Speckled Pocketbook
(Lampsilis streckeri Frierson 1927*)*

5-Year Review:
Summary and Evaluation

U.S. Fish and Wildlife Service
Arkansas Ecological Services Field Office
Southeast Region

5-YEAR REVIEW
Speckled Pocketbook (*Lampsilis streckeri* Frierson 1927)

I. GENERAL INFORMATION

A. Methodology used to complete review

This review was completed by the U. S. Fish and Wildlife Service's Arkansas Field Office. Literature and documents on file at the Arkansas Field Office were used for this review. All recommendations resulting from this review are a result of thoroughly reviewing all available information on the speckled pocketbook and the reviewer's expertise as one of the leading experts on this species. Comments and suggestions regarding the review were received from Arkansas Field Office supervisors and three peer reviews from outside the Service by Bill Posey, malacologist for the Arkansas Game and Fish Commission; Dr. Alan Christian, Assistant Professor for Arkansas State University; and Dr. John Harris, Assistant Chief of the Environmental Division for Arkansas Highway and Transportation Department. No part of the review was contracted to an outside party.

B. Reviewers

Lead Region – Southeast Region: Kelly Bibb, (404) 679-7132

Lead Field Office – Conway, Arkansas: Chris Davidson, (501) 513-4481

Cooperating Field or Regional Office(s) - None, speckled pocketbook only occurs in AR.

C. Background

1. **Federal Register Notice initiating this review:** July 26, 2005. Endangered and Threatened Wildlife and Plants; 5-Year Review of 13 Southeastern Species. (70 FR 43171)

2. **Species Status:** Increasing (2005 Recovery Data Call); Stable (2006 Recovery Data Call)

3. **Recovery Achieved:** 3 = 51-75% recovery objectives achieved (2006 Recovery Data Call)

4. **Listing History**
   Original Listing
   FR notice: 54 FR 8339
   Date listed: February 28, 1989
   Entity listed: Species
   Classification: Endangered

5. **Review History**
Status Reviews

Clarke, A. E. 1987. Status survey of *Lampsilis streckeri* Frierson (1927) and *Arcidens wheeleri* (Ortmann and Walker 1912). A report to the U. S. Fish and Wildlife Service. 24pp. plus field notes.

Harris, J. L., P. J. Rust, A. C. Christian, W. R. Posey II, C. L. Davidson and G. L. Harp. 1997. Revised status of rare and endangered Unionacea (Mollusca: Margaritiferidae, Unionidae) in Arkansas. Journal of the Arkansas Academy of Science 51:66-89.

6. **Species' Recovery Priority Number at start of review**: 8

7. **Recovery Plan or Outline**
Name of plan: Speckled Pocketbook Mussel (*Lampsilis streckeri*) Recovery Plan.
Date issued: January 2, 1992

II. REVIEW ANALYSIS

A. Application of the 1996 Distinct Population Segment (DPS) policy: Not applicable. The speckled pocketbook mussel is an invertebrate, and therefore, not covered by the DPS policy, and will not be addressed further in the other DPS questions in this review.

B. Recovery Plan and Criteria

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

2. **Adequacy of recovery criteria.**

a. Does the recovery criteria reflect the best available and most up-to-date information on the biology of the species and its habitat? No
The objective of this plan is to reclassify the speckled pocketbook mussel, *Lampsilis streckeri*, from endangered to threatened status. The speckled pocketbook may be reclassified when:

(1) four additional populations are discovered or reestablished,
(2) all five populations are viable and the habitat fully protected, and
(3) viable population levels are maintained for a period of at least 20 years.

The recovery criteria for reclassification are stringent considering that only five stream populations are known from historic literature and the species is endemic to the Little Red River watershed in Arkansas. The main stem Little Red River

population probably has been permanently lost due to inundation and cold water releases in the tailwaters of Greers Ferry Reservoir dam. The Middle Fork Little Red River (MFLRR) was believed to be the only remaining stream population at listing (1989) and as recently as 2003. However, it appears, based on current information, populations have persisted in the headwaters of the four forks of the Little Red River. Big Creek, a tributary to the Little Red River downstream of Greers Ferry Reservoir, is a newly discovered population that was not previously documented in the literature. Given this information, no additional populations could be added to develop delisting criteria.

