The Niangua Darter
(*Etheostoma nianguae*)
5-Year Review:
Summary and Evaluation

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5-YEAR REVIEW
Niangua darter (*Etheostoma nianguae)*

1.0 GENERAL INFORMATION

1.1 Reviewers

Regional Office: Carlita Payne, Midwest Region, 612-713-5339

Lead Field Office: Rick Hansen, Columbia, Missouri Field Office, 573-234-2132, ext. 106

Cooperating Field Office: NA

1.2 Methodology used to complete the review:

This 5-year review was prepared by Rick Hansen, U.S. Fish and Wildlife Service (Service) - Columbia, Missouri Field Office (CMFO). The October 4, 2007, Federal Register notice initiating the 5-year review (72 FR 56787-56788) requested new scientific or commercial data and information that may have a bearing on the Niangua darter's classification as threatened. New information considered in this review includes relevant information generated since the final listing rule and issuance of the July 12, 1989, approved recovery plan, published reports in peer-reviewed literature, various state and Federal grant reports, theses and dissertations by graduate students and data received from various state personnel through personal communication, electronic mail and letters. Mr. Hansen relied extensively on information from Craig Fuller and Doug Novinger of the Missouri Department of Conservation (MDC) and Hayden Mattingly, doctoral student at the University of Missouri, Columbia. We did not carry out formal peer review of this 5-year review because scientific uncertainty or controversy was not high. All literature and documents used for this review are on file at the USFWS Columbia, Missouri Ecological Services Field Office.

1.3 Background:

1.3.1 FR Notice citation announcing initiation of this review: The Service notified the public of initiation of the 5-year review in the *Federal Register* on October 4, 2007 (72 FR 56787): Notice of Review of Endangered and Threatened Wildlife and Plants; 5-year Reviews of Two Plant Species and Two Wildlife Species in the Midwest Region.

1.3.2 Listing History:
Federal Register Notice: 50 FR 24649
Date listed: June 12, 1985
Entity listed: Species
Classification: Threatened, with critical habitat

1.3.3 Associated rulemaking: Critical habitat was designated in Camden, Cedar, Dallas, Greene, Hickory, Miller, and St. Clair Counties in Missouri on June 12, 1985, concurrent with the determination of threatened status, at 50 FR 24649.

1.3.4 Review History: The Niangua darter was included in a cursory review of all species listed before 1991(56 FR 56882; November 6, 1991). The 5-year review resulted in no change to the listing classification of threatened.

1.3.5 Species Recovery Priority Number at start of review: 8
The recovery priority number of the Niangua darter is 8; indicative of a species with a moderate degree of threat and high recovery potential.

1.3.6 Recovery Plan:
Name of Plan: A Recovery Plan for the Niangua Darter (*Etheostoma nianguae)*
Date issued: July 17, 1989
Dates of previous revisions, if applicable: N/A

2.0 REVIEW ANALYSIS

2.1 Application of the 1996 Distinct Population Segment (DPS) policy

2.1.1 Is the species under review a vertebrate? Yes

2.1.2 Is the species under review listed as a DPS? No

2.1.3 Is there relevant new information for this species regarding the application for the DPS policy? No

2.2 Recovery Criteria

2.2.1 Does the species have a final, approved recovery plan containing objective, measurable criteria? Yes

2.2.2 Adequacy of recovery criteria

2.2.2.1 Do the recovery criteria reflect the best available and most up to date information on the biology of the species and its habitat? No

2.2.3 List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information

The recovery objective is to improve the status of the Niangua darter to the point that it will no longer require protection under the Endangered Species Act (Act). Although the 1989 recovery plan is not formatted with a specific recovery criteria section, the following recovery criteria must be met to accomplish the objective:

- the eight known populations must be made secure by reducing existing and potential threats to the greatest extent possible and population size is stable or increasing, and
- viable populations have been discovered or established in four additional stream drainages.

The criteria are partially met.

Progress towards Meeting Recovery Criteria

The recovery plan states that surveys of occupied and suitable streams must be done (USFWS 1989). If no additional populations are located, they will be established. A viable population is one in which recruitment is sufficient to maintain or increase the population size. All populations and their habitats will be monitored to detect changes. Occupied stream habitat will be protected by (1) review and modification of actions potentially adversely affecting these areas, (2) purchase or lease of important habitat, (3) habitat improvement actions, and (4) public education.

The first criterion is partially met based on the following:

Currently, the range of the Niangua darter is known to occur in Maries River, Big Tavern Creek, Niangua River, Little Niangua River, Pomme de Terre River, Brush Creek, North Dry Sac River, and Bear Creek. These are the populations to be secured under the first criterion. To date, several threats have been removed from the watersheds. Recovery actions over the years have improved the condition of the Niangua darter and its habitat. These continued actions are contributing towards securing the species in all eight populations (see 2.3.1.2, 2.3.1.6, 2.3.1.7, and 2.3.2.4).

The Missouri Department of Conservation (MDC) has been monitoring the Niangua darter for more than ten years (see 2.3.1.2). There are 29 fixed monitoring sites distributed among five major Osage River tributary watersheds: Little Niangua River (7), Maries River (7), Niangua River (5), Pomme de Terre (6), and Big Tavern Creek (6) watersheds. The monitoring shows that the numbers of Niangua darters have fluctuated in various streams but remain stable overall (see Fig. 1).

Starting in 2010, monitoring was conducted in half of the streams including the Little Niangua River, Tavern Creek, and the Sac River tributaries including Bear Creek, Brush Creek, and North Dry Sac River. In 2012 the MDC sampled in Niangua, Pomme de Terre, and the Maries Rivers.

The second criterion has not been met based on the following:

The Niangua darter has been found in other stream drainages, but its presence in these streams may be a result of better monitoring techniques since the earlier years of surveying. Our data is inconclusive, as it is difficult to determine whether viable

populations of Niangua darter have actually expanded into four additional stream drainages.

2.3 Updated Information and Current Species Status

2.3.1 Biology and Habitat

2.3.1.1 New information on the species' biology and life history:

There has been significant new information on the Niangua darter's biology and life history since 1985, when it was listed as threatened on June 12.

The Missouri Department of Conservation has been the leader in gathering Niangua darter life history information. In 1991, the multi-agency Niangua Darter Recovery Team was appointed by the Service's Director to direct and monitor recovery efforts. Additional research on the ecology of the Niangua darter was identified as one of the top priorities of the recovery team. Since several factors are known to pose threats to Niangua darter, some scientific experts have suggested that the fish may be naturally (historically) rare in the Osage basin (Mattingly and Galat 1998). In the early 1990's, MDC successfully propagated Niangua darter in captivity. Several adults were kept at MDC's Blind Pony Fish Hatchery as brood stock. It was decided not to release the captive-reared young to the wild until additional research was gathered about releasing to locations with wild stock.

