Prospectus

West Fork White River Stream Mitigation Bank

Washington County, Arkansas

September 18, 2012

Prepared by:

Watershed Conservation Resource Center
380 W. Rock St.
Fayetteville, AR, 72701
wcrc@watershedconservation.org
(479) 444-1916

Table of Contents

List of Appendices

Appendix A: Figures

Appendix B: Site Photographs

Appendix C: Tables

1. Introduction

1.1. Mitigation Bank Development

The Watershed Conservation Resource Center (WCRC) proposes to establish a mitigation bank in the West Fork White River (WFWR) watershed located in Washington County, Arkansas to be known as the WFWF Mitigation Bank (Figure 1). The WFWR Mitigation Bank will offset unavoidable adverse impacts to stream and other aquatic resources authorized by the Clean Water Act section 404 permits and other Department of Army permits. Compensatory mitigation will be carried out at streams, wetlands, or riparian areas through restoration, enhancement, establishment, and/or preservation. The proposed mitigation bank will focus on the restoration of the river channel and the enhancement of riparian areas to generate stream mitigation credits. The WFWR Mitigation Bank will be developed in accordance with the Compensatory Mitigation for Losses of Aquatic Resources - Final Rule (DOD & EPA, 2008) under the guidance of the Interagency Review Team established by the US Army Corps of Engineers Little Rock District (LR District). The WFWR Mitigation Bank will consist of multiple sites and will be operated and managed by the WCRC. Properties associated with the bank will be held in suitable conservation easements.

1.2. Need and Technical Feasibility

Northwest Arkansas is one of the fastest growing areas in the country with Washington County seeing an increase in its population by at least 29% since the year 2000 (U.S. Census, 2000, 2010). Though the recent economic down-turn in 2008 has slowed this growth, development and highway projects are on the rise again, which can result in damage and destruction of aquatic resources in the Beaver Lake watershed, the drinking water source for over 420,000 people in Northwest Arkansas. Currently, there is not a mitigation bank site located within the Beaver Lake watershed. The nearest mitigation bank site is in the Kings River watershed which confluences with the White River downstream of Beaver Lake. The WFWR is a major tributary of the White River and its confluence with the White River is only 5 miles upstream of Beaver Lake. To protect the water quality and aquatic resources of Beaver Lake watershed there is a need for mitigation sites within its own watershed. Mitigation sites in the WFWR watershed will directly compensate for losses that occur in the Beaver Lake watershed. The WFWR Mitigation Bank will provide an option to permittees to purchase stream mitigation credits from a bank that has mitigation sites where their impacts to aquatic resources have occurred. Figure 1 shows the location of the WFWR watershed and other major tributaries within the Beaver Lake watershed.

Watershed-based Assessment and Planning: Because of the importance of Beaver Lake to Northwest Arkansas, watershed-based studies, assessments, and planning have been conducted in an effort to understand, improve, and protect this natural resource. Based on a comprehensive watershed assessment, accelerated streambank erosion has been identified as contributing 66% of the average annual sediment load to the WFWR (ADEQ 2004), a state 303 (d) listed stream (ADEQ 2012). Also, the Arkansas Natural Resource Commission (ANRC) has identified the WFWR watershed as a high priority for sediment and nutrient load reduction efforts (ANRC 2012). Severe streambank erosion not only destroys aquatic habitat and mature forested riparian areas along the main channel of the WFWR and its tributaries, but it contributes, annually, thousands of tons of sediment and pounds of phosphorus to the stream network (Formica, et al., 2004). Excessive amounts of suspended sediment from streambank erosion not only adversely affects water quality in the form of reduced water clarity and decreased aesthetics, but it also impacts aquatic habitat. Suspended sediment loads impact benthic habitats through clogging and burying of interstitial spaces of gravel bed stream networks and aquatic biology by clogging fish gills, suffocating eggs and benthic insect larvae (Schueler and Holland, 2000).

The need for river restoration and streambank stabilization to reduce contaminants and restored aquatic resources has been established in local watershed-based plans. The WCRC worked with several local partners, landowners, and government agencies to develop the "West Fork Watershed Restoration of Priority Stream Reaches Project Plan," which identified 29 sites within the WFWR watershed in which unstable streambanks are generating significant loads of sediment and phosphorus and are in need of restoration (Formica and Van Eps, 2010). Also, the Beaver Lake Watershed Protection Strategy (WPS), developed through a stakeholder process, lists addressing streambank erosion and improving riparian buffers as a priority for reducing sediment and nutrient loads delivered to Beaver Lake (Tetra Tech, 2009). The WFWR Mitigation Bank supports the following stated goals and objectives of the Beaver Lake WPS: 1) Maintain a long-term, high-quality drinking water supply and 2) Restore water quality of impaired stream and lake areas. The WFWR Mitigation Bank is a means to put the Beaver Lake WPS into action through the implementation of stream restoration on unstable sections of river, which is a recommended best management practice.