Mussel populations generally are considered persistent and viable if three consecutive surveys conducted at three to five year intervals demonstrate that population size and age structure are adequate and populations contain representatives in the one to three year age classes. Viability of the speckled pocketbook has only been documented in two of the four forks. The definition of a viable population in the recovery plan does not provide a measure for reproductive capability other than to state that "*...sustain itself without immigration of individuals from other populations.*" Since the stream meta-populations are fragmented by Greers Ferry Reservoir, immigration of individuals from other populations is unlikely to occur.

Revising the recovery criteria to better address the five listing factors and distinguishing local populations versus stream meta-populations is required to allow manageable, geographical units to be determined so that measurable recovery criteria can be created and applied to downlist and delist this species. The proposed plan is a departure from the normal recovery process to expect 100 percent recovery of stream populations for reclassification. The issues regarding recovery criteria for this species should be an impetus for revising the recovery criteria prior to the next 5-year review.

b. Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria (and there is no new information to consider regarding existing or new threats)? Yes

3. List the recovery tasks and discuss how each task has or has not been achieved?

Task 1.1 Conduct population surveys

1991 – Harris, J. L. – Conducts a survey for *Lampsilis streckeri* in the Middle Fork Little Red River at the proposed NOARK pipeline crossing prepared for ENSR Consulting and Engineering.

1992 – Harris, J. L. – Conducts a status survey of *Lampsilis streckeri* in segments of the Middle, South, and Archey Forks Little Red River in Stone and Van Buren counties for the U. S. Fish and Wildlife Service.

1993 – Harris, J. L. – Habitat characterization and species associates of the speckled pocketbook (*Lampsilis streckeri*) in the Middle Fork Little Red River, Arkansas.

2003 – Winterringer, R. – Population dynamics and reproductive patterns of the federally endangered freshwater mussel, *Lampsilis streckeri*.

2004 – Davidson, C. and M. Wine. – Threats assessment for the speckled pocketbook (*Lampsilis streckeri*) in the South, Middle, Turkey, and Beech Forks Little Red River watershed.

2005 – Davidson, C. – Threats assessment and survey for the speckled pocketbook (*Lampsilis streckeri*) in Archey Fork Little Red River.

2005 – Davidson, C. – Survey for speckled pocketbook in Big Creek, a northern tributary of the Little Red River below Greers Ferry Reservoir.

2006 – Davidson, C. and W. R. Posey, II – Survey for speckled pocketbook in Middle Fork Little Red River from Little Red Creek confluence to Winterringer (2003) upstream speckled pocketbook occurrence.

Task 1.2 Use legislation to protect habitat

The Arkansas Department of Environmental Quality has designated the Archey, Middle, Beech, and Turkey Forks Little Red River as ecologically sensitive waterbodies. This designation provides for more stringent water quality criteria and restricts certain activities that may degrade water quality or habitat (*i.e.* instream gravel mining.

Task 2.1 Characterize habitat

Preferred habitat types for adult speckled pocketbook have been described by Harris (1993) and Winterringer (2003).

Task 2.2 Determine associate species

Several surveys (refer to Task 1.1) have documented associate species and composition in the upper Little Red River watershed and Big Creek. A population dynamics (refer to Task 1.1) study was completed in 2003 that provides mussel community abundance and composition for the Middle Fork Little Red River.

Task 2.3 Develop life history data

Winterringer (2003) determined reproductive patterns, including fish host identification and refined artificial propagation techniques, for speckled pocketbook.

Harris et al. (2004) investigated the limits and phylogeography of Lampsilinae in Arkansas with emphasis on species of *Lampsilis*. Speckled pocketbook

specimens formed a well supported monophyletic group, within the *Lampsilis reeveiana* complex, that is significantly divergent from *L. r. reeveiana* and *L. r. brevicula* specimens. This finding was consistent with the speckled pocketbook's current taxonomic status as a distinct species.