2.3.1.2 Abundance, population trends (e.g., increasing, decreasing, stable), demographic features (e.g., age structure, sex ratio, family size, birth rate, age at mortality, mortality rate, etc.), or demographic trends:

The MDC performs annual monitoring surveys for the Niangua darter during mid-June through the end of September. MDC collects data with the objective of describing spatial and temporal trends in Niangua darter population densities and size structure, associated darter species diversity, and multi-scale habitat characteristics. Monitoring from 2002 until 2009 involved monitoring surveys in all 8 watersheds where the Niangua darter was known to occur.

Data collected during 2010 represented the ninth consecutive year of surveys at fixed monitoring sites (Novinger and Decoske 2010). MDC also provided an update of ongoing monitoring of several low-water crossing improvement projects that have been completed since 2004. Sampling at the low-water crossings evaluated both pre and post-road crossing improvements upstream and downstream of the crossings. The MDC surveyed five of eight watersheds where the Niangua darter occurs as part of the annual monitoring plan. MDC surveyed 29 fixed monitoring sites in the five watersheds inhabited by populations of the Niangua darter: Little Niangua River (n=7), Maries River (n=7), Niangua River (n=5), Pomme de Terre River (n=6), and Tavern Creek (n=6) watersheds.

MDC also surveyed sites associated with 12 low-water crossings, with a monitoring site established both upstream and downstream of each crossing. (Novinger and Decoske 2010). The data collected provides the number of Niangua darters observed in various streams, which supports overall stable populations sizes (Fig. 1). Although the Niangua darter has been observed in other streams, it's inconclusive whether darters found in those areas are the result of improved monitoring techniques or actual expansion into new watersheds.

The MDC found population densities of adult-sized Niangua darters as well as the number of monitoring sites occupied by Niangua darters had declined range-wide during 2010. Compared to previous years, counts of adult Niangua darters during 2010 totaled 176 compared to 278 during 2009 (Figure 1). In 2008, MDC observed 265 Niangua darters at 27 monitoring sites distributed among MDCs five annually monitored watersheds, which was a slight decrease in total numbers compared to 2007, but an increase in spatial distribution (293 Niangua darters in 22 sites). From 2002 to 2008, the populations of Niangua darter appeared to be stable or increasing with generally diverse size structures and relatively broad distributions (Novinger and Decoske 2008). The total number of Niangua darters observed was 99 in 2002, 129 in 2003, 175 in 2004, 288 in 2005, 244 in 2006, 293 in 2007, and 265 in 2008.

Monitoring in 2010 showed that the number of Niangua darters continued to be highest in the Little Niangua River (77 medium and large size class) and extremely low in the Niangua River (1 large class) in 2010. Fish community characteristics and species' associations with the Niangua darter remained constant throughout the study period linking Niangua darter with rich species assemblages.

There are weak but detectable longer-term declines in densities in the Little Niangua and Maries river watersheds. The recent decline in population numbers and distribution appeared to be correlated with high flows that have occurred frequently since 2008. The MDC's qualitative observations suggested that fine sediment concentrations were higher in many locations, particularly in Tavern Creek, compared to water quality conditions prior to 2008 (Novinger and Decoske 2008). Frequent precipitation and fluctuating flows have caused increased erosion and siltation that contributed to habitat degradation. High flows can negatively impact Niangua darter habitat quality or physiological ecology to cause declines in population densities and distribution, resulting in reduced reproductive success, displacement, and increased energetic costs.

Increases in Niangua darter abundance, percentage of occupied suitable habitat, percentage of non-pool habitat, and darter species richness were documented at all sites, particularly upstream of the low-water crossings that were replaced with piered structures. However, there is evidence that the movement of bedload downstream following low-water crossing replacements has had detrimental effects at some sites including reduced abundances of Niangua darters and darter

species richness (Novinger et al. 2008). The negative impacts will remain relatively low-level, localized, and will be amended through time as high flow events redistribute stream bed materials. The most significant benefit is improved sediment transport and stream channel stability, resulting in higher quality habitat for Niangua darters.

Research conducted at the University of Missouri's School of Natural Resources by Hayden Mattingly, PhD, entitled "Factors Affecting the Distribution and Abundance of the Federally Threatened Niangua darter, *Etheostoma nianguae* (Mattingly 1995) outlined a strategy with five objectives designed to identify factors affecting Niangua darter distribution and abundance. The first three objectives were designed to identify habitat variables on the stream, reach, and microhabitat scales that are significantly correlated with Niangua darter presence/absence and abundance. The fourth objective was to construct and subsequently validate empirical models that could predict Niangua darter presence/absence and abundance, given values for significant habitat variables. The fifth objective was to produce a synthesis of the implications of all results, including recommendations for management and recovery of the species. As a result of his research, Dr. Mattingly published "Distributional Patterns of the Threatened Niangua Darter, *Etheostoma Niangua*, at Three Spatial Scales, with the Implications for Species Conservation" (Mattingly and Galat 2002). He indicated that the maintenance of viable populations of Niangua darters will require protection of habitat quality in occupied streams. Also, those populations where human activities alter stream size, riffle spacing, gradient, bank erosion, water depth, and substrate composition in a direction away from optimal Niangua darter usage, are likely candidates of concern. Based on his research (Mattingly and Galat 2002), Dr. Mattingly models could be used to rank potential reintroduction to streams due to their relative stability for darter presence. Reaches and microhabitats within the stream would be evaluated prior to reintroduction, comparing statistical probability to those reported (Mattingly and Galat 1998). A similar ranking process also could be used to prioritize habitat improvement projects, land purchases, and conservation easements.

2.3.1.3 Genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding, etc.):

The Niangua darter population is comprised of isolated subpopulations as a result of habitat fragmentation. The primary factor causing habitat fragmentation is poorly designed low-water crossings that restrict Niangua darter movement. Upstream and downstream movement is crucial for maintaining populations in streams where local extirpation occurs as a result of environmental extremes (e.g., droughts and floods). In addition, isolation of subpopulations reduces or prevents gene flow, ultimately limiting genetic diversity. Small, isolated populations are vulnerable to genetic bottlenecks, genetic drift, and inbreeding, consequently reducing the species' ability to adapt to changing environmental conditions. Gene

flow among populations is key to preventing population declines (Frohauner 2009). Dr. Jeff Koppleman, geneticist for the Missouri Department of Conservation, evaluated the reduction or prevention of gene flow and genetic diversity in Niangua darter populations isolated by low-water crossings. (Jeff Koppleman, MDC, pers. comm. 2003)

2.3.1.4 Taxonomic classification or changes in nomenclature:

No change

2.3.1.5 Spatial distribution, trends in spatial distribution (e.g., increasingly fragmented, increased number of corridors, etc.) or historic range (e.g., corrections to the historical range, change in distribution of the species' within its historic range, etc.):

Four large hydroelectric and flood control reservoirs have been constructed in the Osage Basin. These are the Lake of the Ozarks on the Osage River, Pomme de Terre Reservoir on the Pomme de Terre River, Stockton Reservoir on the Sac River and the Truman Reservoir on the Osage River above Lake of the Ozarks. The four reservoirs have isolated the populations of the Niangua darter into five groups:

- the Maries River and Big Tavern Creek below the Lake of the Ozarks,
- North Dry Sac River above Stockton Lake
- Pomme de Terre River above Pomme de Terre Reservoir
- Brush and Bear Creeks below Stockton Lake
- Niangua River and Little Niangua Rivers above Lake of the Ozarks.

