed conservation measures.

- February 26, 2014 The Corps submitted additional information regarding potential habitat improvement and water quality improvement projects in the BSFNRRRA.
- February 26, 2014 The KFO conducted a teleconference BSFNRRRA Superintendent to update NPS staff on the consultation process and discuss the Corps' proposed conservation measures for the proposed action, which would include habitat improvement and water quality improvement projects within the BSFNRRRA.
- March 6, 2014 The Corps submitted additional information regarding its proposed conservation measures.
- March 12, 2014 The Corps provided additional information via electronic mail on the Interim Dam Adjustment conservation measure.
- March 13, 2014 The KFO provided the Corps with a draft biological opinion for review
- March 24, 2014 The KFO issued the final biological opinion on the Corps' proposed action to return Wolf Creek Dam to historical lake operations.

FWS Log No.: 2008-B-0075	Application No.: N/A
Date Started: February 13, 2014	Ecosystem: Upper Cumberland River
Applicant: U.S. Army Corps of Engineers	Action Agency: U.S. Army Corps of Engineers
Project Title: Wolf Creek Dam/Lake Cumberland Return to Historical Pool Level Operations	
County: Russell County, Kentucky	

DESCRIPTION OF THE PROPOSED ACTION

As defined in the Service's section 7 regulations (50 CFR 402.02), "action" means "all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by federal agencies in the United States or upon the high seas." The "action area" (project area) is defined as "all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action." The direct and indirect effects of the actions and activities must be considered in conjunction with the effects of other past and present federal, state, or private activities, as well as the cumulative effects of reasonably certain future state or private activities within the action area. This biological opinion addresses only those actions for which the Service believes adverse effects may occur.

Determination of the Action Area

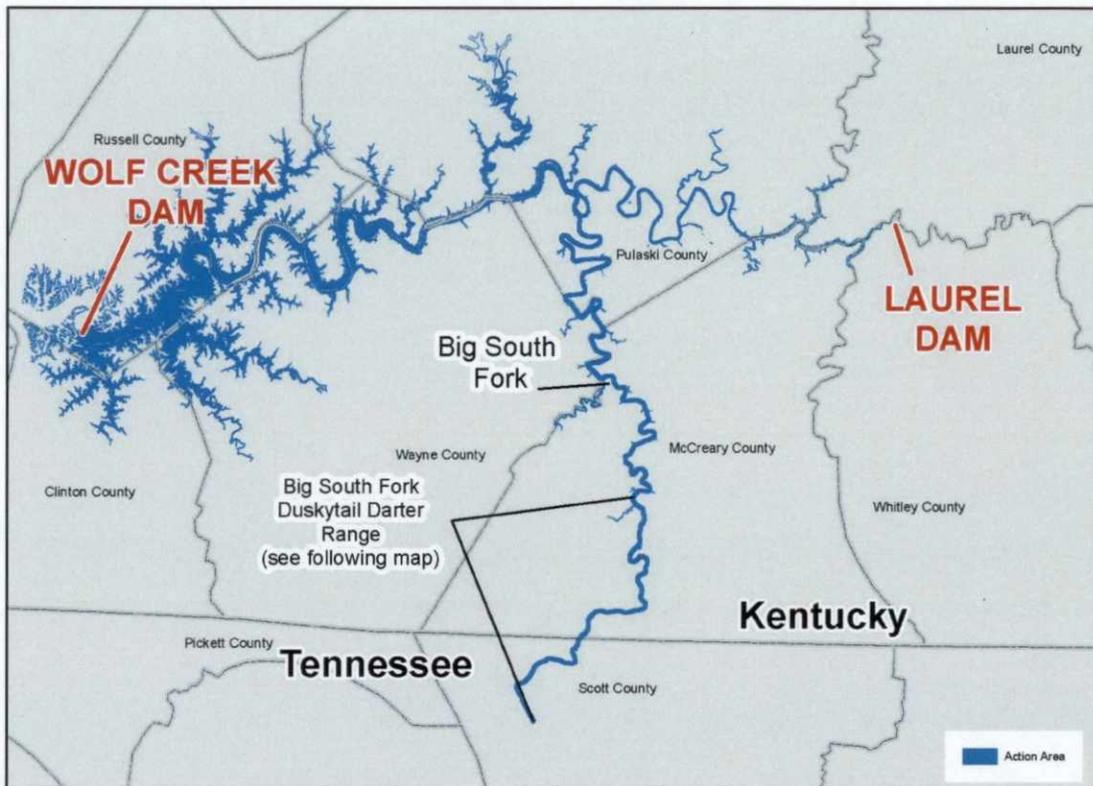
Wolf Creek Dam is located near Jamestown, Kentucky at Cumberland River mile 460.9. Lake Cumberland, created by the dam, impounds 6,089,000 acre-feet at its maximum pool elevation of 760 feet (National Geodetic Vertical Datum of 1929). The action area includes Wolf Creek Dam, Lake Cumberland, and those riverine, riparian, and upland habitats associated with the Cumberland River mainstem and its tributaries upstream of Wolf Creek Dam, that are subject to temporary and/or permanent inundation resulting from the historical operation of Wolf Creek Dam. In addition, the action area includes the portion of the Big South Fork occupied by duskytail darters upstream to BSFRM 66.5. While the upstream portions of the Big South Fork are not usually impacted by the Corps' operation of the Wolf Creek Dam, the Corps has proposed several conservation measures as part of their proposed action, which will occur within this portion of the Big South Fork. While the Service believes the overall outcome of implementing these measures will be positive on duskytail darters, there is the potential for minor, short-term adverse effects on duskytail darters and/or duskytail darter habitat due to implementation of these conservation measures. Therefore, it is appropriate to include the upper portion of the Big South Fork between Blue Heron and the uppermost duskytail darter occurrence at BSFRM 66.5 as part of the action area. A map depicting this action area is contained in Figure 1.

Project action

The construction of Wolf Creek Dam was completed in 1952 and was originally justified on the basis of flood damage reduction and hydropower production. The preferred method of releasing water is through hydropower turbines; however, spillway gates and/or sluice gates are also used when conditions warrant. In 1984, a Memorandum of Understanding (MOU) was signed, by the Corps, Department of Energy, Southeastern Power Administration (SEPA), and the Tennessee Valley Authority (TVA). The MOU directed the Corps to make daily water release decisions for Wolf Creek Dam and other hydropower projects within the Cumberland Basin reservoir system. Under this MOU, TVA continued to set the hourly generation schedule, but instead of TVA receiving all of the hydropower produced, it was now marketed to a group of utilities under the direction of SEPA. For purposes of this consultation, the period from 1984 to 2006 should be considered representative of historical lake operations, as this was the period that best represents how the project was being operated prior to the emergency draw-down initiated in January 2007 for the dam safety project.

The power pool for Wolf Creek Dam extends from the top of the conservation pool, which is at an elevation of 673 feet, up to an elevation of 723 feet. The flood control pool extends from an elevation of 723 feet to an elevation of 760 feet. There is a seasonal operating guide within the power pool called the "Power Marketing Band" (PMB). This operating zone was jointly developed by SEPA, TVA, and the Corps. The PMB starts the year ranging from an elevation of 682-700 feet and then gradually fills from February to mid-May when the elevation ranges from 710-723 feet. The PMB then gradually falls, beginning in mid-June, until it returns to elevations in the 682-700-foot range at the end of the year, prior to initiation of the flood season. The PMB is a non-binding operating guide that maximizes hydropower benefits, while also supporting

Figure 1. Wolf Creek Dam/Lake Cumberland Return to Historical Pool Level Operations Action Area



other operating objectives including flood control, water quality, water supply, and recreation, as well as other downstream uses dependent on the release of stored water through the summer and fall (e.g., navigation). The upper end of the PMB is referred to as the “Top SEPA Curve” throughout the rest of this biological opinion. Raising the pool elevation in Lake Cumberland in the late winter and early spring is a typical operation that balances the need to preserve storage volume during the traditional flood season, while capturing water for release during the summer and fall when natural river flows are not sufficient to meet water management operating objectives (e.g., minimum flows, navigation, etc.). Capturing cool, oxygenated water in the late winter and early spring also benefits water quality, fish, and other aquatic organisms in the lake.

The interim operating restriction implemented at Wolf Creek in 2007 was to operate for a year-round target elevation of 680 feet. In 2013, the operating restrictions at Wolf Creek were revised to allow the pool behind the dam to rise to elevation 705 feet to evaluate the barrier wall, which was a major safety component of the dam safety project that had been completed in March 2013. Following the evaluation period for the barrier wall, the pool was lowered from elevation 705 down to an elevation of 690 feet to support the remaining construction activity on the embankment section of Wolf Creek Dam. This construction is scheduled to be completed by March 2014. Therefore, the Corps proposes to cease the emergency operations that were initiated in 2007 and return Wolf Creek Dam to historical lake operations, with an intended

target elevation of 723 feet. The dam would be operated in accordance with the Corps' existing water control manuals; therefore, project purposes would be restored to pre-construction, pre-drawdown management.

Proposed Conservation Measures

The Corps has proposed the following conservation measures in the BA and supplemental BA information to minimize impacts associated with returning Lake Cumberland to historical lake operations. The conservation measures are, therefore, considered part of the proposed action and include the following:

1. **Capture and Hold:** This measure would involve a tiered implementation approach that focuses on capturing a portion of the affected duskytail darter individuals at 8 sites (i.e., sites 2-9 in the Corps' 2013 survey report) in the Big South Fork and holding them in a secure facility for a length of time that is estimated to last 5 to 10 years. The exact duration that duskytail darters would be held would depend on the duration of the Corps' post-project implementation monitoring of the occupied duskytail darter sites that would be adversely affected by the proposed action. This conservation measure includes specific tasks, described below, that provide flexibility in advance to pursue future conservation and recovery efforts for the duskytail darter if post-project implementation monitoring shows that all duskytail darter occurrences and suitable habitat at sites 2-9 are lost.
 - Tier 1 – Capturing and Holding Duskytail Darters: The elements of Tier 1 would be implemented in-full, as soon as conditions in the Big South Fork are favorable for capturing duskytail darters. Based on historical gauge data, favorable flow conditions for collecting duskytail darters will not typically occur until late August or September. The Corps and the Service believe that collection efforts will still be successful if they occur after Lake Cumberland is returned to historical lake operations, provided that this element of the conservation measure is carried out as soon as conditions become favorable, and after the raising of Lake Cumberland has commenced. Tier 1 would include: (a) capturing duskytail darters from sites 2-9, (b) holding captured duskytail darters at one or more approved facilities for the duration of the Corps' post-project implementation monitoring (c) propagating duskytail darters at levels necessary to maintain the captive population, and (d) maintaining the captive population for the duration of the monitoring period. Tier 1 will also involve conducting genetic analysis of duskytail darters from sites 2-9 and from the other sites within the Big South Fork to ensure that propagation and captive population maintenance efforts are scientifically-based and would promote the species' recovery and conservation. If monitoring indicates that duskytail darters and/or habitat at sites 2-9 are not declining or absent, implementation of Tier 2 will not be necessary, and the Corps and the Service will coordinate on the future disposition of the captured duskytail darters.
 - Tier 2 – Surveys for Potential Reintroduction Sites: Implementation of Tier 2 will be dependent on data obtained during the Corps' post-project implementation monitoring. If monitoring indicates that duskytail darters and/or habitat are

declining or absent at all of the occurrences in the Corps' 2013 Survey report), implementation of Tier 2 will become necessary. If the monitoring effort shows that duskytail darters and their habitat are stable or increasing at one or more of the occurrences at sites 2-9, implementation of Tier 2 will not be necessary, because the effect of the take potentially associated with the proposed action will have been minimized through the retention of the occurrence(s). If implemented, Tier 2 will include: (a) conducting surveys for duskytail darters at sites where the species is not currently known to exist in the Big South Fork and other Cumberland River tributaries that may contain habitat suitable for the species; (b) evaluating potential sites for reintroduction or population augmentation based on these surveys and recommendations resulting from the genetic analysis; (c) developing a reintroduction and population augmentation plan if suitable locations are identified; and (d) conducting reintroduction efforts based on the reintroduction and population augmentation plan.