Task 3.1 Develop plan to restore historic habitat
A programmatic Safe Harbor Agreement for the upper Little Red River watershed was signed by the U. S. Fish and Wildlife Service (Arkansas Field Office), Arkansas Game and Fish Commission, Natural Resources Conservation Service, and The Nature Conservancy in November 2005. The agreement is currently being processed by the Southeast Region office in Atlanta, GA. This agreement will help implement the conservation strategy (USFWS 2005) for the speckled pocketbook which was developed in early 2005. However, portions of the historic habitat inundated by Greers Ferry Reservoir and affected by cold water releases in the tailwaters downstream of the reservoir's dam are not restorable.

Task 3.2 Develop plan for reestablishing mussel populations
This task has not been accomplished, but is listed as a recovery action in the conservation strategy and should be developed by 2008 or 2009.

Task 3.3 Implement plan to restore historic habitat
Implementation of the Safe Harbor Agreement (refer to Task 3.1) is expected to begin by mid 2006.

Task 3.4 Implement plan to reestablish population in historic habitat
Refer to Tasks 2.3 and 3.2.

Task 4.1 Determine minimum population levels
Refer to Tasks 2.3 and 3.2.

Task 4.2 Develop plan to monitor populations
The programmatic Safe Harbor Agreement for the upper Little Red River watershed has a biological monitoring component which will provide a long term monitoring plan for speckled pocketbook populations.

Refer to Task 2.3

Task 4.3 Implement monitoring plan
Refer to Task 4.2.

C. Updated Information and Current Species Status

1. Biology and Habitat

a. Spatial distribution, abundance and population trends

Recent surveys in 2004 through 2006 rediscovered extant populations of speckled pocketbook in the Archey, Beech, South, and Turkey Forks Little Red River (Davidson and Posey *in review*). A previously undocumented extant population of speckled pocketbook was discovered in Big Creek, a northern tributary of the Little Red River downstream of Greers Ferry Reservoir. These populations collectively represent four additional populations and a substantial increase in range wide abundance (Davidson and Wine 2004, Davidson 2005, Davidson *in review*). Prior to the 2004 and 2005 surveys, the MFLRR was believed to be the only extant population range wide. Winterringer (2003) extended the known range within the MFLRR 43 river miles upstream to near Leslie, Arkansas. Davidson and Posey (*in review*) extended the speckled pocketbook range within the MFLRR upstream to near the confluence of Little Red Creek (10 river miles upstream from Winterringer (2003) occurrence records).

The current known range is restricted to the MFLRR from the influence of Greers Ferry Reservoir upstream to the confluence of Little Red Creek (63 river miles), the South Fork Little Red River extending upstream of Arkansas Highway 95 to near the western boundary of Gulf Mountain Wildlife Management Area and the Ozark National Forest (14 river miles), the Archey Fork from approximately one mile upstream of Arkansas Highway 65 to the confluence of Castleberry Creek (16 river miles), the lower Turkey Fork (2 river miles), Beech Fork (11 river miles; Figure 1), and Big Creek (10 miles; not illustrated on Figure 1, but located approximately nine miles east of Greers Ferry Dam).

All extant populations appear to be stable. Populations in Archey and Middle Forks have documented recruitment and are considered viable. Viability is questionable in the remaining extant populations due to low numbers and lack of evidence verifying recent recruitment. Due primarily to the discovery of four extant populations, the overall population trend since listing is increasing.

b. Demographic characteristics

Winterringer (2003) analyzed 49 speckled pocketbooks from the MFLRR for sex, size, and gravidity status. Sex ratio was near 1:1 (23 females, 26 males). The reported age structure comprised 5 to 11 year old individuals. Davidson (2005) recently discovered several 1 year old juveniles from the Archey Fork. Gravid females recently have been observed in the Archey, Middle, and South Forks (Davidson and Wine 2004, Davidson 2005, Winterringer 2003). Mean length for females in the Middle Fork ranged from 52 mm to 77 mm, while males ranged from 48 mm to 74 mm.

The reproductive cycle of the speckled pocketbook is similar to that of other native freshwater mussels. Males release sperm into the water column; the sperm are then taken in by the females through their siphons

during feeding and respiration. The females retain the fertilized eggs in their gill marsupium until the larvae (glochidia) fully develop. When the gill marsupium is attacked by a potential fish host, the female releases the glochidia which then infest the fish, if it is a suitable host.