Pflieger (1978) found eight populations of the Niangua darter in the Maries River, Big Tavern Creek, Niangua River, Little Niangua River, Pomme de Terre and the Sac River including the Sac's tributaries Brush Creek and the North Dry Sac River**.** The recovery plan (USFWS 1989) indicated that the Niangua darter occurred in eight watersheds; Maries River, Big Tavern Creek, Niangua River, Little Niangua River, Pomme de Terre River, and Sac River tributaries (Bear Creek, Brush Creek and North Dry Sac River). The Bear Creek population was a new population since Pflieger's study in 1978. Map 1 shows the current and historic range of the Niangua darter.

2.3.1.6 Habitat or ecosystem conditions (e.g., amount, distribution, and suitability of the habitat or ecosystem):

Niangua darters live in clear, silt-free streams of the Osage River watershed in west central Missouri. Their habitats are limited to runs, riffles, and shallow pools. Mattingly and Galat (1998) found that Niangua darters do not occur in Osage tributaries that are greater than or equal to three stream orders in size. Their research also found that Niangua darters do not occur in Osage streams that

are persistently turbid. Niangua darters spawn at depths ranging from 10 cm to 25 cm and at velocities ranging from 69 cm to 100 cm per second.

Seasonal and age-class differences in macro- and microhabitat use by Niangua darters support a conservation strategy emphasizing the importance of maintaining habitat heterogeneity to ensure the ecological requirements of all life stages in a population are met. Size-structured differences in macro- and microhabitat use by Niangua darters support a conservation emphasis on maintaining habitat heterogeneity to ensure that the ecological requirements of the full ranges of ages in a population are met. These ecological requirements should also benefit the entire suite of darter species (Novinger and Decoske 2009).

The decline in Niangua darter populations appears to correlate with high flows that have occurred frequently since 2008. The qualitative observations suggested that fine sediment concentrations were higher in many locations, particularly in Big Tavern Creek. Frequent precipitation and fluctuating flows may have caused increased erosion and siltation that would degrade habitat quality. General reductions in darter species richness measured in all of the watersheds during 2009 and 2010 paralleled the declines in Niangua darter declines. The replacement of several low-water crossings has generally led to favorable changes upstream of the new cleared spans including increases in the abundance of Niangua darter, improvements in habitat quality such as increased non-pool habitat and particle sizes that would be expected to benefit the dater species and increased darter species diversity. There can be at least short-term negative impacts to darters and habitat downstream of crossings due to the transfer of accumulated fine sediment.

The Service's Partners for Fish and Wildlife Program has been working with private landowners in Missouri to restore habitat for the Niangua darter. Cost share projects funded in-stream structures to deflect stream current away from banks, tree planting and fencing to keep stream banks vegetated, and reinforcement of stream crossings for cattle and alternative water sources to keep cattle out of streams. The Partners for Fish and Wildlife Program worked with the U.S. Department of Agriculture's Natural Resource Conservation Service to compliment these measures by promoting rotational grazing systems, further reducing the impact from cattle on stream and water quality. Over the past 10 years, the program has worked with 22 landowners on 28 projects within the Niangua darter's range (Kelly Srigley Werner, USFWS-Missouri Private Lands Office, pers. comm. 2005). Habitat along Big Tavern Creek (critical habitat for the Niangua darter) was improved using $80,000 made available through the American Recovery and Reinvestment Act.

The MDC and the Service developed a study entitled "Priority Assessment of Low-water Stream Crossings within the Range of the Niangua Darter" (Novinger et al. 2008) to provide a prioritization process for improving low-water stream crossings to benefit Niangua darter. The range of the Niangua darter includes

stream systems with a vast number of road crossings, several of which are poorly-designed low-water crossings that pose a threat to recovery of the species. The approach was to identify the crossings that offered the most formidable barrier to benthic fish like the Niangua darter and to gauge the magnitude of the benefit that would be realized by improving the crossing based on proximity of Niangua darter records and the linear stream miles that would be reopened to unobstructed passage. The approach included creating a list of relevant crossings, collecting field data, developing a crossing database, creating a low-water crossing passage quality index, and scaling and weighting index variables. The priority ranking included 32 crossings.

To date, 11 low-water stream crossings have been replaced using several sources of funding including the Service's Fish Passage, compensatory mitigation for project impacts from the Missouri Department of Transportation activities authorized under Section 404 of the Clean Water Act (CWA), the Missouri Conservation Heritage Foundation's Stream Stewardship Trust Fund, the Service's Partners for Fish and Wildlife Program, the Federal Emergency Management Agency's federally declared disaster funds, the Osage River Basin State Wildlife Grant, and in-kind matching funds from counties within the range of the darter. In FY2011, the Service's Columbia Fish and Wildlife Conservation Office received National Fish Passage funding which was used to replace three additional low-water crossings. The Little Niangua River supports the largest numbers of Niangua darters. Therefore, between 2004 and 2009, replacement of low-water crossings in designated critical habitat areas on the Little Niangua River was a priority (Map 2). Of special note was the replacement of four low-water crossings with funding from the Missouri Department of Transportation's stream compensatory mitigation bank. Removal of four consecutive low-water crossings (Bannister Slab, Howard's Slab, Green Slab, Griswold Slab) in the Little Niangua River reopened 21.3 miles of important habitat for the Niangua darter [Figure 2 provides "before and after" improvement images of Bannister Ford (aka, Bannister Slab)].

2.3.1.7 Other:

Best Management Practices (BMP's) for the Niangua darter were developed through a collaborative effort by MDC and the Service (Figure 3). In addition, MDC developed a list of important Niangua darter spawning streams. The BMP's and spawning stream list is used by the Service, MDC, and other agencies to reduce impacts from various development actions on the species. Within these streams, it is recommended that no activities occur below the high bank from March 15 to June 15, the spawning season of the Niangua darter.

General habitat requirements and access to the Natural Heritage Data Base has been provided to the Kansas City District's Corps of Engineers (Corps) regulatory branch to facilitate informed decisions for nationwide and individual permits regarding project impacts to the Niangua darter under Section 404 of the CWA.