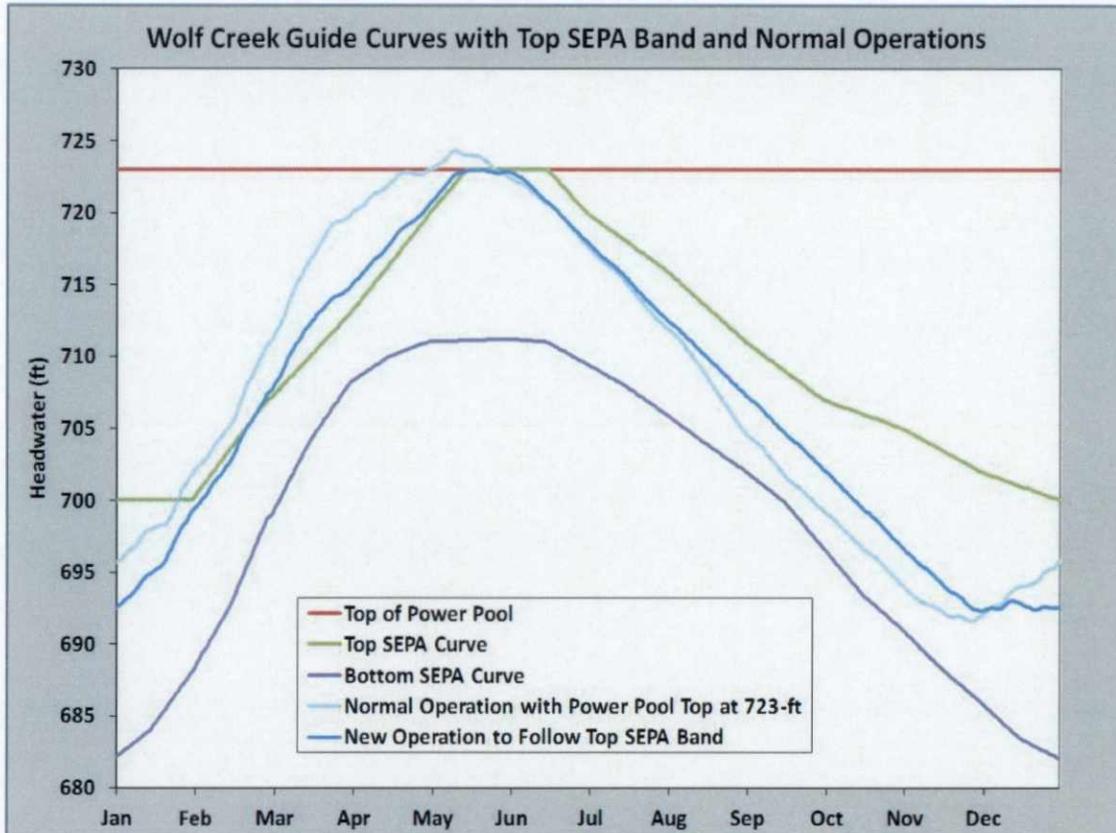
2. Water Quality/Habitat Improvement: The Corps will (a) remediate two acid mine drainages (AMD) on tributaries that drain to the Big South Fork and are within the range of the duskytail darter and (b) implement at least one sediment abatement/soil stabilization project that would reduce sediment levels in the portion of the Big South Fork containing the species. The AMD sites are located in the Laurel Branch area, which is upstream of Blue Heron (i.e., site 1 in the Corps' 2013 Survey report), and are contributing water to the Big South Fork containing a variety of chemical contaminants and metals and sediment into the reach of the Big South Fork occupied by duskytail darters. The Corps has assessed two sites (described below); however, other sites may be chosen if further field investigations indicate their remediation would provide equal, or greater, conservation and recovery benefits to the duskytail darter. The sediment abatement/soil stabilization project would be chosen from several potential trail crossing projects proposed by the NPS, a potential stream bank and coal spoil pile stabilization project located along the mainstem of the Big South Fork, or a similar proposed project that would have demonstrable benefits of reducing sediment sources in the Big South Fork and improving water quality for duskytail darters. Because all of these sites are located within the BSFNRRA, implementation of this conservation measure depends on NPS approval of the Corps' proposed Water Quality/Habitat Improvement projects.

- **AMD Site 1: Laurel Branch Stream Spoil (LBSS) Site** – The LBSS site contributes pollutants to the Big South Fork from diffuse discharges associated with historic deep mine spoil on the side-slope of the watershed. The mine spoil from this mining is located down-slope of an abandoned mining opening and includes a large section of spoil deliberately placed across the channel to be used as a bridge during active mining. The bridge foundation has washed away leaving mine residues in the channel and has created a waterfall on Laurel Branch that is approximately 20 feet high. Remediation recommended for this site would involve segregating the stream flow from the mine spoil by construction of a stable, lined stream channel to minimize infiltration of stream flow in the mine spoil. This would eliminate all but direct precipitation falling on the spoil.

- AMD Site 2: Laurel Branch Confluence (LBC) Site – The LBS site is approximately 800 LF downstream of the confluence of Laurel Branch and the Big South Fork. It consists of 1-2 acres of partially-vegetated spoil. The spoil extends down to the banks of the Big South Fork and are eroded into the river at times of high flow. Remediation at this site would include re-grading the spoil piles to compact and neutralize spoil material with lime, and segregating natural stream flow of a smaller unnamed tributary from the mine spoil with a lined interceptor channel.
 - Sediment Abatement: The BSFNRRRA has an active recreational component that includes a network of horse, mountain bike, and hiking trails. Points where these trails cross the Big South Fork and its tributaries can result in sources of sediment input. Many of the trails have become entrenched into the floodplain and funnel local runoff into the river, often scouring large sediment loads from the trail or roadbed. As part of its trail management planning, the NPS intends to harden as many of these stream crossings as possible to address both the relic impacts from the trail or road and to reduce the current effects caused by trail users. The NPS and Corps have identified several key stream crossings that would be suitable for sediment abatement based on the proximity of the site(s) to the reach of the Big South Fork that contains duskytail darters. The Corps has also identified several potential erosion control projects along the mainstem of the Big South Fork. These proposed projects would involve stabilizing existing coal mine spoil piles that are currently being eroded by the river. Other erosion protection sites within the duskytail darter's range in the Big South Fork will also be explored as long as the projects would have demonstrable benefits of reducing sediment sources in the Big South Fork and improving water quality for duskytail darters.
- 3. Interim Dam Adjustment:** In an effort to offset potential impacts while the water quality/habitat improvement conservation measure is being implemented, operations at the Wolf Creek Dam will follow, as much as conditions allow, the Top SEPA Curve during the filling cycle (Figure 2). The objective of the interim dam operation adjustment will be to follow the Top SEPA Curve during the fill cycle with an overall goal of reaching elevation 723 around the middle of May. During the fill cycle, the Corps will make operational adjustments that include 1) use of sluice releases or 2) full hydropower releases, rather than power peaking releases, when the pool elevation is in the power pool and above the Top SEPA Curve. Based on historical operations, the net long-term result is depicted in Figure 2.

Strict adherence to the Top SEPA Curve will not be possible due to the range of variability observed in project in-flows. The volume of runoff associated with large rainfall events in the Lake Cumberland watershed far exceeds the discharge abilities of Wolf Creek Dam due to physical discharge constraints. The combination of these factors will result in lake levels that are above the Top SEPA Curve elevations, and may

Figure 2. Wolf Creek Dam Guide Curves with the Top SEPA Curve and Normal Operations



result in lake levels entering the flood control pool. Conversely, during extended dry periods, the pool elevation may drop below the Top SEPA Curve, and the Corps' ability to reach the 723-foot elevation could be compromised. This is due in part to discharges normally made to meet reservoir system minimum flow and hydropower objectives.

As part of the Interim Dam Adjustment conservation measure, the Corps' water managers will maintain the pool elevation as close to the Top SEPA Curve as possible while still considering downstream flooding concerns and forecasted weather events. When the lake level is above the Top SEPA Curve, but within the hydropower pool, all efforts will be made to return the pool to the Top SEPA Curve using hydropower releases. However, in some cases, sluice releases may be necessary and will be undertaken in addition to releases through hydropower generation. As pool levels are drawn down to the Top SEPA Curve and still within the hydropower pool, reductions in releases will be implemented to smooth the transition and minimize navigation and hydropower impacts. Guidance in the Wolf Creek water control manual states that following a flood event, storage is recovered as quickly as possible based on downstream conditions in order to restore the capability to provide protection from future flood events. This guidance will be followed when lake levels enter the flood control pool.

STATUS OF THE SPECIES/CRITICAL HABITAT

Unless cited otherwise³, the following information was obtained from the Duskytail Darter Recovery Plan (USFWS 1994), the final listing rule for the species (58 FR 25758-25763, April 1993), and the Duskytail Darter 5-year Review: Summary and Evaluation (5-year review) (USFWS 2012).

Species/critical habitat description

The duskytail darter was listed as endangered on April 27, 1993. The species' current distribution is fragmented, but its historical range was likely more widespread within the upper Tennessee River and middle Cumberland River drainages of Kentucky, Tennessee, and Virginia. At the time of listing, the species was known from only four isolated stream reaches: (1) Little River (Blount County, TN), (2) Citico Creek (Monroe County, TN), (3) Big South Fork Cumberland River (Scott County, TN)⁴, and (4) Copper Creek/Clinch River (Scott County, VA). Two historical populations – Abrams Creek (Blount County, TN) and South Fork Holston River (Sullivan County, TN) – were considered to be extirpated. Since federal listing, the duskytail darter has been successfully reintroduced into Abrams Creek and the Tellico River. With the addition of these streams, the species now occupies a total of six, geographically-isolated stream reaches within the upper Tennessee and Cumberland River drainages. Critical habitat has not been designated for the species.