The speckled pocketbook is gravid during August with the release of glochidia in late February through early June. Winterringer (2003) tested 22 fish species for their potential as suitable host. Glochidia successfully transformed on sunfishes (Centrarchidae) from the MFLRR, with greatest success occurring with the green sunfish (*Lepomis cyanellus*; Table 1). Approximately 2,000 juveniles were released in the MFLRR post propagation (Winterringer 2003).

Figure 1

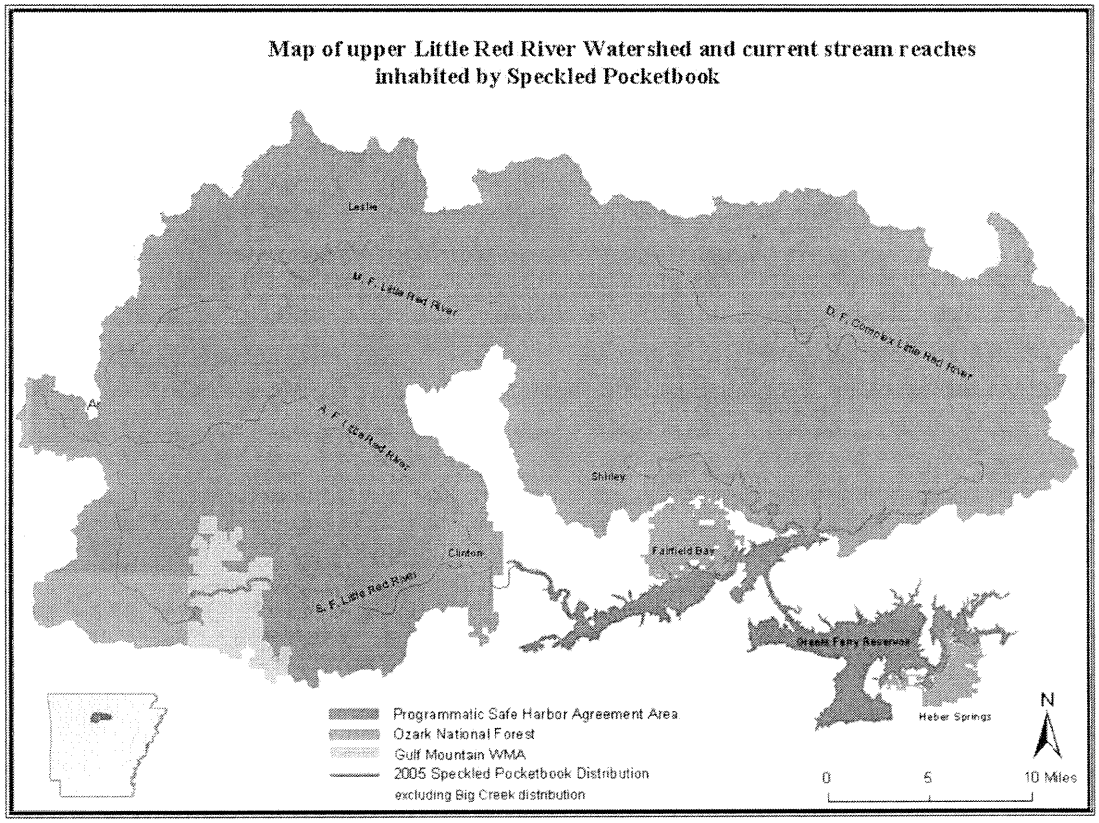

Table 1. The Seven Suitable Fish Host from Winterringer (2003) Fish Host Suitability Trials for the Speckled Pocketbook (*Lampsilis streckeri*).

Scientific Name	Common Name	First Trial	Second Trial	Transformation Rate (%)
Ambloplites ariommus	Shadow Bass	23	NT	0.9
Lepomis cyanellus	Green Sunfish	195	692	36.5
Lepomis macrochirus	Bluegill	341	NT	14.0
Lepomis gulosus	Warmouth	417	33	18.5
Lepomis megalotis	Longear Sunfish	466	25	20.2
Micropterus dolomieu	Smallmouth Bass	0	47	1.9
Micropterus punctulatus	Spotted Bass	27	167	8.0
Total Glochidia		1,469	964	100.0
NT = Not tested				

c. **Habitat**

There is new information on habitat suitability for the speckled pocketbook. A secondary habitat type occurs in pools with crevices between large rocks and boulders which have some accumulation of sand/gravel (Davidson 2005, Harris 1993, Winterringer 2003).