The Corps consults with the CMFO under section 7 of the Act when there is a potential "may affect" determination to the Niangua darter. The Corps provides measures to reach a "not likely to adversely affect" determination. In cases when there is a "likely to adversely affect" determination, formal consultation is initiated with the Corps.

Three Agricultural Nonpoint Source Special Area Land Treatment projects (SALT) occur within the range of the Niangua darter. The local soil and water conservation districts used funds from the SALT program to work with landowners to reduce soil erosion on crops, pastures and woodlands, and to target special technical assistance in priority watersheds. The Maries and Niangua River watersheds are two of these priority watersheds. A goal for the two watersheds is to improve water quality and aquatic habitat for Niangua darters through implementing technically and socially beneficial BMP's in three sub-basins in the Maries and the Niangua River watersheds. The projects will protect and restore riparian and in-stream habitats by providing in-stream cover and reducing stream sedimentation and bedload, reducing streambank erosion rates, regulating water temperatures, and filtering nutrients (Craig Fuller, MDC, pers. comm. 2009).

2.3.2 Five-Factor Analysis (threats, conservation measures, and regulatory mechanisms)

Threats include reservoir construction, introduced predators, increased sediment load, increased nutrient enrichment, stream channelization, in-stream gravel removal, and low-water road crossings that prevent fish passage.

2.3.2.1 Present or threatened destruction, modification or curtailment of its range or habitat: Dr. William Pflieger, (USFWS 1989), defined reservoir construction, general deterioration of stream habitat, and introduction of non-native fishes -- spotted base (*Micropterus punctulatus*) and rock bass (*Ambloplites rupestris*), as significant threats to the survival of the Niangua darter. The construction of four major reservoirs (Lake of the Ozarks, Pomme de Terre, Stockton, and Truman) adversely affected Niangua darter populations through inundation of stream habitat, stream reach fragmentation, and the introduction of predatory fish species from the reservoirs into tributary streams. Restriction of Niangua darter movements may affect gene flow and genetic diversity. Pfleiger also indicated that the accelerated conversion of woodlands to pasture caused increased sedimentation and nutrient enrichment to the streams.

Landowners continue to clear wooded areas (riparian and watershed) and convert these habitats to pasture. Destabilized soils and rock erode from the upper watersheds into Niangua darter habitat. Excessive removal of willows and other woody vegetation from the stream channel causes greater instability to the stream channel and results in increased water temperatures. Livestock are often allowed

to move freely into the streams, thereby contributing to streambank erosion and water pollution from their waste.

There are an estimated 50 low-water crossings within the range of the Niangua darter. These low-water crossings pose threats similar to that of reservoir construction, but on a smaller, more localized scale. Low-water crossings create barriers to the dispersal of Niangua darters between and among stream reaches of suitable habitat. Such crossings negatively affect populations of fish and other aquatic organisms by fragmenting populations, limiting movement to and from preferred habitat, restricting gene flow, and eliminating sources of recolonization when individuals become isolated. Poorly designed low-water crossings may also create degraded habitat conditions for some species by impounding water and sediment upstream, causing severe erosion and scouring downstream of these structures. Cumulatively, these problems represent a significant threat to benthic fishes such as darters that commonly inhabit small streams in the Ozarks and require moderately clear, flowing channels with clean substrates to persist.

Threats to Niangua darter, in addition to the threats described in the 1989 recovery plan, include:

- the destruction of habitat caused by the removal of sand and gravel from the stream channel
- degradation of stream quality caused by livestock grazing along stream banks and use of streams for livestock water sources
- barriers to the movement, including other aquatic life, created by poorly designed low-water crossings
- accumulating silt and gravel on the upstream side of low-water crossings and formation of plunge pools on the downstream side of bridges which changes the physical characteristics of streams
- fertilizer and pesticide run-off into streams from adjacent farm fields
- degraded water quality caused by waste from humans and livestock

The creation of reservoirs, which destroyed stream habitat and restricted movement of fish, led to the Niangua darter's initial decline. Continued deterioration of habitat due to low-water crossings, sand and gravel removal, loss of streamside vegetation, fertilizer and pesticide run-off, and waste from humans and livestock currently threatens the species existence. Over 95% of the Niangua darter's range is privately-owned, with cattle grazing being the predominant land use (Mattingly 1995).

2.3.2.2 Overutilization for commercial, recreational, scientific, or educational purposes: No new information has been received that would alter the findings made regarding overutilization at the time of listing. This threat factor was not an issue as concluded in the 1985 final rule listing (USFWS 1985).

2.3.2.3 Disease or predation: Non-native species such as rock bass, spotted bass (C. Fuller, pers. comm. 2009) and the largemouth bass (*Micropterus*

salmoides) may be predators. The log perch (*Percina caprodes*) is a potential competitor of the Niangua darter, often favored by reservoir construction.

2.3.2.4 Inadequacy of existing regulatory mechanisms: The Niangua darter is listed as threatened under the Act. The Act provides several tools to conserve the species. Section 7(a)(2) requires Federal agencies to consult with the Service to ensure any project funded, authorized, or carried-out by such agency does not jeopardize the continuing existence of a listed species, or result in the destruction or adverse modification of designated critical habitat for the species. Designated critical habitat for this darter is located only on private land in Miller, Dallas, Greene, Cedar, St. Clair and Camden counties in Missouri. Section 9 provides for direct protection of a federally-listed species by prohibiting "take" (i.e., to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct). Through section 10(a)(1)(B), the Service may allow incidental take with an approved Habitat Conservation Plan that minimizes and mitigates the effects of authorized incidental take. To date, a Habitat Conservation Plan has not been developed for the Niangua darter. Section 6 of the Act allows for cooperation between the Service and States in the management and funding of projects designed to enhance the conservation of federally-listed species. To date, a couple of Niangua darter conservation projects funded through section 6 purchased of a few parcels of private land for protection of the fish.

The Wildlife Code of Missouri, Rule 3 CSR10-4. 111 (MNHP 2014) also provides protection for Niangua darter. The species is listed as endangered under the State law. Protection is provided by prohibiting take of this darter (i.e., harm, harass, kill, transport, sale, barter, etc.), however, its habitat is not protected (MDC 2014a).

The Federal Clean Water Act affords some protections for Niangua darter. The U.S. Army Corps of Engineers issues permits for the discharge of dredged or fill materials into "Waters of the United States." This phrase is interpreted to include not only navigable waters, but also other defined waters that are adjacent or hydrologically connected to traditional navigable waters. Permittees must show that they have, to the extent practicable, taken steps to avoid wetland impacts, minimized potential impacts on wetlands, and provided compensation for any remaining unavoidable impacts. Because of the Niangua darter's Federal listed status, the Corps is required under section 7 of the Act to consult with the Service prior to issuance of a 404 permit to an applicant on a project that may affect the species. If the Act's protections were removed, section 404 of the CWA protections for conserving the Niangua darter would likely decrease significantly. Examples of actions that may affect the species and would be likely to occur if the Act's protections were removed include: excavation and placement of fill, such as riprap, directly in the active, flowing channel; and work occurring in the active channel during the species' spawning period. These actions could increase erosion and sedimentation resulting in decreased habitat quality and reproductive

success, and possibly result in direct mortality by burying or crushing due to fill being placed, or equipment operating in the channel.