Taxonomy

When the recovery plan was completed in 1993, the duskytail darter was recognized as an undescribed member of the *Etheostoma flabellare* species group of the subgenus *Catonotus* (Page 1975, Page 2000). Soon after completion of the recovery plan, the species was described by Jenkins (1994) as *Etheostoma percnum*. Blanton and Jenkins (2008) examined morphological variation among extant and extirpated populations and concluded that *E. percnum* represented a species complex, consisting of four geographically isolated and morphologically distinct species. These included *E. percnum* (duskytail darter) from the Clinch River and Copper Creek (Tennessee River system in Virginia), *E. sitikuense* (Citico darter) from Citico Creek, Abrams Creek, and the Tellico River (Tennessee River system in Tennessee), *E. marmorpinnum* (marbled darter) from the Little River and South Fork Holston River (Tennessee River system in Tennessee), and *E. lemniscatum* (tuxedo darter) from the Big South Fork (Cumberland River system in Kentucky and Tennessee). Blanton & Jenkins (2008) based their conclusions on meristic, morphological, and pigmentation analyses that showed each of the four extant populations were morphologically diagnosable. The Service has not formally recognized these nomenclatural changes; therefore, the duskytail darter description, as published

³After 2008, published and unpublished literature typically refers to the Big South Fork population of the duskytail darter as the “tuxedo darter”, based on taxonomic work by Blanton & Jenkins (2008) as further described in the “Taxonomy” section of this biological opinion.

⁴ Although not referenced in the Recovery Plan or 5-year review, the Big South Fork population also occurs in McCreary County, Kentucky.

in 58 FR 25758 is the current taxon recognized under the ESA and the taxon covered for the purposes of this formal consultation.

Life history

The duskytail darter is a small (6.4 cm) member of the Family Percidae, with a straw to olivaceous colored body, a medium to dark gray top of head, and a dingy-white to pale-gray belly. It has 10 to 15 long dark vertical bars on the sides of its body, 38 to 48 (usually 40 to 45) lateral scales, and 17 to 20 (usually 18 to 19) dorsal spines and rays. It is difficult to determine the sex of non-breeding individuals in the field; however, during the breeding season, males are very distinctive. The head becomes dark and swollen and the humeral spot and lateral vertical bars are intensified. The first dorsal saddle and vertical bar form a dark yolk, and brilliant gold, fleshy knobs develop on the tips of the dorsal fin spines (Layman 1991).

The duskytail darter inhabits the edges of gently flowing, shallow pools (up to 120 cm in depth), eddy areas, and slow runs in usually clear water of large creeks and moderately large rivers. Snorkel observations in Citico Creek by Rakes *et al.* (1992) and in the Little River, Copper Creek and Big South Fork of the Cumberland River by Shute *et al.* (1993), indicate that the species is discriminatory about preferred microhabitat type, being found over heterogeneous mixtures of rock sizes from pea gravel, rubble/cobble, slab-rock, and boulder substrates. This preference for a mixture of various substrate sizes often results in patchy distributions. There may be locally dense clumps of individuals within a relatively short distance, and then long stretches where few specimens were observed.

The duskytail darter is insectivorous (Layman 1991). The youngest individuals consume microcrustaceans, midge larvae (Family Chironomidae), and sometimes large quantities of mayfly nymphs (Family Heptageniidae). Larger individuals are also mainly benthic insectivores but generally feed on larger prey items such as midge larvae, mayfly nymphs, microcrustaceans, and caddisfly larvae. The largest individuals sometimes feed on fish eggs (Layman 1991). Spawning generally begins in late April or early May and ends in June. Both males and females become mature at age one and rarely survive to age three. Prior to spawning, males choose and clean a spawning site under a rock. Eggs (23 to 150) are deposited by the female on the undersides of rocks and the male remains to guard the eggs. Males stay at the nest site, guard the eggs, and may spawn with multiple females.

Population dynamics

The following is a summary of the most-recent information on the population dynamics of the duskytail darter for each of the six geographic locations where it currently occurs:

Little River (TN): The duskytail darter was known from two sites in the lower Little River until Conservation Fisheries, Inc. (CFI) discovered a third site in 1999 (CFI 2004). Due to perceived population declines, CFI began captive propagation and augmentation of duskytail darters in the Little River in 2003, and over 100 duskytail darters were released above U.S. Highway 411 at that time (CFI 2004). The following summer, five individuals were found at the release site, including one individual resulting from natural reproduction. Since 2003, 719 propagated

duskytail darters have been stocked at three sites in the Little River. While efforts have been made to augment the population and expand the species' range upstream, it is too early to determine the success of these efforts (J.R. Shute 2014, pers. comm.). There are no specific data on population stability for this location, but observations by CFI indicate that the population is declining. There is no specific information on population size or variability for this location.

Citico Creek (TN): The duskytail darter continues to be considered stable or increasing in Citico Creek (Petty *et al.* 2011) and remains the source population for reintroductions into the Tellico River (Petty *et al.* 2011). Eggs taken from nests in Citico Creek are used to propagate young for the reintroduction efforts into Abrams Creek, and the Tellico River. In 2010, CFI stocked a total of 321 individuals into Citico Creek (Petty *et al.* 2011). In 2009 and 2010, 114 individuals and 35 nests were observed by CFI (Petty *et al.* 2011). In 2006, a total of 220 individuals and 24 nests were observed (Rakes and Shute 2007). From 1993-2002, annual abundance indices ranged from 2.0 to 7.85 fish per person-hour, and averaged 4.6 fish per person-hour (CFI 2003); although these indices provide a basis for a range of variation or abundance in this population, there is no specific estimate of population size for this location.

Abrams Creek (TN): In 1992, CFI began captive propagation and reintroduction of the duskytail darter into Abrams Creek, which is in the Great Smoky Mountains National Park, Blount County, Tennessee. Duskytail darter nests removed from nearby Citico Creek, which is isolated from Abrams Creek by Chilhowee and Tellico reservoirs, were reared in order to produce young duskytail darters for the reintroduction efforts. Between 1987 and 2003, a total of 3,430 duskytail darters were stocked into Abrams Creek (Shute *et al.* 2005). Monitoring conducted during the same time period revealed 433 observations of duskytail darters (Shute *et al.* 2005). From 1993 to 2002, annual abundance indices ranged from 0.5 to 1.74 fish per person-hour, with an average of 1.0 fish per person-hour (CFI 2003).

In 2007, the average annual duskytail darter abundance index was 12.1 fish per person-hour, the highest ever recorded (Rakes and Shute 2008). CFI has consistently observed evidence of natural reproduction in Abrams Creek since 1995 (Shute *et al.* 2005). Duskytail darters appear to be doing well above and below the Abrams campground area (J.R. Shute 2008, pers. comm.). Given steady increases in annual abundance indices and an expanding distribution in Abrams Creek, this population appears to be viable (Rakes and Shute 2008); however, there is no specific information on population size, stability, or variability for this location.

Tellico River (TN): In 2002, CFI began captive propagation efforts for duskytail darter introductions within the Tellico River designated as a non-essential population (NEP) (67 FR 52420-52428). Nests removed from nearby Citico Creek were reared to produce young for the reintroduction efforts. From 2002 to 2010, a total of 3,547 duskytail darters were reintroduced into the Tellico River (Petty *et al.* 2011). Natural reproduction was observed at two reintroduction sites in 2007 (Rakes and Shute 2008), and there is now evidence of natural reproduction and successful recruitment of new year-classes (Petty *et al.* 2011); however, there is no specific information on population size, stability, or variability for this location.

Big South Fork of the Cumberland River (KY and TN): Duskytail darters have consistently been observed in the Big South Fork since at least 1998. From 1993 to 2002, annual abundance indices ranged from 0.66 to 2.0 fish per person-hour, and averaged 1.3 fish per person-hour (CFI 2003). In 2005 surveys, CFI observed 28 individuals at three sites (CFI, unpublished field notes). Recent surveys have expanded the known range of the Big South Fork population to a 22.5-kilometer (km) (14 mile (mi)) reach of the river (Davis 2010), with the core population being located between Station Camp Creek and Blue Heron on the mainstem of the river (CFI 2003). Davis (2010) estimated the total population size as approximately 200 in 2008 and approximately 100 in 2009. Ninety percent of the Big South Fork population was found within a 7-km (4.3-mi) reach (Davis 2010). There is no specific information on population stability or variability for this location.

Copper Creek and Clinch River (VA): From 1993 to 2002, the duskytail darter was indirectly monitored while surveying for the yellowfin madtom in Copper Creek. During that time period, annual abundance indices in Copper Creek ranged from 0.33 to 2.22 fish per person-hour, with an average of 1.2 fish per person-hour (CFI 2003). In 2007, CFI observed 62 duskytail darters in Copper Creek above the VA Highway 627 Bridge (CFI, field notes). In a 2008 survey focused on duskytail darters, CFI observed 98 duskytail darters from approximately 19 km (12 mi) of lower Copper Creek (rkm 2.9 to 22.2 or rmi 1.8 to 13.8) (Rakes *et al.* 2009). In 2008, the duskytail darter numbers ranged from 0 to 8 fish per person-hour, and the range of the fish appeared to have contracted in both an upstream and downstream direction when compared with earlier studies (Rakes *et al.* 2009). In 2009, CFI observed one duskytail darter at Copper Creek rkm 22.4 (mi 13.9) (CFI 2009). There is no specific information on population size, stability, or variability for this location.

Status and distribution

Reasons for listing

In order to determine if listing was warranted for the duskytail darter, the Service assessed the best scientific and commercial information available regarding the past, present, and future threats faced by the species. The final listing rule specifically identified water quality deterioration resulting from siltation and other pollutants from poor land used practices, coal mining, and waste discharge as threats to the species. The final listing rule further states that the species' limited distribution also makes it vulnerable to chemical spills and other stochastic events. Because of the restricted distribution of the duskytail darter and its perceived vulnerability to a variety of threats, the species was listed as endangered.

While the final listing rule included a broad discussion of threats to the duskytail darter, a more comprehensive review was included in the Recovery Plan and 5-year review. These documents identified impoundments, water withdrawal, urbanization, coal mining, toxic chemical spills, siltation, improper pesticide use, and streambank erosion as threats to the duskytail darter. Of these, siltation, caused by excessive releases of sediment from activities such as agriculture, resource extraction (e.g., coal mining, silviculture), road construction, and urban development is considered the most significant (Waters 1995).

Rangewide trends

According to the 5-year review (USFWS 2012), the duskytail darter population was considered stable, as of 2011; however, based on observations by CFI, the Little River population appeared to be declining. No new information is available to indicate that the threats have increased for any of the duskytail darter populations.

New Threats

Physical habitat destruction resulting from a variety of human-induced impacts such as siltation, disturbance of riparian corridors, and changes in channel morphology continues to threaten the duskytail darter; however, no new threats have been identified.