2. **Five Factor Analysis (threats)**

a. **Present or threatened destruction, modification or curtailment of its habitat or range:**

Several new threats have been identified since listing (Davidson and Wine 2004, Davidson 2005). These include:

- Gravel mining, unrestricted cattle access into streams, water withdrawal for agricultural and recreational purposes (i.e. golf courses), lack of adequate riparian buffers, construction and maintenance of county roads, and non-point source pollution arising from a broad array of activities appear to be degrading suitable habitat for speckled pocketbook.

- Eroding stream banks are depositing sediment in downstream reaches resulting in a reduction of habitat quantity and/or quality. Thirty-five eroding stream banks have been identified in the Middle Fork, 14 in South Fork, six in Archey Fork, and one in Beech Fork. Unrestricted cattle access in the Middle and South Forks also threatens to degrade water quality and habitat.

- The MFLRR was designated as an impaired waterbody under section 303(d) of the Clean Water Act in 2004 due to excessive fecal and *E. coli* bacteria and low dissolved oxygen.

Since Davidson and Wine (2004) and Davidson (2005) threats assessment, a new and potentially major threat is evolving in the upper Little Red River watershed. The Fayetteville Shale is an unconventional natural gas reservoir located on the Arkansas side of the Arkoma Basin encompassing nearly a quarter of the state and the entire upper Little Red River watershed. It is unknown at this time the extent of the impact of exploration and production will have on the speckled pocketbook and its habitat. Copious amounts of water are required for production of natural gas and could lead to dewatering or decreased base flows in the upper Little Red River watershed depending upon the source of water used for natural gas production. Additional concerns include habitat fragmentation, increased sedimentation, pollutant runoff, and spills.

The historic loss/modification of habitat remains unchanged. Channelization of the lower Archey and South Forks continues to degrade habitat downstream and upstream of the projects area. The construction of Greers Ferry Reservoir has resulted in the permanent loss of habitat due to inundation and continues the isolation of populations in each of the Little Red River forks. Cold water releases continue to degrade habitat below the dam.

b. Overutilization for commercial, recreational, scientific, or educational purposes:
There is no evidence to suggest that overutilization is a threat.

c. Disease or predation:
Muskrats and turtles are known to prey on speckled pocketbook. Numerous dead speckled pocketbook with bite marks have been reported from the MFLRR.

d. Inadequacy of existing regulatory mechanisms:
The adequacy of regulatory mechanisms has increased due to the Arkansas Department of Environmental Quality designation of the Archey, Beech, Middle, and Turkey Forks as extraordinary resource and ecologically sensitive waterbodies. These designations restrict certain activities (*e.g.*, instream gravel mining) and have more stringent water quality criteria. The Clean Water Act has been a substantial piece of legislation resulting in improved water quality in many locations (*e.g.*, regulating municipal and industrial discharges, etc.) and should continue to help alleviate and reduce non-point source pollutants.

e. **Other natural or manmade factors affecting its continued existence:** The development of Fayetteville Shale natural gas has the potential to significantly impact the continued existence of small populations that have persisted in the relatively pristine headwaters of the four forks of the Little Red River.

Information on the age/size structure of speckled pocketbook populations, the potential lack of gene flow between populations, and status of host fish and their habitat is lacking at this time. These are important population biology issues that may affect the continued existence of speckled pocketbook.

3. **Conservation Measures**

There is new relevant information regarding implementation of conservation measures that benefit the speckled pocketbook.

U. S. Fish and Wildlife Service. 2005. Conservation Strategy for the Speckled Pocketbook (*Lampsilis streckeri*) and Yellowcheek Darter (*Etheostoma moorei*). U. S. Fish and Wildlife Service, Arkansas Ecological Services Field Office, Conway, Arkansas. 22pp.