The Kansas City District, Corps of Engineers administers section 404 of the CWA which regulates the placement of fill material into streams inhabited by the Niangua darter. Commercial sand and gravel operations continue to degrade and, in some cases, render unsuitable, the habitat of the Niangua darter. Unfortunately, most sand and gravel operations are not regulated under section 404 permits as a result of the "Tulloch II" rule which allows only de minimis (i.e., very small amount) material to enter into the streams (EPA 2008). As such, gravel bar scalping is not presently a regulated activity under section 404 because it occurs above the waterline. The Corps does however, regulate the operation through a general permit (NWKGP-34M) when the level of material that is returned to the stream is more than de minimis. General Permit 34 M limits dredging operations on exposed gravel bars within the range of the Niangua darter. Additionally, no dredging may occur below the ordinary high water mark of the stream during the spawning season of the species. The impacts to Niangua darter habitat have lessened considerably with the improvements of regulations under section 404 of the CWA. In-channel sand and gravel operations must also obtain a mine reclamation permit from the Missouri Department of Natural Resources (MDNR). There is no Federal nexus with MDNR's reclamation permit, so it has limited value in protecting the Niangua darter.

Through an interagency effort between the Service, EPA, Corps, MDC and, MDNR, most low-water crossings are regulated under Section 404. However, section 402 of the CWA governs National Pollution Discharge Elimination System (NPDES) permits for point sources. While this system is managed by EPA, most states, including Missouri, are authorized to implement the program. These permits require the use of best management practices to reduce pollutants to the maximum extent practicable. States are not required to consult with the Service regarding delegated programs, nor are they required to specifically consider the impact of permitted actions to the Niangua darter. The MDNR has a general permit for return wash water from sand and gravel operations that discharge materials back into the stream. The interagency effort promotes replacing low-water crossings with piered structures to re-establish fish passage. NPDES permits have some ability to control discharges of pollutants from waste water outfalls. If the Act's protections were removed, there would be no impact to the NPDES permitting process. With or without the Act's protections, the standards put in place through this permitting process likely benefit the species by providing protection to water quality.

As described above, protections for the species or consideration for the species' biological needs would be limited in the absence of the Act.

2.3.2.5 Other natural or manmade factors affecting its continued existence: Warming trends of climate change is a potential threat to Missouri's habitat. Climate change in the Midwest may result in precipitation becoming "more intense throughout the year" with more frequent flooding (Karl et al. 2009). Flooding of Ozark streams may lead to increased frequency and duration that likely would alter the gradient and substrate of the streams thus impacting the Niangua darter.

On the other hand, climate change may lead to increased frequency and duration of droughts (Rind et al. 1990; Seager et al. 2007; Rahel and Olden 2008). Climate change may decrease groundwater levels or significantly reduce annual stream flows (Moore et al. 1997). Increased drought conditions and prolonged low flows associated with climate change may favor the establishment and spread of non-native species (Rahel and Olden 2008).

The information currently available on the effects of global climate change and increasing variable temperatures does not make sufficiently precise estimates of the location and magnitude of the effects. Nonetheless, because the Niangua darter is totally dependent upon an adequate water supply, adverse effects associated with climate change that could significantly alter the quantity and quality of the range of the darter, will impact the species in the future.

2.4 **Synthesis**

The adult Niangua darter is a slender, yellowish-olive colored percid fish that is approximately 3-4 inches long. It displays eight prominent saddle bars along its back, orange spots scattered over the upper sides, a series of u-shaped greenish blotches alternating with narrow orange bars along its mid-side, and two small jet-black spots at the base of the caudal fin (which are distinguishable and significant to Niangua darters). The brilliantly colored breeding male has an orange-red belly and a series of iridescent blue-green bars along its sides. One of the bars crosses the base of the caudal fin, obscuring the two jet-black spots (USFWS 1989; MDC 2014b).

This darter inhabits clear, medium-sized streams draining hilly areas underlain by chert, dolomitic bedrocks in a few tributaries of the Osage River Basin of the Ozark Region in west-central Missouri (USFWS 1985). It prefers the margins of shallow pools with silt-free gravel or rocky bottoms. Spawning occurs on swift, gravel riffles. The Niangua darter's diet consists of aquatic insect larvae, crustaceans and snails, which are probed from crevices from the stream bottom (MDC 2014b)**.**

Threats to the survival of the Niangua darter include dam construction which has created barriers in the darter's habitat, fragmentation of its range, and escape blockage from streams that become polluted or altered; the straightening and widening of streams through highway and bridge construction which eliminates the small pools in which darters live; construction and other streamside activities such as clearing brush and gravel dredging which increases erosion and silt into the streams, disrupting the fish's habitat; and introduced predatory fish such as spotted bass and rock bass (USFWS 1997).

The recovery plan criteria which must be satisfied to ensure the Niangua darter no longer needs the protection of the Endangered Species Act have been partially met. Progress in removing threats is contributing towards securing the species in all eight populations, and the numbers of Niangua darters in the five major Osage River tributary watersheds remain stable overall under the first criterion -- *the eight known populations must be made secure by reducing existing and potential threats to the greatest extent possible and population size is stable or increasing*. However, no viable populations have been established or discovered in four additional stream drainages as required under the second criterion -- *viable populations have been discovered or established in four additional stream drainages.*

Although progress has been made toward improving the habitat conditions and conservation of Niangua darter, threats have not significantly diminished, and climate change represents a new, unknown threat. The conditions for achieving the recovery criteria have not been completely met. Niangua darter is still a threatened species -- defined under the Endangered Species Act of 1973 as "any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range." The listing classification of Niangua darter should remain as threatened under the Act.

3.0 RESULTS

3.1 Recommended Classification

___ Downlist to Threatened
___ Uplist to Endangered
___ Delist
_X_ No change is needed

3.2 New Recovery Priority Number: N/A (Retain recovery priority number 8)

Brief Rationale: The recovery priority number is unchanged because of the progress being made toward removing threats. This species continues to be subject to a moderate degree of threat with high recovery potential.