Recovery criteria

The goal of the Duskytail Darter Recovery Plan (USFWS 1994) is to restore viable populations of the duskytail darter to a significant portion of its historic range and remove the species from the Federal List of Endangered and Threatened Species. The duskytail darter will be considered for reclassification to threatened status when the likelihood of the species becoming extinct in the foreseeable future has been eliminated by achieving the following criteria:

1. Three distinct viable populations exist, through protection and enhancement of the existing populations in the Little River, Blount County, Tennessee; Citico Creek, Monroe County, Tennessee; Big South Fork of the Cumberland River, Scott County, Tennessee; and Copper Creek and Clinch River, Scott County, Virginia, and successful establishment of a reintroduced population in Abrams Creek or other historic habitat or the discovery of an additional population.
2. Studies of the fish's biological and ecological requirements have been completed and the implementation of management strategies developed from these studies has been or is likely to be successful.
3. No foreseeable threats exist that would likely threaten the survival of any of the three aforementioned populations.

Although some progress has been made at addressing criterion 2 above, the 5-year review (USFWS 2012) states that none of the reclassification (i.e., downlisting) criteria have been met.

In addition, the criteria necessary to delist the duskytail darter have not been met yet (USFWS 2012), but are presented below for reference.

1. Through protection and enhancement of the existing population and successful establishment of reintroduced populations or the discovery of additional populations, five distinct viable populations exist.
2. Studies of the fish's biological and ecological requirements have been completed and the implementation of management strategies developed from these studies has been successful.

3. No foreseeable threats exist that would likely threaten the survival of any of the populations.

Previous Biological Opinions

Two previous biological opinions have been completed for the duskytail darter (Table 3):

- The first biological opinion was issued by the Tennessee Field Office (TFO) in 1996 for the emergency repair of Citico Creek Road and the associated stabilization of areas along Citico Creek on the Cherokee National Forest in Monroe, Tennessee. The TFO did not identify the number of individuals anticipated to be lost or the amount of habitat that would be disturbed, but instead indicated that the proposed action could have resulted in incidental take of the population in Citico Creek, but this did not occur.
- The second biological opinion was issued by the Virginia Ecological Services Field Office (VFO) in 2013 for a stream restoration and riparian buffer establishment project along Copper Creek in Scott County, Virginia. The VFO indicated that 12 duskytail darters could be incidentally taken as a result of elevated turbidity and sedimentation associated with that project.

Table 3. Previously-issued Biological Opinions for the Duskytail Darter.

Biological Opinion	Species	Take Amount	HABITAT	
			Critical Habitat Impacted	Amount of Habitat Adversely Affected
1996 – TFO	duskytail darter	Not specified	NA	Not specified
2013 – VFO	duskytail darter	12 individuals	NA	0
TOTAL		12 individuals	NA	0

Analysis of the species/critical habitat likely to be affected

This biological opinion considers the effects of the proposed action on the duskytail darter. Critical habitat has not been designated for the species; therefore, no critical habitat will be affected. The KFO has previously concurred with the Corps’ “may affect – not likely to adversely affect” determinations for the 23 species shown in Table 1 and the NLEB, and the designated critical habitat for three federally-listed mussel species shown in Table 2 and for the fluted kidneyshell in the Little South Fork. Therefore, those species and critical habitat areas will not be considered further in this biological opinion.

ENVIRONMENTAL BASELINE

Under section 7(a)(2) of the Act, when considering the “effects of the action” on federally-listed species, the USFWS is required to take into consideration the environmental baseline. The environmental baseline includes past and ongoing natural factors and the past and present impacts of all Federal, State, or private actions and other activities in the action area (50 CFR 402.02), including Federal actions in the area that have already undergone section 7 consultation, and the impacts of State or private actions that are contemporaneous with the consultation in process.

Status of the species within the action area

The Big South Fork is the largest tributary to Lake Cumberland where it originates in north-central Tennessee at the confluence of the New River and Clear Fork and flows northeast for 77 miles to join the Cumberland River near Burnside, Pulaski County, Kentucky. The entire free-flowing mainstem portion of the Big South Fork is located within the boundaries of the BSFNRRRA, which is operated by the NPS. The duskytail darter is only known to occur within the Big South Fork portion of the action area. Within this reach, duskytail darter only inhabits those areas that provide suitable habitat, which consists of gently flowing stream edges with a heterogeneous mixture of rock sizes (shoals). These shoals are often separated by hundreds of meters of long, deep, pools that are not expected to be utilized by duskytail darters and are not considered suitable habitat for the species.

Prior to implementation of emergency operations at Wolf Creek Dam in 2007, the species had been confirmed in at least 14 shoals, extending from Big South Fork River Mile (BSFRM) 66.5 downstream to BSFRM 45.1 at Blue Heron. Duskytail darters were present at Blue Heron (BSFRM 45.1) in 2005, which was prior to the draw-down of Lake Cumberland and represented the most downstream extent of their known distribution prior to the draw-down (Scott 2010).

The Corps’ 2013 survey evaluated all shoal complexes located between BSFRM 45.1 (i.e., the Blue Heron occurrence and site 1 of the survey) and BSFRM 34.4 (site 15) as potential areas for federally-listed and rare aquatic species. Site 1 (Blue Heron) was the most upstream shoal complex, whereas site 15 was the most downstream shoal complex surveyed. Survey sites were selected based on their potential to be affected by inundation under the return to historical lake operation levels and based on whether they were free-flowing during the period of reservoir draw-down (i.e., 2007 – present). New occurrences of duskytail darters were documented at seven new shoals (sites 2-8) and one previously documented site (Blue Heron, site 1). The occurrences observed at sites 2-8 expanded the number of known occurrences within the Big South Fork to 21 (Figure 3). The survey also identified site 9 as containing suitable duskytail darter habitat (Table 4), but no darters were observed at the time of the survey. Therefore, the Service estimates that duskytail darters occur, or are likely to occur, at 22 shoals within the Big South Fork.

Observed abundances were similar to those reported from previous surveys conducted by Eisenhour and Burr (2000) and CFI (2003) in upstream reaches, ranging from approximately 1 to 15 individuals at each shoal. The species may have also been present at site 9, because it was

Figure 3. Duskytail Darter Sites Discussed in the Corps' 2013 Survey Report.

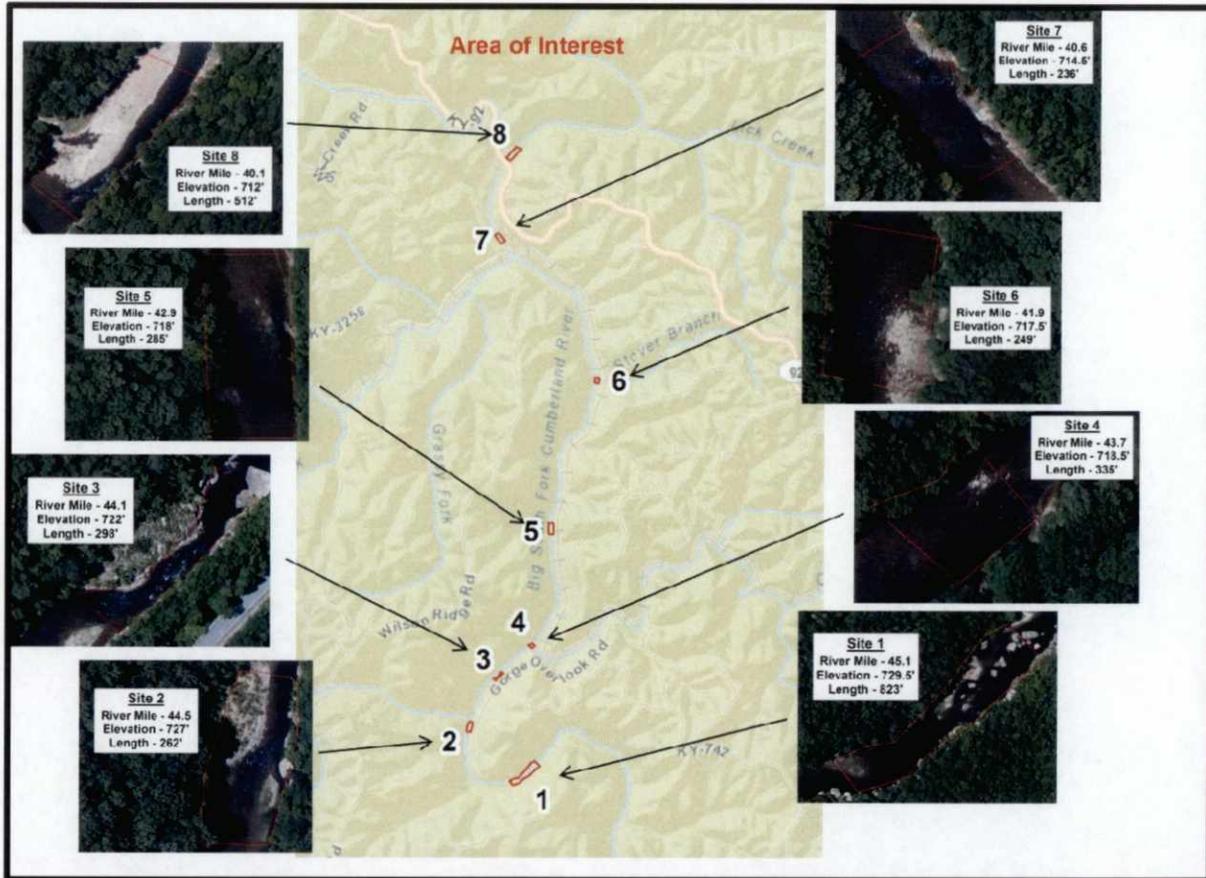


Table 4. Duskytail Darter Site Location Information for Sites 1-9.

Site	BSFRM	Elevation ⁵	Length (ft)
1	45.1	729.5	823
2	44.5	727.0	262
3	44.1	722.0	722
4	43.7	718.5	335
5	42.9	718.0	285
6	41.9	717.5	249
7	40.6	714.5	236
8	40.1	712.0	512
9 ⁶	39.1	707.0	765

⁵ The elevations used in this table are based on a 1930s streambed survey (USACE 1975).

⁶ Site 9 was considered suitable but unoccupied habitat in the Corps' 2013 survey report.

judged during the Corps' 2013 survey to be suitable habitat. However, the species was not detected at that site during the survey.

Factors affecting the species environment within the action area

The Big South Fork watershed has been impacted by coal mining, agriculture, domestic and industrial wastes, channelization, logging, and oil exploration (O'Bara 1982). According to the 5-year review (USFWS 2012), the Big South Fork and its tributaries continue to be impacted by forestry practices, municipal and domestic waste, agricultural runoff, oil and gas operations, and water withdrawal, all of which can adversely affect the species. However, the Service is not aware of any other Federal actions within the action area that would affect the species.

EFFECTS OF THE ACTION

Factors to be considered

This section includes an analysis of the direct and indirect effects of the proposed action on the species and its interrelated and interdependent effects. While analyzing direct and indirect effects of the proposed action, the Service considered the following factors:

- Proximity and distribution of the action – We describe the known species locations in relation to the action area and proposed action, where the proposed action will occur, and the likely impacts of the activities;
- Timing – We describe the likely effects in relation to sensitive periods of the species' lifecycle;
- Nature of the effects – We describe how the effects of the action may be manifested in elements of a species' lifecycle, population size or variability, or distribution, and how individual animals may be affected;
- Duration – We describe whether the effects are short-term, long-term, or permanent;
- Disturbance frequency – We describe how the proposed action will be implemented in terms of the number of events per unit of time;
- Disturbance intensity – We describe the effect of the disturbance on a population or species; and
- Disturbance severity – We describe how long we expect the adverse effects to persist and how long it would take a population to recover.