A multi agency group of state and federal agencies and non-governmental organizations developed a comprehensive conservation strategy for the speckled pocketbook in 2005. The strategy outlines a plan to protect existing speckled pocketbook populations and to restore and/or enhance suitable habitat within the species range upstream of Greers Ferry Reservoir in preparation for possible reintroduction. The strategy proposes to undertake the following conservation actions:

- develop and implement a programmatic Safe Harbor Agreement,
- develop a database and GIS coverage of survey sites and occurrences,
- conduct long term population and water quality monitoring,
- survey for unknown occurrences and suitable restoration sites,
- conduct habitat enhancement, restoration, and maintenance,
- propagate, reintroduce, and augmentation of populations,
- conduct public outreach, and
- host annual meetings of the multi-agency group to modify conservation actions as needed.

Several conservation actions are currently being implemented such as conducting water quality monitoring at 11 stations, conducting speckled pocketbook surveys, conducting public outreach, and developing a programmatic Safe Harbor Agreement.

The following programmatic Safe Harbor Agreement was signed in November 2005 by the U. S. Fish and Wildlife Service (Arkansas Field Office), Arkansas

Game and Fish Commission, Natural Resources Conservation Service, and The Nature Conservancy. The agreement is currently being processed by the Southeast Region office in Atlanta, GA and is expected to be finalized by March or April 2006.

Programmatic Safe Harbor Agreement for the Speckled Pocketbook in the Upper Little Red River Watershed, Arkansas. U. S. Fish and Wildlife Service, Arkansas Ecological Services Field Office, Conway, Arkansas. 47pp.

D. Synthesis

At the time of listing, the only known population of speckled pocketbook was in the MFLRR from the confluence of Meadow Creek downstream to near Shirley (approximately 10 river miles). Surveys in recent years have expanded the distribution of extant populations of speckled pocketbook in the MFLRR extending upstream of the Meadow Creek confluence to the confluence of Little Red Creek (an increase of 53 river miles). Extant populations also have been discovered in 14 river miles of the South Fork, 16 river miles of Archey Fork, two river miles of Turkey Fork, 11 river miles of Beech Fork, and ten miles of Big Creek. Collectively, current extant populations occupy 102 river miles more than at the time of listing and four (Turkey and Beech Forks are considered one population) additional extant meta-populations are known.

Characteristics of population demographics (*e.g.* suitable habitat, male to female sex ratio, etc.) are better understood now than at the time of listing. Primary and secondary suitable host fish have been identified and successful propagation techniques have been developed for the speckled pocketbook. These techniques will be extremely valuable in recovery efforts, should the need to conduct population augmentations or reintroductions arise. Additionally, phylogenetic analysis of the *Lampsilis* species in Arkansas confirmed taxonomic status of the speckled pocketbook. However, information on the age/size structure of speckled pocketbook populations, the potential lack of gene flow between populations, and status of host fish and their habitat is lacking at this time. These are important population biology issues that need to be determined in order to ensure the continued existence of speckled pocketbook.

The U.S. Fish and Wildlife Service with assistance from the Arkansas Game and Fish Commission conducted a comprehensive threats assessment in 2004 and 2005 for the four forks of the upper Little Red River. The assessment identified several new threats (*e.g.* unrestricted cattle access to streams, eroding stream banks, gravel mining, etc. associated with poor land use practices) that were not previously identified in the five factor analysis. This information has enabled resource agencies to prioritize conservation efforts and areas within the watershed.

The production of natural gas in the Fayetteville Shale poses a significant threat (*e.g.* water quality and quantity and habitat fragmentation) to the species. It is difficult to quantify the exact impact at this time because oil/gas companies are still in the

exploration stage. Production is expected to increase significantly in 2007 and 2008. The Service and partners are in the planning stage of beginning to work with oil/gas companies and landowners to develop best management practices that are expected to minimize impacts from these activities to the speckled pocketbook and its habitat.

A conservation strategy was finalized in 2005 for the upper Little Red River watershed. This strategy is intended to assist resource agencies and NGOs in identifying conservation actions and prioritizing conservation activities and areas within the watershed to benefit speckled pocketbook. A programmatic Safe Harbor Agreement was signed in November 2005 to help implement the conservation strategy and encourage private landowner conservation efforts. The Safe Harbor Agreement is the most promising recovery effort for this species since listing and may be the "gold nugget" that enables the Service to eventually delist the speckled pocketbook.