Local and Regional Benefits: The WFWR Mitigation Bank will focus on restoring unstable sections of river based on watershed-scale assessments and planning involving stakeholders. A natural channel design approach will be used as the basis for restoration planning and implementation (Rosgen 2010). The 29 identified areas in

need of stream restoration range in length from 1,000 ft to 5,600 ft. There are an additional 25 individual streambanks also identified for rehabilitation.

The WFWR Mitigation Bank will provide a multitude of local and regional benefits:

- High quality stream restoration will be designed and implemented based on the natural tendency of the river system that will stabilize banks while creating and enhancing aquatic habitat and forested riparian areas.
    - Aquatic habitat will be further enhanced –
        - better assimilation of nutrients in the water column
        - creation of stable and diverse riffle, pool, run, and glide bed features that
            - supports the different life phases of aquatic inhabitants
            - improve water oxygenation and temperatures
        - Reduced siltation of gravel beds
    - As the improved riparian areas mature, the trees will provide shade and help to maintain lower water temperatures during summer months
    - Reduction of phosphorus and nitrogen loads resulting from streambank erosion will reduce the potential for algae blooms, which can negatively affect sensitive aquatic species
- Healthy riparian areas will be created by planting native plants and removing invasive plants
- When the opportunity arises, riverine wetlands will be created, enhanced, and/or preserved
- Creating a WFWR Mitigation Bank helps to direct needed funding and efforts to a high priority watershed in need of stream restoration and improved water quality based on watershed planning that included stakeholder involvement.
- High quality stream restoration projects that will generate stream credits will be implemented that reduce sediment and other contaminants to the stream system, thus protecting and improving water quality within Beaver Lake watershed, the main drinking water source for Northwest Arkansas.

1.3. Goals and Objectives

The goal of the WFWR Mitigation Bank is to restore unstable sections of the West Fork White River that are contributing excessive amounts of sediment and nutrients from accelerated streambank erosion. Over 70,000 linear feet of river reaches have been identified in the watershed as needing restoration. Stream channels and streambanks where restoration takes place will be stabilized so that the dimension, pattern, and

profile of the channel will be maintained and aquatic resource function will be maximized. The objectives of the WFWR Mitigation Bank are to provide

- Compensatory mitigation that replaces aquatic resource functions and services lost to unavoidable adverse impacts to streams and other aquatic resources authorized by permits issued by the U.S. Army Corps of Engineers.
- USACE permittees the ability to purchase mitigation credits to replace damaged or destroyed aquatic resources with high quality river restoration credits within the Beaver Lake watershed.
- A mechanism to fund and maintain high quality river restoration in a state priority watershed in which the river is impaired that will result in environmental improvements to both aquatic resources and water quality.

2. Bank Establishment and Operation

2.1. Site Selection

The WFWR forms an 80,000 acre (124 square miles) watershed in which the southern 63% of its area lies in the Boston Mountain Ecoregion and the other 28% lies in the Ozark Highlands Ecoregion. The watershed is a major tributary to the White River which forms Beaver Lake. The WFWR and Beaver Lake watersheds are part of the Upper White River Basin, which continues north to Missouri and then travels back south through Arkansas (Figure 1).

The first mitigation site selected within the WFWR watershed is on the east side of Fayetteville, Arkansas (Figure 2). The site crosses Dead Horse Mountain Road and encompasses 6,600 feet of stream along the WFWR. The mitigation site was selected for the following reasons:

- Two high priority reaches with accelerated streambank erosion were identified as needing restoration are located on the site (Formica and Van Eps, 2010).
- Both aquatic habitat and riparian areas need to be restored at the site
- The restoration potential is high because the property associated with the mitigation bank lies in the floodway, which cannot be developed. The area will always be allowed to flood creating the potential for long-term ecological restoration to occur.
- The main property owner wants both the stream and riparian area to be restored and placed in a conservation easement.

- In addition to the main channel of the WFWR, there are existing riverine wetlands and ephemeral streams that will be enhanced or preserved as part of the mitigation bank
- There are some existing high quality riparian areas with mature hardwood trees and understory of native shrubs, grasses, and wildflowers that will be preserved.

The proposed site includes a total of 102 acres of land and is 4 miles from the confluence with the White River. The river is large at this point with a bankfull width of 136 ft and a watershed area of 113 mi^2 (ADEQ, 2004). The site is composed of 3 distinct areas and a mitigation plan will be developed for each area and implemented as three phases (Figure 3). Photographs showing the existing conditions of each area can be found in Appendix B (Figure 1, Photo 1-15). The properties included in the proposed initial mitigation site are owned by three different landowners. A mitigation plan will be developed and implemented for Area 1 first, which is owned by a single property owner.