Proximity and distribution of the action

As stated in the environmental baseline, duskytail darters occupy habitat within the action area. The Service anticipates that seven occupied sites (sites 2-8) and one suitable, but potentially

unoccupied, site (Site 9) will be impacted by the proposed action. Site 1 (Blue Heron) was documented to have duskytail darters prior to the drawdown and is, therefore, not expected to be impacted by the proposed action. Site 1 has apparently not been adversely affected by historical lake operations based on the fact that the species has persisted at the site during both historical lake operations and during the period that emergency operations and its associated draw-down were in-effect.

The remaining 13 occurrences within the Big South Fork that are upstream of Blue Heron (site 1) are only expected to experience minor impacts as a result of implementation of the Capture and Hold conservation measure. Similarly, these areas may also experience short-term impacts that result from implementing the Water Quality/Habitat Improvement conservation measure due to short-term changes in water quality and increased sedimentation while projects associated with this conservation measure are being implemented.

Timing of the action

The Service believes the duskytail darter would be most vulnerable during the spring spawning period (late April through June). The Corps has indicated that, once the lake is returned to historical lake operations, lake levels will typically begin to return to an elevation of 723 feet in early spring, in order to capture spring precipitation. Therefore, water depths are expected to be higher, and inundated longer (altering current velocity), during the time that duskytail darters would be beginning to spawn. Because these changes in depth and inundation are likely to increase sediment deposition that would cover nest sites, smother eggs, etc., the Service expects alterations to spawning behavior that could lead to decreased spawning success as a result of the timing of the action.

Nature of the effect

Returning Lake Cumberland to historical lake operations is expected to impact duskytail darter individuals of all age classes by directly and indirectly harming and harassing individuals, indirectly causing the mortality of individuals, and by directly and indirectly altering occupied habitat. These effects are further described in the sections below on Direct and Indirect Effects.

Duration

Returning Lake Cumberland to the historical lake operation level is expected to result in long-term, cyclic, permanent effects to the duskytail darter and its habitat. Once the action is complete, the Corps will return to operating the Wolf Creek Dam and maintaining Lake Cumberland water levels to follow the PMB operating zone. This will mean that the greatest-impacting and most permanent effects will occur at the downstream occurrences at sites 7-9 and the least-impacting and less permanent effects will occur at the upstream sites 2-4.

Disturbance frequency, intensity and severity

The disturbance frequency, intensity, and severity are difficult to determine because these factors will vary throughout the life of the project and are dependent on the synergistic effects of the amount of water entering Lake Cumberland through its various tributaries (e.g., in-flows), climatic conditions (e.g., precipitation amounts and timing), and lake elevations over time and after the return to historical lake operations. However, the Service expects the following effects related to these factors:

Disturbance Frequency: Based on the hydrograph data provided by Corps (USACE 2014) that graphically represents the average effects of historical lake operations, the sites that contain or may contain the duskytail darter that are further downstream (e.g., sites 7-9) are expected to be exposed to the disturbance at a greater frequency than the frequency observed at upstream sites (e.g., sites 2-4). This is because (1) the downstream sites are at a lower elevation that is closer (numerically) to the normal pool elevation of 723-feet and will inundate before upper sites; (2) stream velocities at these locations will be significantly reduced or eliminated for much of the year; and (3) sediment should accumulate for a large proportion of the year at these sites due to reduced flows and increased water depths.

Disturbance Intensity: Hydrograph data provided by Corps (USACE 2014) also indicates that the sites that contain or may contain the duskytail darter that are further downstream (e.g., sites 7-9) are also expected to be exposed to the disturbance at a greater intensity than the upstream sites because (1) the water depth resulting from inundation will be greater at those sites; (2) stream velocities will be significantly reduced or eliminated for much of the year at those sites; and (3) historic sedimentation levels at these sites have been high (i.e., see the photographs in the Corps' BA showing sediment conditions on the river bank at these sites compared to upper sites). For example, site 8 would have an increased backwater depth (up to 7.8 feet) above the normal BSF River Stage for approximately 116 days (late March to mid-July) at the historical pool elevation of 723 feet (Figure 4). This is expected to have a significant impact on habitat and individuals at this location. In comparison, depth hydrographs provided in the BA indicate site 4 (Figure 5) would only have an increased backwater depth (up to 1.3 feet) above the normal BSF River Stage for approximately 24 days in late March to mid-July at the historical pool elevation of 723 feet, indicating that the disturbance at this site would be less intense than the disturbance at site 8.

Disturbance Severity: Hydrograph data provided by Corps (USACE 2014) also indicates that the sites that contain or may contain the duskytail darter that are further downstream (e.g., sites 7-9) are also expected to be exposed to the disturbance at a greater severity than the upstream sites, due to the increased level of inundation, the reduction or elimination of stream velocities, and an increased potential for sedimentation. According to the Corps' data, site 8 would have an increased backwater depth above the normal BSF River Stage for approximately 116 days, while site 4 would only have an increased backwater depth above the normal BSF River Stage for approximately 24 days at the historical pool elevation of 723 feet, indicating that the disturbance severity at site 4 would be less than the disturbance severity at site 8 (Figures 4 and 5).

A summary of the hydrograph data used to compare the disturbance frequency, intensity and severity at all sites is provided in Table 5. Table 5 shows that both the depth and duration of inundation increase in the downstream direction.

Table 5. Summary of Hydrograph Data (USACE 2014)

Site	Duration of Increased Inundation	Backwater Depth Above Normal
1	0	0
2	0	0
3	0	0
4	24 days	up to 1.3 feet
5	30 days	up to 1.8 feet
6	33 days	up to 2.3 feet
7	82 days	up to 5.3 feet
8	116 days	up to 7.8 feet
9	158 days	up to 12.8 feet

Figure 4. Site 8 Depth Hydrograph.

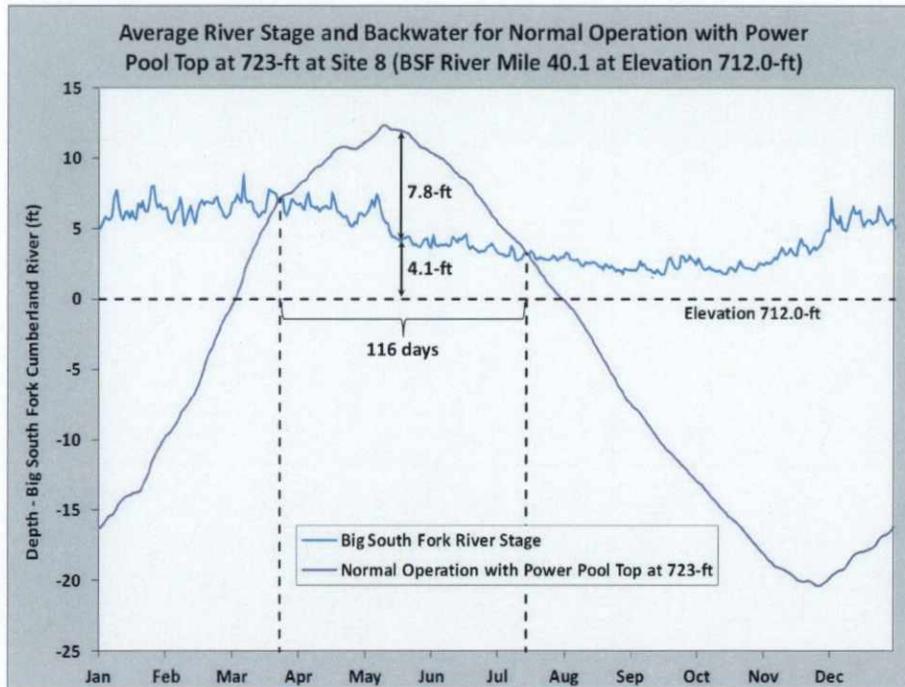
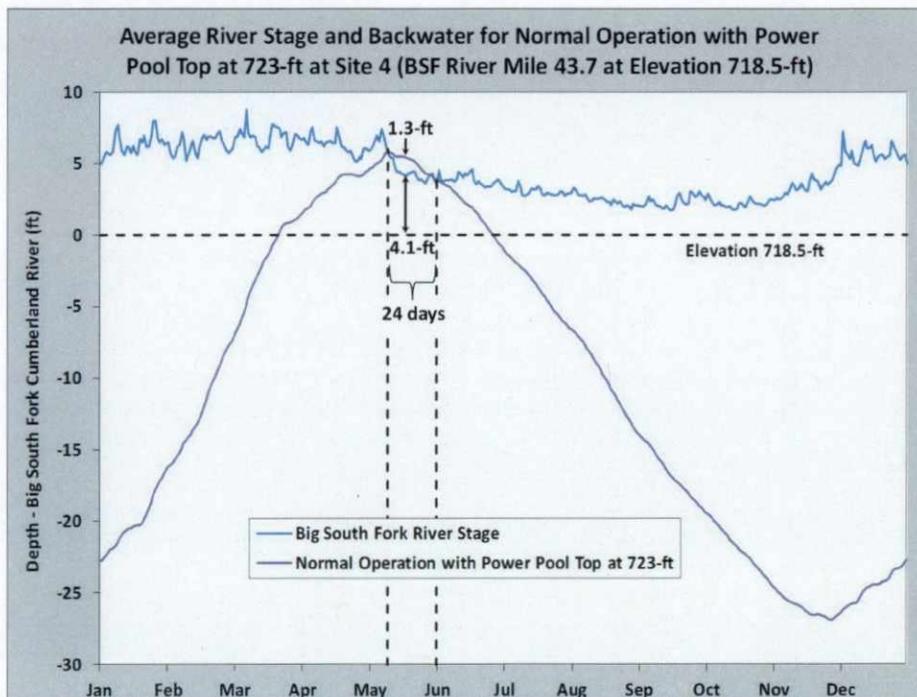


Figure 5. Site 4 Depth Hydrograph.



Direct Effects

Direct effects are considered the direct or immediate effects of the project on the species or its habitat. Direct effects from the proposed action are summarized in the paragraphs below:

Return to Historical Lake Operations

The Service does not expect any direct adverse effects on duskytail darters at site 1 or any of the occurrences upstream of site 1 in the Big South Fork. Conversely, the Service expects direct effects to occur at sites 2-9 and that those effects will follow an increasing downstream gradient, becoming more severe and permanent moving downstream from site 2 to site 9. This would mean that the effects would be most significant at sites 7-9, moderate to significant at sites 4-7, and minor to moderate at sites 2 and 3. While the information provided by the Corps' in Table 6 shows that there would be no increase in the duration of inundation and no increase in water level elevations at sites 2 and 3, this information is based on average historical data and, therefore, cannot accurately predict all potential water level scenarios under a return to historical lake operations. The Service anticipates that there will be periods that result in sites 2 and 3 being subject to increased duration of inundation and water level elevations, which are likely to result in direct adverse effects under a return to historical lake operations. These direct adverse effects would include harm and harassment of duskytail darters at sites 2-9 due to (a) temporary or near-permanent reductions in flow velocities and (b) sediment deposition onto suitable habitat areas.