4.0 RECOMMENDATIONS FOR FUTURE ACTIONS

- Continue to provide technical assistance to landowners pertaining to the benefits of restricting livestock from streams inhabited by Niangua darters. Provide incentives to landowners for building fences, providing alternative water sources, and planting riparian vegetation to protect stream banks and prevent fertilizer and pesticide run-off into the streams.
- Cooperate with counties and the Missouri Department of Transportation in designing and constructing bridges and low-water crossings that eliminate passage barriers for the Niangua darter.
- Coordinate with the Corps of Engineers on activities requiring section 404 permits to develop a general permit and best management practices that will reduce impacts to the Niangua darter.
- Encourage FEMA to adopt a standard practice of replacing low-water crossing that avoid barriers for Niangua darters when providing funding for replacement of structures during a disaster declaration.
- Collaborate with MDC on their annual monitoring program, the identification and implementation of priority land acquisitions, and expand genetic and population studies. The MDC has developed a list of important Niangua darter spawning streams. It is recommended that no activities occur below the high bank from March 15 through June 15.
- Clarify ambiguous language and/or revise recovery criteria.

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U.S. Fish and Wildlife Service
5-YEAR REVIEW of Niangua darter *(Etheostoma nianguae)*

Current Classification: Threatened, with Critical Habitat

Recommendations resulting from the 5-year review

__ Uplist to Endangered
__ Delist
_x_ No change needed

Appropriate Recovery Priority Number: 8

Review conducted by: Rick L. Hansen, Columbia, Missouri Ecological Services Field Office

Lead Field Supervisor, Fish and Wildlife Service

Approve _____ Date 3-11-14

REGIONAL OFFICE APPROVAL:

Assistant Regional Director, Ecological Services, Fish and Wildlife Service, Midwest Region

Approve Lynn M. Lewis Date 3/28/14

Figure 1

Numbers of Niangua Darters by size class (Small, Medium, Large) observed during single-pass or the first pass of surveys in monitoring sites during 2002 to 2010.

	Year/Size class																											
Watershed	2002			2003			2004			2005			2006			2007			2008			2009			2010		
Site	S	M	L	S	M	L	S	M	L	S	M	L	S	M	L	S	M	L	S	M	L	S	M	L	S	M	L
Little Niangua																												
LNR000_00	0	2	3	0	3	5	24	12	14	19	21	11	14	37	17	18	23	49	12	15	52	0	76	16	32	16	16
LNR020	0	0	2	1	1	1	9	8	12	4	3	2	6	2	1	0	3	0	0	0	4	23	1	2	14	0	3
LNR025	0	2	4	1	0	9	0	2	10	5	21	18	1	5	1	0	8	22	0	0	6	0	12	7	1	7	12
LNR030_00	1	10	6	0	7	6	1	5	8	6	5	8	5	11	6	2	3	6	2	0	4	20	1	1	1	1	7
LNR040	0	2	0	1	4	2	2	5	1	20	4	5	0	1	2	0	1	10	0	0	1	1	0	0	-	-	-
LNR050	2	0	0	1	12	6	5	7	5	6	2	1	7	10	1	2	7	9	0	2	7	1	0	1	4	5	10
LNR060_00	2	6	4	1	6	1	0	0	0	0	2	2	9	10	3	7	27	8	0	6	7	0	0	3	0	0	0
Total	**5**	**22**	**19**	**5**	**33**	**30**	**41**	**39**	**50**	**60**	**58**	**47**	**42**	**76**	**31**	**29**	**72**	**104**	**14**	**23**	**81**	**45**	**90**	**30**	**52**	**29**	**48**
Maries																												
MAR000	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	3	0	0	1	0	0	0
MAR020	1	3	2	1	3	3	0	0	0	3	5	6	6	1	0	0	0	0	7	3	1	0	0	2	1	0	0
MAR040	0	1	1	0	0	1	0	0	0	0	0	0	1	1	0	0	1	0	4	8	5	2	0	4	0	1	3
MAR050_00	3	4	5	3	20	13	2	5	2	18	35	11	1	18	6	2	12	11	2	2	1	0	2	7	0	0	1
MAR060	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2	7	3	8	2	0	0	1	0	1
MAR070	0	0	0	0	0	0	0	0	0	0	1	7	1	3	3	0	0	0	0	7	2	0	0	18	0	0	1
MAR080	0	0	2	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	5	0	1	2
Total	**4**	**8**	**11**	**4**	**23**	**17**	**2**	**5**	**5**	**22**	**41**	**26**	**9**	**23**	**9**	**2**	**13**	**13**	**20**	**24**	**20**	**4**	**2**	**37**	**2**	**2**	**8**
Niangua																												
NIR000	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
NIR030	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0	1	0	0
NIR060_00	0	0	0	0	0	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	3	0	0	0
NIR070	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	0	0	0	0	0	0	0	0	0
NIR080	0	0	0	0	0	0	0	1	0	0	0	0	0	0	3	0	1	0	0	0	0	0	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**1**	**0**	**0**	**0**	**1**	**1**	**0**	**3**	**2**	**2**	**3**	**0**	**0**	**1**	**0**	**0**	**3**	**1**	**0**	**1**
Pomme de Terre																												
PDT000	0	0	5	0	1	5	0	2	1	0	0	0	0	2	0	0	0	6	0	3	7	0	3	5	2	2	7
PDT030	0	0	0	0	0	0	0	0	0	0	2	0	0	1	0	1	0	0	0	3	3	0	0	1	1	0	2
PDT040	1	1	1	0	0	0	3	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0
PDT050	0	0	0	0	0	1	0	0	4	1	0	0	0	0	1	0	0	0	0	0	2	0	0	0	-	-	-
PDT060	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	2	3	0	0	8
PDT090	0	0	0	0	0	0	0	2	1	0	0	0	0	2	6	1	0	4	0	8	21	0	8	16	0	0	5
Total	**1**	**1**	**6**	**0**	**1**	**6**	**3**	**4**	**6**	**1**	**2**	**0**	**1**	**5**	**7**	**2**	**0**	**10**	**0**	**14**	**38**	**0**	**13**	**25**	**4**	**3**	**22**