Extant populations of speckled pocketbook occur throughout most of the historic range. Exceptions include the stream reaches permanently lost due to Greers Ferry Reservoir, approximately four miles of the lower Archey and South Forks that have been channelized for flood control, and approximately 12 miles of the lower South Fork that has been severely impacted by poor land use practices. Populations in the Archey, Beech, and Turkey Forks Little Red River and Big Creek are small and collectively comprise fewer than 500 individuals. Without continued efforts to restore historic habitat and conserve existing habitat, several populations may become extirpated in the near future.

The status of the speckled pocketbook has improved since listing. Based on the information provided herein, however, it appears that with existing threats the speckled pocketbook should remain a threatened species. We recommend reexamining the recovery criteria to measure future recovery progress towards reclassification, and delisting.

III. RESULTS

A. Recommended Classification:
The status of speckled pocketbook should remain unchanged.

B. New Recovery Priority Number __8__

The degree of threat to the speckled pocketbook is moderate because there is a continual threat to its habitat (*e.g.* primarily from poor land use practices, illegal activities such as gravel mining, and habitat fragmentation). The recovery potential is high because the biology is well understood as well as ecological factors affecting the biology. A 2004/2005 threats assessment provided a better understanding of threats and these threats should be alleviated through the Safe Harbor Agreement once implementation begins in 2006.

C. Listing and Reclassification Priority Number:
Reclassification (from Threatened to Endangered) Priority Number: Not Applicable

IV. RECOMMENDATIONS FOR FUTURE ACTIONS

1. Implementation of the programmatic Safe Harbor Agreement for the upper Little Red River that should begin in mid 2006 is the highest priority recovery action to improve speckled pocketbook status in the coming years. Successful implementation of this agreement is essential to alleviating threats to water quality and habitat, which thereby should allow for natural expansion of populations into uninhabited stream reaches and provide protection for existing extant populations.

2. The recovery plan should be revised to refine reclassification criteria, define delisting criteria, and better address the five factors.

3. Determine age/size structure of extant speckled pocketbook populations.

4. Determine importance of potential lack of gene flow between different stream populations.

5. Determine status of suitable host fish in the upper Little Red River watershed (*e.g.*, how does their distribution match the distribution of speckled pocketbook?).

6. Determine habitat requirements of suitable host fish, condition/status of habitat (e.g., pristine, degraded, etc), and restoration/protection needs.

7. Foster a working partnership with oil/gas companies operating in the Fayetteville Shale to address and minimize potential impacts associated with production of natural gas. Develop standard best management practices and lease/permit stipulations that provide oil/gas companies, agencies, and landowners guidelines to follow that will help minimize potential impacts to speckled pocketbook.

V. REFERENCES

Clarke, A. E. 1987. Status survey of *Lampsilis streckeri* Frierson (1927) and *Arcidens wheeleri* (Ortman and Walker 1912). A report to the U. S. Fish and Wildlife Service. 24pp. plus field notes.

Davidson, C. L. and W. R. Posey, II. In review. Current distribution and status of the federally endangered speckled pocketbook, *Lampsilis streckeri* Frierson, 1927 Accepted November 2006 for review by Southeastern Naturalist.

Davidson, C. and M. Wine. 2004. Threats assessment for the speckled pocketbook (*Lampsilis streckeri*) and yellowcheek darter (*Etheostoma moorei*) in the upper Little Red River watershed, Arkansas. Unpubl. Report. U. S. Fish and Wildlife Service, Arkansas Field Office, Conway, Arkansas. 28pp. + appendix.

Davidson, C. 2005. Threats assessment for the speckled pocketbook (*Lampsilis streckeri*) and yellowcheek darter (*Etheostoma moorei*) in the upper Little Red River watershed, Arkansas. Addendum 1: Archey Fork Little Red River. Unpubl. Report. U. S. Fish and Wildlife Service, Arkansas Field Office, Conway, Arkansas. 7pp.

Harris, J. L. 1991. Survey for *Lampsilis streckeri* in the Midle Fork Little Red River at the proposed NOARK pipeline crossing, Van Buren County, Arkansas. Prepared for ENSR Consulting and Engineering, Houston, TX. 10 pp.

Harris, J. L. 1992. Status of *Lampsilis streckeri* in segments of the Middle, South, and Archey forks of the Little Red River, Stone and Van Buren counties, Arkansas. Prepared for the U. S. Fish and Wildlife Service, Endangered Species Office, Jackson, MS. 23 pp. + field notes.