Capture and Hold Conservation Measure

Direct effects to duskytail darters are likely to occur during implementation of the Capture and Hold conservation measure. During collection efforts at sites 2-9, duskytail darters could be trampled or crushed, resulting in injury or mortality, and some duskytail darters will be captured and retained. Duskytail darters at other sites within the Big South Fork (i.e., from site 1 upstream to BSFRM 44.1) are also likely to be directly affected while obtaining fin clips for genetic analysis. Duskytail darters at those sites could also be trampled or crushed, resulting in injury or mortality while being captured in order to obtain the fin clip. However, the act of fin clipping is only expected to cause minor harm and harassment of individuals and should not result in mortality (Dr. M. Floyd pers. comm. 2014). In addition, all work associated with fin clipping will be conducted by one or more qualified biologists that holds the appropriate State and federal permits and any take associated with this conservation measure would be attributable to the Scientific Collection Permit(s) of the collector(s).

Water Quality/Habitat Improvement Conservation Measure

Implementation of this conservation measure will not include work conducted in habitat that is suitable for duskytail darters. Therefore, no direct effects on the species are anticipated to result from implementation of this conservation measure. The conservation measure may have minor, indirect adverse effects on the species as described in the Indirect Effects section below.

Interim Dam Adjustment Conservation Measure

Following the Top SEPA Curve is expected to minimize the depth and duration of inundation, while also maintaining some velocity within the channel (Table 6). In order to follow the Top SEPA Curve, the Corps will adjust the timing and magnitude of releases from Wolf Creek Dam as necessary to keep water levels as close to the Top SEPA Curve as possible. The Corps has

historically kept Lake Cumberland well above the Top SEPA Curve during the late winter and early spring fill cycle and when weather conditions allowed, ensuring that power generation needs were met to the maximum extent practicable.

Based on the Corps' modeling predictions, following the Top SEPA Curve will be most advantageous at sites 7 and 8. Table 6 below shows the comparison between the proposed action and the proposed action with the implementation of the Interim Dam Adjustment conservation measure. These data show a 2-3 day reduction in flood duration at sites 4-6, a 10-day reduction at site 9, and a 3-4 week reduction at sites 7-8. The Service believes that the implementation of this conservation measure will reduce the depth and duration of extra water on some of the affected sites, thus minimizing potential harm and harassment of the species while the Water Quality/Habitat Improvement conservation measure is being completed. Therefore, implementation of the Interim Dam Adjustment conservation measure would need to be considered a temporary minimization measure, whereas the Water Quality/Habitat Improvement conservation measure would be considered a permanent minimization measure because it permanently fixes specific water quality problems in the Big South Fork.

Indirect Effects

Indirect effects are those effects that are caused by or result from the proposed action, are later in time, and are reasonably certain to occur. The Service believes that several aspects of the proposed action will result in adverse effects that may not be evident immediately after the lake is returned in historical lake operation levels, but are reasonably certain to occur. These adverse indirect effects are summarized in the following sections:

Return to Historical Lake Operations

The Service expects that adverse indirect effects will occur as the result of: (1) habitat-related effects resulting from historical lake operations that will, over time, change the habitat from a primarily free-flowing (e.g., lotic) aquatic system to a primarily-to-occasionally impounded (e.g., lentic) aquatic system, and (2) species-related effects on duskytail darters and their behavior that will occur as a result of the change from lotic to lentic habitat.

Habitat-related indirect effects are expected to result in changes to duskytail darter habitat caused by the following:

- Increased water depths;
- Increased duration of inundation;
- Decreased stream flow velocity; and
- Increased sediment deposition.

The Corps' hydrograph data has shown that the return to historical lake operation levels will result in increased water depth, longer periods of inundation, and decreased stream velocities at the affected sites. These impacts are all likely to increase the amount of sedimentation within the affected area, as indicated by the habitat descriptions provided in the Corps' 2013 survey report. Habitat descriptions indicated that sites 10-15 were demonstrative of the lasting effects of impoundment. Water stains were evident on boulders along the shoreline and sediment and detritus piles were common along the stream banks. Site 11, which has been affected by

Table 6. Comparison of Historical Lake Operations and the Interim Dam Adjustment Conservation Measure.

Normal Operation/Proposed Action						
Site #	# Days Average Lake Backwater is above River Stage	Average Depth from Lake during Backwater Period (ft)	Average Natural BSF Depth during Backwater Period (ft)	Increase in average depth during Lake backwater period (ft)	Percent Increase in average depth during Lake backwater period	Percent decrease in average channel velocity during Lake backwater period (see Note 1)
4	24	5	4.3	0.7	16%	15.1%
5	30	5.2	4.2	1	24%	20.7%
6	33	5.6	4.3	1.3	30%	25.0%
7	82	7.7	4.9	2.8	57%	39.5%
8	116	9	4.9	4.1	84%	49.3%
9	158	12.1	4.7	7.4	157%	65.8%

Top of SEPA Band Operation							
Site #	# Days Average Lake Backwater is above River Stage	Percent decrease in Lake backwater period as compared to normal operation	Average Depth from Lake during Backwater Period (ft)	Average Natural BSF Depth during Backwater Period (ft)	Increase in average depth during Lake backwater period (ft)	Percent Increase in average depth during Lake backwater period	Percent decrease in average channel velocity during Lake backwater period (See note 1)
4	22	8%	4.3	4.1	0.2	5%	5.0%
5	28	7%	4.7	4	0.7	13%	16.0%
6	30	9%	5.2	4	1.2	30%	24.7%
7	60	27%	7.1	4.4	2.7	61%	41.0%
8	90	22%	8.4	4.4	4	91%	51.2%
9	148	6%	10.8	4.4	6.4	145%	63.5%

Note 1 - Percent decrease in average channel velocity is based on average depths and assumes a 150 foot bottom width trapezoidal channel with 3H to 1V stream bank slopes.

periodic inundation during the draw-down period, silt covered the rocky substrate in the glide and pool habitats. The Service believes that sites 2-9, which are currently indicative of a free-flowing stream (USACE 2013), are likely to experience similar effects, but at varying degrees, once Lake Cumberland is returned to historical lake operations.

As previously stated, duskytail darters have specific habitat preferences, usually in clear, gently flowing water with shallow pools and a mixture of rock sizes (from pea gravel to boulder substrates). Therefore, these physical changes are expected to degrade the habitat quality at sites

2-9 with varying intensity. For example, the Service expects the return to historical lake operations to alter habitat at sites 7-9 to an extent that duskytail darters will no longer occupy these sites because of the significant amount of time these sites will be inundated (82 to 158 days) and the predicted increase in water depths (2.8 to 7.4 feet) at these sites, above baseline conditions. Sites 4-6 are expected to experience moderate changes in habitat, resulting from increased inundation for approximately one month; however, the predicted depth at these sites once the lake is returned to historical lake operation levels, is only slightly higher than the current conditions. However, we expect indirect effects at site 2 and 3 to be less severe, potentially resulting in only minor habitat changes, for shorter periods of time; therefore, potentially remaining suitable for the species throughout the year.

Species-related effects on the duskytail darter are expected to be caused by the following:

- Increased predation; and
- Increased sediment deposition.

The changes to duskytail darter habitat relating to increased water depths and duration of inundation are likely to create suitable conditions for predatory species such as sunfishes and basses (*Lepomis* spp. and *Micropterus* spp.) within the sites where duskytail darters occur. These species, especially larger individuals of sufficient size to prey on adult duskytail darters, are typically not abundant in areas inhabited by duskytail darters because these areas are typically shallow (M. Floyd pers. comm. 2014). Therefore, these species will become more likely to prey on duskytail darters under the return to historical lake operations because of the increased water depths that will occur seasonally and/or permanently at sites 2-9. While some level of predation is normal and can occur from sunfishes and other species, duskytail darters do not normally occur in deeper, pooled waters where such predators are more prevalent. Therefore, some predator-related mortality that is greater than duskytail darters would normally be subjected to is likely to occur as a result of the proposed action.

Activities that contribute sediment discharges into a stream system change the erosion or sediment deposition patterns, which can lead to the destruction of riparian vegetation, bank collapse, excessive in-stream sediment deposition, and increased water turbidity and temperatures. Sediment has been shown to abrade and or suffocate bottom-dwelling organisms by clogging gills; reducing aquatic insect diversity and abundance; impairing fish feeding behavior by altering prey base and reducing visibility of prey; impairing reproduction due to burial of nests; and, ultimately, negatively impacting fish growth, survival, and reproduction (Waters 1995). Wood and Armitage (1997) identified at least five impacts of sedimentation on fish, including (1) reduction of growth rate, disease tolerance, and gill function; (2) reduction of spawning habitat and egg, larvae, and juvenile development; (3) modification of migration patterns; (4) reduction of food availability through the blockage of primary production; and (5) reduction of foraging efficiency.

The Service believes that all of these indirect effects may occur as a result of the proposed action, and the indirect effects could result in mortality, harm, and harassment to individual duskytail darters and habitat degradation at sites 2-9.

Capture and Hold Conservation Measure

Indirect adverse effects are unlikely to result from implementation of this conservation measure, but it is possible that some duskytail darters that are collected and/or their offspring may be harmed or die while being held as part of this conservation measure. However, any take of these individuals would be covered by the Scientific Collection Permit(s) of the collector(s) and facilities that hold these fish.

Water Quality/Habitat Improvement Conservation Measure

The Service believes the Corps' proposal to remediate these sites would offset and minimize some of the water quality-related and sedimentation-related harm and harassment resulting from the proposed action and could, potentially, increase numbers and/or occurrences of the duskytail darter downstream of the sites where these conservation actions are implemented. Nonetheless, the Service expects that some minor adverse effects may occur as a result of the implementation of this conservation measure. In particular, minor adverse effects can result from short-term and temporary discharges of sediment and coal mining spoils associated with the remediation actions associated with this conservation measure. However, these potential adverse effects can and will be minimized through implementation of stringent erosion and sediment control measures and other efforts to reduce the downstream transport of water contaminated with sediment and AMD-related contaminants and chemicals.

Interim Dam Adjustment Conservation Measure

The Interim Dam Adjustment conservation measure is expected to have all of the indirect adverse effects identified in the *Return to Historical Lake Operations* section above; however, those effects will be reduced because the Corps' efforts to follow the Top SEPA Curve will reduce the elevation and duration of inundation at sites 2-9 to various degrees as summarized in Table 6. These reduced effects may be sufficient to maintain duskytail darters at the upper sites (e.g., sites 2-4) for the period that the Interim Dam Adjustment is being implemented, but they are not expected to preclude loss of the species at the lower sites, especially sites 7-9.