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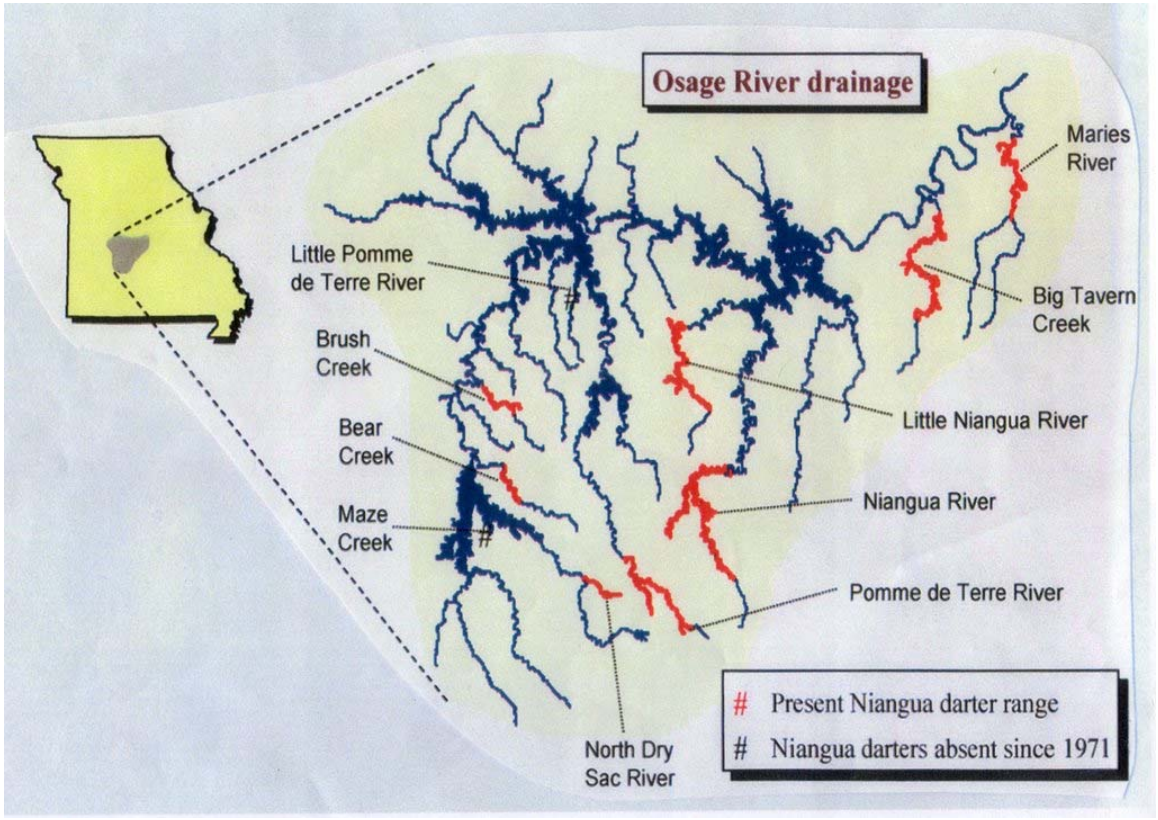
Table 3 continued.

Watershed	Year/Size class																											
	2002			2003			2004			2005			2006			2007			2008			2009			2010		
Site	S	M	L	S	M	L	S	M	L	S	M	L	S	M	L	S	M	L	S	M	L	S	M	L	S	M	L
Tavern																											
TAC020	0	4	7	0	0	7	2	0	1	2	1	1	0	0	1	2	1	0	1	2	2	7	2	3	1	0	0
TAC031				0	0	1	2	3	2	5	11	5	3	0	1	1	0	2	1	0	1	0	0	5	0	1	0
TAC040	0	0	0	0	0	1	0	2	3	1	1	1	1	7	6	0	0	2	0	0	0	0	0	4	0	0	0
TAC070	0	4	0	0	0	0	0	0	0							12	6	8	0	0	0	4	0	0	0	0	2
TAC080	0	4	2	0	0	1	1	0	1	0	1	1	1	6	6	1	0	5	0	2	17	0	2	0	0	0	0
TAC100	0	0	1	0	0	0	0	0	0	0	0	0	0	2	3	0	0	1	0	1	3	0	0	2	0	0	0
Total	**0**	**12**	**10**	**0**	**0**	**10**	**5**	**5**	**7**	**8**	**14**	**8**	**5**	**15**	**17**	**16**	**7**	**18**	**2**	**5**	**23**	**11**	**4**	**14**	**1**	**1**	**2**
Grand Total	**10**	**43**	**46**	**9**	**57**	**63**	**53**	**54**	**68**	**91**	**115**	**82**	**58**	**119**	**67**	**51**	**94**	**148**	**36**	**66**	**163**	**60**	**109**	**109**	**60**	**35**	**81**
Year Total			**99**			**129**			**175**			**288**			**244**			**293**			**265**			**278**			**176**

Map 1

Historic and Current Range of Niangua Darter



Map 2

Little Niangua River – Road/Stream Crossings

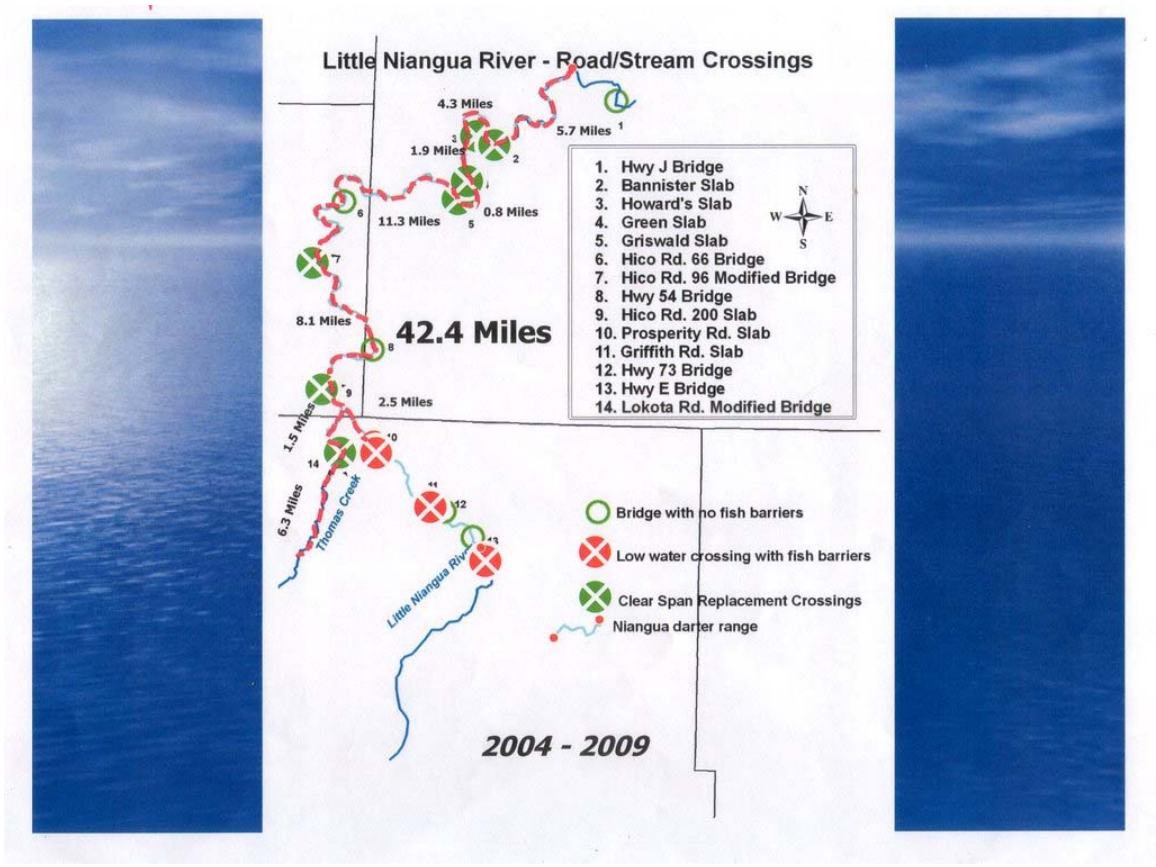


Figure 2

Low-Water Crossing Replacement on the Little Niangua River (Bannister Ford – aka, Bannister Slab)