Harris, J. L. 1993. Habitat characterization and species associates of the speckled pocketbook (Lampsilis streckeri) in the Middle Fork Little Red River, Arkansas. Prepared for the U. S. Fish and Wildlife Service, Endangered Species Office, Jackson, MS. 28pp. plus appendices.

Harris, J. L., P. J. Rust, A. C. Christian, W. R. Posey II, C. L. Davidson, and G. L. Harp. 1997. Revised status of rare and endangered Unionacea (Mollusca: Margaritiferidae, Unionidae) in Arkansas. Journal of the Arkansas Academy of Science 51:66-89.

Harris, J.L., W. R. Hoeh, A.D. Christian, J. Walker, J.L. Farris, R.L. Johnson, and M.E. Gordon. 2004. Species limits and phylogeography of Lampsilinae (Bivalvia: Unionida) in Arkansas with emphasis on species of *Lampsilis*. Prepared for Arkansas Game and Fish Commission and U. S. Fish and Wildlife Service. 61 pp. + appendix.

U. S. Fish and Wildlife Service. 1989. Endangered and threatened wildlife and plants: endangered status for the speckled pocketbook (*Lampsilis streckeri*). Federal Register 54(38):8339-8341.

U. S. Fish and Wildlife Service. 1991. Speckled Pocketbook Mussel (*Lampsilis streckeri*) Recovery Plan. U. S. Fish and Wildlife Service. Jackson, MS. 14pp.

U. S. Fish and Wildlife Service. 2005. Conservation strategy for the speckled pocketbook (*Lampsilis streckeri*) and yellowcheek darter (*Etheostoma moorei*). U. S. Fish and Wildlife Service. Conway, AR. 22pp.

Winterringer, R. 2003. Population dynamics and reproductive patterns of the federally endangered freshwater mussel, *Lampsilis streckeri* (Frierson 1927). M.S. thesis. Arkansas State University, State University, Arkansas. 74pp.

Peer Review: A draft copy of this 5-year review was sent to the following knowledgeable individuals for their review and comment:

Bill Posey, Malacologist
Arkansas Game and Fish Commission

Dr. Alan Christian, Assistant Professor
Arkansas State University

Dr. John Harris, Assistant Chief, Environmental Division
Arkansas Highway and Transportation Department

Results of Peer Review:

Bill Posey responded with a letter of support for the Service's recommendation in the speckled pocketbook 5-year review. No additional comments were received from Bill Posey.

Dr. A. Christian provided the following comments in addition to minor editorial changes:

1. Overall, this document represents a comprehensive coverage of the current knowledge on this species that includes important recent distribution, population, and life history information important to determining the status;

2. Is the age / size structure of the populations fully understood and is that a factor that needs to be verified/validated;

3. How important is the issue of potential lack of gene flow between the different stream populations, as this issue was not brought up;

4. What is the status of the suitable host fish in the upper little red river and the tributaries, how does their distribution match the distribution of the speckled pocketbook (genetic analysis of this might be prudent as well), and does the suitable host fish habitat needs need to be addressed and are they protected; and

5. How about the phylogenetic analysis by Harris et al 2004 verifying the validity of this as a species as part of a phylogenetic study of Lampsiline in AR?

Dr. J. Harris made a few minor editorial changes.

U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW
Speckled Pocketbook (*Lampsilis streckeri*)

Current Classification Endangered

Recommendation resulting from the 5-Year Review

____ **Downlist to Threatened**
____ **Uplist to Endangered**
____ **Delist**
__X__ **No change is needed**

Appropriate Listing/Reclassification Priority Number Not applicable

Review Conducted By Chris Davidson, USFWS Arkansas Field Office

FIELD OFFICE APPROVAL:

Lead Field Supervisor, Fish and Wildlife Service

Approve _____ Date 12/11/06

Cooperating Field Supervisor, Fish and Wildlife Service

Not applicable

REGIONAL OFFICE APPROVAL:

Lead Regional Director, Fish and Wildlife Service

Approve _____ Date 1/9/2007
acting ARD-ES

Cooperating Regional Director, Fish and Wildlife Service

Not applicable