Beneficial effects

There are no wholly beneficial effects associated with the proposed project. However, several of the Corps' proposed conservation measures are intended to promote conservation and recovery of the species and are likely to result in long-term benefits to the species and its habitat. In particular, the Capture and Hold conservation measure would ensure that the effects of a stochastic event (e.g., significant contaminants spill) would not eliminate the Big South Fork population and would provide important genetic data that will assist with future management of the species in the Big South Fork. The Water Quality/Habitat Improvement conservation measure would help reduce sediment and the introduction of contaminants into the Big South, thus improving water quality and physical habitat conditions for the species. The Interim Dam Adjustment conservation measure will minimize the duration of inundation and reduce water elevations at some of the upstream sites (e.g., sites 2-4) and, in doing so, will encourage (but not ensure) maintenance of duskytail darters at those sites for a short period of time.

Interrelated and interdependent actions

An interrelated activity is an activity that is part of the proposed action and depends on the proposed action for its justification. An interdependent activity is an activity that has no

independent utility apart from the action under consultation. Based on the Service's review of the Corps' BA and associated documentation, there are no foreseeable interrelated or interdependent actions associated with this project.

Species' response to the proposed action

Numbers of individuals/populations in the action area affected

Eisenhour and Burr (2000) estimated that the Big South Fork duskytail darter population ranged between 300 and 600 individuals. In contrast, adaptive cluster sampling designs by Davis (2010) estimated the population within the Big South Fork at 200 individuals in 2008 and 100 individuals in 2009. Davis (2010) suggested that the Big South Fork population appeared to have declined during the two sampling years of his study but did not offer an explanation for the decline. Davis (2010) also suggested that the Big South Fork population may be larger due to low detectability and sampling inefficiencies (sampling methods using underwater observation are needed for this species to accurately estimate population size). Davis (2010) further clarified the issue, suggesting his results would be more accurately described as a census or estimated count rather than a population estimate. These population estimates (Eisenhour and Burr 2000, Davis 2010) did not include individuals from the 7 additional sites discovered during the Corps' 2013 surveys.

The 2013 surveys revealed abundances at each shoal ranging from 1 to 15 individuals, which is consistent with abundance data reported from previous surveys and recent BSF population information provided by Davis (2010). There are 21 shoals known to be occupied by duskytail darters, and 1 site presumed to be occupied (site 9) within the action area. Assuming there are 15 individuals at each shoal, the Service estimates the average number of individuals present within the action area to be 330 duskytail darters.

Species' sensitivity to change

The duskytail darter has specific habitat needs that consist of shallow pools and runs under substrates of various sizes (Davis and Cook 2010). More specifically, Davis and Cook (2010a) found that micro-habitat preferences are for slow-flowing, relatively shallow areas with an abundance of cobble- or small boulder-sized cover rocks. Duskytail darters have not been found further upstream of the known occurrences, possibly due to high-gradient rapids, or further downstream due to poor water quality and habitat conditions (Davis and Cook 2010). Further, models by Davis and Cook (2010) demonstrate a link between high quality habitat and population size. Therefore, it is reasonable to assume that the duskytail darter is highly sensitive to habitat change, particularly when it involves the anticipated changes to its preferred habitat type that are likely to result from the proposed action.

Species' resilience

There is no specific information to determine how resilient the duskytail darter will be to the proposed action. However, we do not expect the species to be resilient to the expected habitat alterations that will be caused by the return to historical lake operations, because the species has been shown to prefer shallow water habitats with constant flow and little or no sediment.

Species' recovery rate

Given what is known about the species' life history and habitat preferences, the Service believes it is likely that the species may recover at the sites that occur upstream (sites 2 and 3), because these sites may only experience temporary, short-term effects of inundation. This would allow the species to persist because the effects are expected to be minor and of shorter duration at the upper sites. Recovery is unlikely at the lower sites (sites 7-9) due to permanent habitat changes (e.g., increased water depths, sedimentation, low or zero flow) resulting from the effects of increased frequency and duration of inundation. It is unlikely that the species would be able to swim upstream to find suitable habitat under these conditions (P. Shute pers. comm. 2014) or that the habitat would return to suitable conditions at an interval that would support the species.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future state, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation under section 7 of the Act. While the Service's 5-year review for the species (USFWS 2012) indicates that the Big South Fork and its tributaries continue to be impacted by forestry practices, municipal and domestic waste, agricultural runoff, oil and gas operations, and water withdrawal, the entire Big South Fork population occurs within the BSRNRAA. Thus, any future State, local, or private actions that could potentially occur within the action area would require a permit or other authorization from the Corps and/or NPS and would require compliance with the consultation provisions of the ESA. The Service expects that the type of activities listed above will likely occur outside of the BSRNRAA, and could result in adverse effects to the duskytail darter by increasing sediment and degrading water quality; however, we cannot precisely predict the total extent and/or specific types of adverse effects that will occur. As a result, we are not aware of any other State, tribal or local actions to include under Cumulative effects.

CONCLUSION

After reviewing the current status of the duskytail darter, the environmental baseline for the action area, the effects of the proposed return to historical lake operations and the cumulative effects, it is the Service's biological opinion that the return to historical lake operations, as proposed, is not likely to jeopardize the continued existence of the duskytail darter. It is further determined that the proposed return to historical lake operations will not destroy or adversely modify designated critical habitat, because no critical habitat has been designated for this species; therefore, none will be affected.

The duskytail darter is considered stable within the Big South Fork, and throughout its range, with the exception of the Little River population, which appears to be declining. Prior to implementation of emergency operations at Wolf Creek Dam in 2007, duskytail darters were confirmed in at least 14 shoals within the Big South Fork. The Corps' 2013 aquatic species survey increased the number of occupied, or presumed occupied, shoals to 22. Although

individual duskytail darters and habitat are likely to be directly and indirectly adversely affected by the proposed action, a complete loss of the Big South Fork population is not anticipated. The Service expects 8 (sites 2-9) of the 22 occupied (or presumed occupied in the case of site 9) sites in the Big South Fork to experience indirect, adverse effects that could potentially result in a complete loss of duskytail darters and habitat at these locations. However, if all 8 sites are lost, no less than 14 occupied occurrences would persist within the Big South Fork. Further, the Service does not anticipate that any additional loss of habitat or duskytail darters is reasonably certain to occur as a result of cumulative effects.

The Corps has also proposed a number of conservation measures that, once implemented, would promote the survival and recovery of the species:

- a) The Capture and Hold conservation measure promotes the survival and recovery of the species, because collection and maintenance of some of the affected individuals will ensure that the entire Big South Fork population will not be lost during implementation of the proposed action. This conservation measure ensures that some of the affected duskytail darters will be conserved and, if necessary, used to re-populate the Big South Fork in the event of a stochastic event, such as a major contaminants spill or disease outbreak in the wild population. In addition, it also has the potential to increase the distribution of the species within the Big South Fork and/or other suitable streams by providing individuals that could be used in reintroduction and population augmentation efforts to further the species' recovery.
- b) The Water Quality/Habitat Improvement conservation measure will improve water quality and reduce sediment input in areas that are occupied by duskytail darters within the Big South Fork. The sites identified for remediation are contributing pollutants (i.e. metals, such as aluminum and zinc) and sediment to the Big South Fork, which would be reduced once remediation is complete. Stabilizing and providing erosion protection at the identified trail crossing or sediment reduction (i.e., spoil pile) projects will further reduce the sediments and other potential contaminants that are currently entering the Big South Fork in areas that are occupied by duskytail darters.

These improvements have the potential, over time, to allow the Big South Fork population of the duskytail darters to expand into areas that were not occupied or previously suitable for the species due to poor water quality and habitat conditions. If that were to occur, the duskytail darter's population size and distribution within the Big South Fork would increase, thus contributing to the recovery of the species.

- c) The Interim Dam Operation conservation measure will reduce potential adverse effects while the Water Quality/Habitat Improvement conservation measure is being implemented. This measure is expected to minimize the depth and duration of inundation at several of the sites, primarily sites 7 and 8, while also maintaining some velocity within the channel at the affected sites. Although this is an interim measure, the Service believes it contributes to the survival and recovery of the species in the short-term by potentially allowing duskytail darters to persist at the affected sites until other measures are implemented.

After considering the status of the duskytail darter within the Big South Fork and throughout its' range, the environmental baseline within the action area, and all of the effects of the proposed action (both adverse and positive), the Service believes that the species' reproduction, numbers, and distribution will not be appreciably reduced as a result of the proposed action. Therefore, the species can be expected to survive and potentially be recovered within the Big South Fork and the rest of its range.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation under section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by the Corps so that they become binding conditions of any grant, contract, or permit issued to an applicant, contractor, or permittee, as proper, for the exemption in section 7(o)(2) to apply. The Corps has the continuing duty to regulate the activity covered by this Incidental Take Statement. If the Corps (1) fails to assume and implement the terms and conditions or (2) fails to require an applicant, contractor, or permittee to adhere to the terms and conditions of the Incidental Take Statement through enforceable terms that are added to the grant, contract, or permit document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Corps must report the progress of the action and its impact on the species to the Service as specified in the Incidental Take Statement. [50 CFR §402.14(I)(3)]

AMOUNT OR EXTENT OF TAKE ANTICIPATED

The Service expects that much of the incidental take of individual duskytail darters will be difficult to detect because (a) the individuals are small and hard to locate; (b) finding dead or injured specimens during or following project implementation is unlikely; (c) the number of individuals within the action area at the time of project implementation will be unknown; (d) losses of duskytail darters may be masked by seasonal fluctuations in numbers or other natural

causes; and (e) most incidental take that could occur is expected to be non-lethal and undetectable.

The Big South Fork population has been estimated by the Service to support 330 individuals and by Eisenhour and Burr (2000) to be between 300 and 600 individuals, but there is no way of determining how many duskytail darters actually exist in the Big South Fork or will be present in the action area during project implementation. Based on this uncertainty, the Service believes that the amount of incidental take is best estimated by the total amount of duskytail darter habitat that will be impacted at sites 2-9, which is estimated at 9.38 acres of habitat. However, as part of this take, we expect all duskytail darters within the 9.38 acres of habitat to be harmed, harassed, and/or killed as a result of the proposed action, but the exact number of individuals that will be taken is not quantifiable for the reasons previously noted. Incidental take is summarized in Table 7 below.

The Service believes that (1) any incidental take that results from implementing the Water Quality/Habitat Improvement conservation measure will not be quantifiable; and (2) any incidental take associated with fin clipping at sites other than sites 2-9 will be covered by the Scientific Collection Permit(s) of the collector(s) that would be conducting the work associated with the Capture and Hold conservation measure. Therefore, an estimation of incidental take for these activities is not included in Table 7. There is no critical habitat designated for this species; therefore, none will be affected.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of expected take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measure (RPM) is necessary and appropriate to minimize the impacts of the incidental take of the duskytail darter:

Reasonable and Prudent Measure 1: Implementation of Conservation Measures

The Corps will coordinate with the Service to ensure the proposed conservation measures are implemented to provide the maximum benefit to the species and ensure that the anticipated level of take is not exceeded.