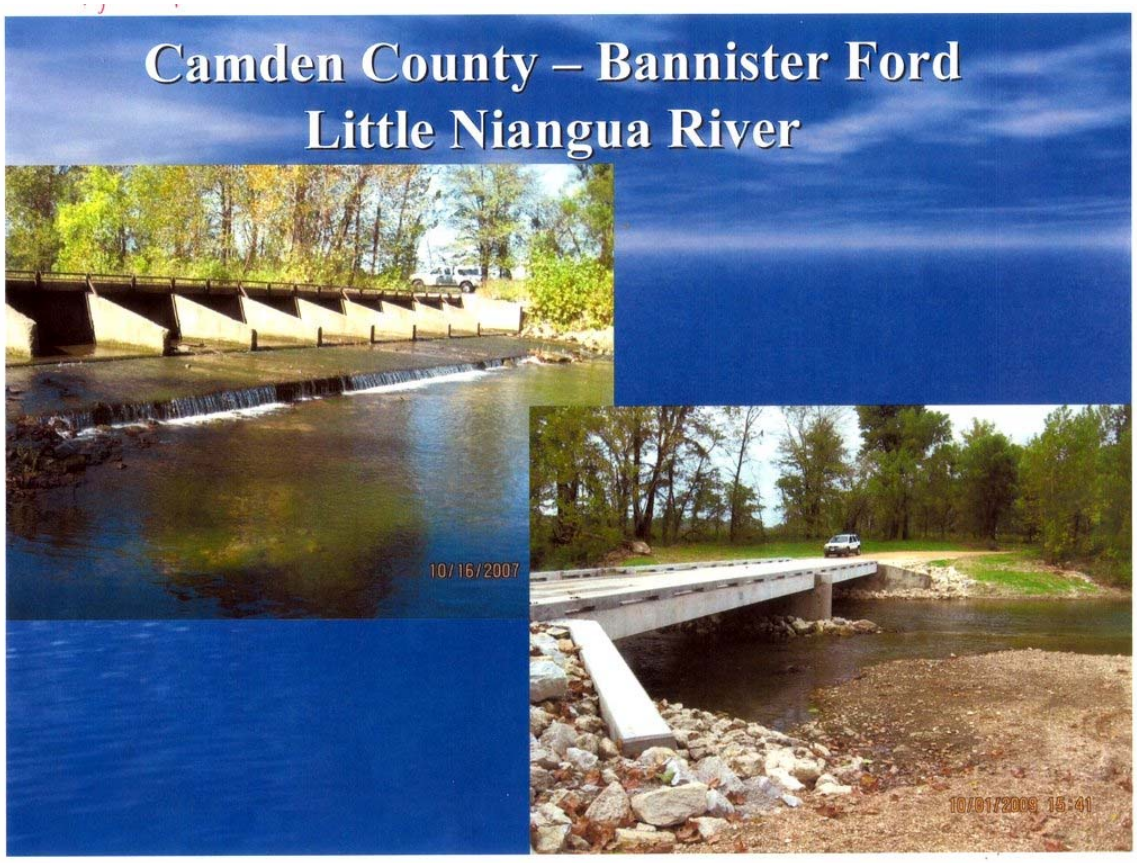


Figure 3 - Best Management Practices for the Niangua Darter

Best Management Practices

MISSOURI DEPARTMENT OF CONSERVATION

Niangua Darter

Etheostoma nianguae

Common name - Niangua Darter
Scientific name - *Etheostoma nianguae*
Federal status - Threatened
State status - Endangered

Ecology

Niangua darters are endemic only to southcentral Missouri. They inhabit clear upland creeks and small- to medium-sized rivers with slight to moderate currents. They require continuously flowing streams with silt-free gravel and rock bottoms. Niangua darters are found most of the year in shallow pools, margins, and stream runs. Prior to spawning, they move from pools and slow runs to gravel riffles. The spawning season runs from mid-March to early June, but most of the breeding occurs in April. Adults are commonly 2.6-4.4 inches in length. Niangua darters eat the nymphs of stoneflies and mayflies and other aquatic insects.

Reasons for Decline

The Niangua darter has never been abundant nor widespread in distribution. Although historically it occurred in several rivers throughout southcentral Missouri, most populations have been declining for the past several decades or have already disappeared. Declines in Niangua darter numbers are primarily due to habitat loss from reservoir and bridge construction, stream channelization, and increased sediment in streams. Current threats to Niangua darters include improper and untimely gravel and sand removal, loss of stream side vegetation, fertilizer and pesticide run-off, increased nutrification from livestock and human waste, and increased competition and predation from introduced fish species.

Specific Recommendations

The Niangua darter is a valuable indicator species because it appears to be quite sensitive to changes in stream habitat. Local Niangua darter populations are quick to respond to stream degradation, especially increases in silt and nutrient loads. Practices that stabilize and improve Niangua darter habitat will benefit numerous other aquatic species.

- Project activities should not occur below the high bank of the stream between March 15 and June 15.
- Sheet piling used to construct coffer dams for bridge piers may be placed after June 15 and should be removed before the following March 15. Removal of the sheet piling should be coordinated with appropriate Missouri Department of Conservation personnel.
- Dams and impoundment structures should not be constructed in streams where this species occurs.

General Recommendations

Refer to Management Recommendations for Construction Projects Affecting Missouri Streams and Rivers.

Information Contacts

For further information regarding regulations for development in rivers and streams, contact:

Missouri Department of Conservation
Policy Coordination Section
P.O. Box 180
2901 W. Truman Blvd
Jefferson City, MO 65102-0180
Telephone: 573/751-4115

Missouri Department of Natural Resources
Division of Environmental Quality
P.O. Box 176
Jefferson City, MO 65102-0176
Telephone: 573/526-3315

U.S. Army Corps of Engineers
Regulatory Branch
635 Federal Building
Kansas City, MO 64106-2896
Telephone: 816/389-3990

U.S. Environmental Protection Agency
Water, Wetlands, and Pesticides Division
901 North 5th Street
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Ecological Services Field Office
101 Park DeVille Drive, Suite A
Columbia, MO 65203
Telephone: 573/876-1911