Table 7. Summary of Estimated Incidental Take of Duskytail Darters.

Site	Number of individuals	Type of Incidental Take as Previously Summarized in this Biological Opinion	Estimated Habitat Present (acres)
1	0	None	0
2	cannot be quantified	Mortality; harm and harassment; changes to or loss of habitat	0.77
3	cannot be quantified	Mortality; harm and harassment; changes to or loss of habitat	1.25
4	cannot be quantified	Mortality; harm and harassment; changes to or loss of habitat	0.96
5	cannot be quantified	Mortality; harm and harassment; changes to or loss of habitat	1.18
6	cannot be quantified	Mortality; harm and harassment; changes to or loss of habitat	1.05
7	cannot be quantified	Mortality; harm, and/or harassment; habitat loss	0.85
8	cannot be quantified	Mortality; harm, and/or harassment; habitat loss	0.96
9	cannot be quantified	Mortality; harm, and/or harassment; habitat loss	2.36
TOTAL	cannot be quantified		9.38

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the Corps must comply with the following terms and conditions, which carry out the reasonable and prudent measures, described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

Terms and Conditions Related to RPM 1 – Implementation of Conservation Measures

1. The Corps shall implement the return to historical lake operations as planned and shall provide the Service with either of the following which documents the Corps’ decision to return to historical lake operations: (a) written notification of the Corps’ intent to return to historical lake operations specifying the date such decision was made and the date that the return to historical lake operations will commence, or (b) a copy of the Corps’ decision documentation on the return to historical lake operations if such documentation contains the information identified in (a) of this Term and Condition.
2. The Corps shall develop a monitoring plan and associated monitoring protocols in coordination with the Service by June 23, 2014. The monitoring plan will evaluate the

effects of the return to historical lake operations on duskytail darters and duskytail darter habitat.

3. The Corps shall provide the Service with an annual summary report of monitoring that was conducted under the monitoring plan. The report shall be provided to the Service by February 15th of each year for the previous calendar year. The report shall contain the following minimum information:
 - a) A summary plot of daily lake levels (midnight), daily average releases (separated by hydropower, sluice, and spillway), and inflows for the previous calendar year,
 - b) A summary of the Corps' efforts related to the implementation of the RPM in this biological opinion,
 - c) A summary and photo-documentation of habitat conditions, as described and specified in the monitoring plan, that were observed during the Corps' monitoring efforts at sites 2-9 in the Big South Fork, and
 - d) A summary and photo-documentation of duskytail darter presence/absence and population levels that were observed during the Corps' monitoring efforts at sites 2-9 in the Big South Fork.
4. Monitoring will be conducted annually according to one of the following schedules:
 - a) a maximum of 7 years of monitoring or less if, during those 7 years, water level conditions meet or exceed the average hydrograph levels in the Big South Fork at sites 2-4 for at least 4 of the 7 years, or as may subsequently be identified in the monitoring plan; or
 - b) a minimum of 5 years of monitoring if, during those 5 years, water level conditions meet or exceed the average hydrograph levels in the Big South Fork at sites 2-4 for at least 3 consecutive years, or as may subsequently be identified in the monitoring plan.
5. A qualified biologist, which holds the appropriate State and federal permits, will collect duskytail darters from sites 2-9 and fin clips from other sites within the BSNRRA as may be sufficient to ensure that captive population of duskytail darters can be established at one or more Service-approved facilities and that a thorough genetic analysis is completed that will serve as the basis for holding and maintaining collected duskytail darters.
6. A genetic analysis will be conducted on collected duskytail darters so that a plan for maintaining the individuals can be developed and executed.
7. Duskytail darters will be held and maintained at one or more Service-approved facilities for the duration of the Corps' monitoring period.

8. If monitoring indicates that duskytail darters and/or habitat at sites 2-9 are not declining or absent, implementation of Tier 2 will not be necessary, and the Corps and the Service will coordinate on the future disposition of the captured duskytail darters. At that point, the Corps' responsibilities for implementing the RPM under this biological opinion can cease unless Term and Condition 18 has not been met.
9. If the duskytail darter monitoring at sites 2-9 shows that duskytail darters are not stable or increasing, as described and specified in the monitoring plan, at one or more of those sites at the end of the Corps' monitoring efforts, the Corps shall implement and/or fund the components in Tier 2 of the Capture and Hold conservation measure, which includes:
 - a) Surveys shall be conducted in the Big South Fork and other streams determined by the Service to be potentially suitable for the duskytail darter to (1) determine if duskytail darters are present, (2) evaluate the potential for introduction of the species into unoccupied habitat, and (3) evaluate the potential for population augmentation at sites found to already contain the species.
 - b) Based on the results of these surveys and evaluation efforts, a reintroduction and/or population augmentation plan will be developed to support the species' recovery that (1) creates new duskytail darter occurrences where no duskytail darters existed previously and/or (2) improves the viability existing populations through population augmentation.
 - c) The reintroduction and/or population augmentation plan will be implemented upon its completion in coordination with the Service and other necessary partners.
10. The Corps shall enter into a Memorandum of Understanding (MOU) with the Service and NPS regarding the remediation of the LBSS and LBC AMD sites on the BSFNRRRA. This MOU shall guide the parties' understanding of how and when the AMD remediation work will take place and outline the expectations of the parties.
11. The Corps shall implement and/or fund the remediation of the LBSS and LBC AMD sites, or other approved sites that provide equal or greater conservation and recovery benefits to the duskytail darter, on the BSFNRRRA upon receiving approval from the NPS and obtaining any other necessary authorizations and permits.
12. The Corps shall ensure that stringent erosion and sediment control measures are implemented, an erosion and sediment control plan is developed, and other necessary efforts to reduce the downstream transport of water contaminated with sediment and AMD chemicals are implemented, if any exist, to minimize the potential for indirect adverse effects on duskytail darters downstream of these project sites.
13. The Corps shall, in conjunction NPS and the Service, develop and implement a monitoring plan to assess the overall success of the AMD remediation projects on water

quality. The results of this monitoring will be forwarded to the Service as specified in the monitoring plan.

14. The Corps shall enter into a Memorandum of Understanding (MOU) with the Service and NPS regarding the remediation of two trail hardening sites or at least one sediment reduction project site on the BSFNRRRA that are in close proximity to and upstream of known duskytail darter occurrences. This MOU shall guide the parties' understanding of how and when the remediation work at these two sites will take place and outline the expectations of the parties.
15. The Corps shall implement and/or fund the remediation of the two trail hardening or one sediment reduction sites on the BSFNRRRA upon receiving approval from the NPS and obtaining any other necessary authorizations and permits.
16. The Corps shall ensure that stringent erosion and sediment control measures are implemented, an erosion and sediment control plan is developed, and other necessary efforts to reduce the downstream transport of water contaminated with sediment and other pollutants are implemented, if any exist, to minimize the potential for indirect adverse effects on duskytail darters downstream of the trail hardening or sediment reduction project sites.
17. The Corps shall, in conjunction NPS and the Service, develop and implement a monitoring plan to assess the overall success of the trail hardening remediation or sediment reduction projects on water quality. The results of this monitoring will be forwarded to the Service as specified in the monitoring plan.
18. If the duskytail darter monitoring at sites 2-9 shows that duskytail darters are stable or increasing at one or more of those sites at the end of the Corps' monitoring efforts, but remediation work associated with the Water Quality/Habitat Improvement conservation measure has been initiated but not been completed, the Corps shall complete the remediation work contemplated by Terms and Conditions 11 and 15 that has been initiated.
19. The Corps shall implement the Interim Dam Adjustment as part of its operations at Wolf Creek Dam so that the timing and magnitude of releases from the dam follow, as much as conditions allow, the Top SEPA Curve during the filling cycle as identified in the Corps' BA and supplemental BA information.
20. The Corps shall implement the Interim Dam Adjustment for a minimum of three years or will continue to implement the Interim Dam Adjustment until such time as the Water Quality/Habitat Improvement conservation measure is completed, whichever is longer.
21. The Corps shall notify the Service within 10 business days when the Corps makes an operational decision not to follow the Top SEPA Curve, such as during an emergency response or when water releases from Wolf Creek Dam would result in an unacceptable flood risk as determined by the Corps. This notification will be made via email to the

Service and will give the Service background information on why this course of action was taken. The Corps shall add the Service to their distribution lists for a summary of daily operations (Corps flowsheet) and event-based reservoir system updates which are prepared during high flow events.

22. The Corps shall provide the Service with a written analysis in the annual monitoring report of the likely effects to duskytail darters and duskytail darter habitat at sites 2-9 for each instance where operational decisions made it not possible to follow the Top SEPA Curve in any given year.
23. Upon locating a dead, injured, or sick individual of a duskytail darter or any other federally listed species, initial notification must be made to the USFWS Law Enforcement Office in Louisville, Kentucky (502-582-5989). Additional notification must be made to the KFO in Frankfort Kentucky (502-695-0468). Care should be taken in handling sick or injured individuals and in the preservation of specimens in the best possible state for later analysis of cause of death or injury.

The Service believes that no more than 9.38 acres of occupied habitat will be incidentally taken as a result of the proposed action. The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The Corps must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to use their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary (i.e., optional to the Corps with no obligation to carry them out) activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help carry out recovery plans, or to develop information. The following conservation recommendations are recommended in association with the Corps' proposal to return to historical lake operations at Wolf Creek Dam and Lake Cumberland:

1. The Corps should provide sufficient funding to Wolf Creek National Fish Hatchery to maintain duskytail darters for 10 years past the end of the Corps' monitoring period. This conservation recommendation would help ensure that individual duskytail darters are readily available for recovery actions and recovery-related research for a longer period of time than the actions associated with the RPM in this biological opinion.
2. The Corps should fund a study to determine if suitable habitat for duskytail darters can be created and maintained in the Big South Fork through in-stream manipulation of habitat

features (i.e., placement of boulders and flat rocks, and manipulating localized flow patterns).

3. The Corps should continue to work with the National Park Service to identify and fix sources of sediment and contaminants that negatively affect water quality in the Big South Fork and Lake Cumberland.

In order for the USFWS to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of the conservation recommendations carried out.

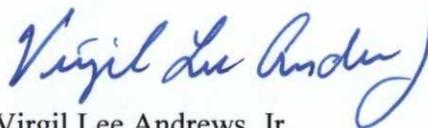
REINITIATION NOTICE

This concludes formal consultation on the action(s) outlined in the request. As written in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Corps involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the Corps' action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the Corps' action is later modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease until reinitiation of consultation is completed.

For this biological opinion, the incidental take would be exceeded when the take exceeds 9.38 acres of occupied habitat, which is what has been exempted from the prohibitions of section 9 of the ESA. The KFO appreciates the cooperation of the Corps during this consultation.

For further coordination on this project, please reference our project identification number FWS #2008-B-0075 and contact Ms. Carrie Allison of this office at 502-695-0468.

Sincerely,



Virgil Lee Andrews, Jr.
Field Supervisor

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