2.2. Ecological Suitability

Land Use

Historically, the land adjacent to the river was cleared and used as a cattle operation with hay production. Some riparian areas along the river were not cleared and mature native trees can be found where there is not extreme streambank erosion. The predominant grasses grown in the pasture area are Bermuda and Fescue. The property was on the market the past four years and the pasture management continued at that time, but areas near the riparian areas are now overgrown with shrubs and are fallow. A new owner recently acquired the land and continues to manage the property adjacent to the mitigation areas for hay and livestock. This past July 2012, over 1,500 4'x5' bales of hay were harvested from the adjacent property (Appendix B, Photo 5). These areas will not be included in the proposed mitigation banking site.

Stream Condition

The WFWR is a perennial stream and the proposed mitigation site has 2,500 feet of highly erodible cut-banks that are 10 to 14 feet high (Appendix B, Photos 3 and 8). A combination of channel incision, low radius of curvature to bankfull width ratios, erodible bank materials, and lack of a forested riparian area is resulting in accelerated streambank erosion causing land loss, vegetation loss, and poor aquatic habitat. There are several ephemeral tributaries that are moderately stable and flow to the WFWR. There are also several side channels and riverine wetlands that will be included in the mitigation bank. Forested riparian areas can be found periodically throughout the site.

Some of the cut banks have no forested riparian and are eroding pasture land. The area receives stormwater runoff from the adjacent road, nearby highway, and residential developments.

Morphology and Hydrology

The site is located in the United States Geological Survey 8-digit HUC 11010001, which is the Beaver Reservoir HUC (Appendix A, Figure 1). The drainage area at the site is approximately 113 square miles and the stream flows through a broad alluvial valley with the presence of a wide flood plain and multiple alluvial terraces. The WFWR generally flows from the south to the north as shown in Area 3, but the river runs west to east through Areas 1 and 2. The terraces are positioned laterally with gentle, down-valley elevation relief. Being located on the valley floor of the WFWR, there is little elevation change throughout the project site with the exception of the depressions associated with abandoned channel meanders which now act as riverine wetlands. The valley slope through the site is approximately 0.0007 and the water surface slope of the stream is approximately 0.0005. The bankfull width and cross-sectional area are approximately 136 feet and 520 square feet, respectively (ADEQ, 2004).

The Rosgen stream type is a C4, which is characteristic of wide alluvial terraced valleys (Rosgen, 2010). Stream flow is predominantly surface water driven. The D50 of the bed material being 32.6 mm. The stream has very short and steep riffles and flat, long pools with point bars running along the inside of the meander bends. The channel sinuosity is 1.4 (ADEQ, 2004). Air photos show wetland areas throughout the adjacent flood-prone area that appear to be old meander bend scars. There is potential for enhancement and restoration of the wetland areas located within the banking areas.

Historically, the stream channel probably first became unstable from the increase in bedload following the initial clearing of the forest during the mid-1800's through the early 1900's. Land clearing along the valley floor for row crop agriculture production reduced the amount of forested riparian along the river corridor. As river instability has propagated through the river network due to a variety of causes, including changes in hydrology, erosion into non-forested channel banks has resulted in accelerated erosion. Once the initial channel instability was initiated, there was insufficient resistance along the channel boundary to prevent additional erosion, perpetuating a cycle of channel instability. Fortunately for this site, the stream channel has access to a wide floodplain in which flood waters and precipitation can be retained and nutrient and sediment can be filtered. Restoration of the river reaches located within the proposed site will curtail the cycle of instability.

Soils

A soils map of the site is shown in Appendix A, Figure 4 and based on the Natural Resource Conservation Service's (NRCS) Soil Survey Geographic (SSURGO) (NRCS, 2004). The major soils at the site are typical for flood plains and include Cleora fine sandy loam and Sloan silt loam.

Vegetation

The overall mitigation site will be approximately 102 acres and will run alongside of the WFWR in two locations. Approximately 36% of the site is forested riparian, which mainly consists of mixed hardwood trees typical of river systems with wide flood plains found in the Ozark Highlands. A cursory inspection of the site identified several tree species including: American sycamore (*Platanus occidentalis*); bitternut hickory (*Carya cordiformis*); black locust (*Robinia pseudoacacia*); box elder (*Acer negundo*); common hackberry (*Celtis occidentalis*); common serviceberry (*Amelanchier arborea*); Shumard oak (*Quercus shumardii*); black willow (*Salix nigra*); river birch (*Betula nigra*); silver maple (*Acer saccharinum*); slippery elm (*Ulmus Rubra*); and swamp white oak (*Quercus bicolor*). Numerous sycamore and silver maple trees were observed adjacent to the channel, while hickory, oak, hackberry, and river birch trees were observed along wetland areas and side channels.

Native shrubs and grasses observed in the riparian areas included: button bush (*Cephalanthus occidentalis*); smooth alder (*Alnus serrulata*); river cane (*Arundinaria gigantean*); wood oats (*Chasmanthium latifolium*); and Virginia wild rye (*Elymus virginicus*).

Species of Greatest Conservation Need

There are over 60 species of fish, aquatic invertebrates, reptiles, and mammals that are listed as 'species of greatest conservation need (SGCN)' either by the federal and/or state government agencies that have been observed near or in close proximity of the mitigation site (ANHC 2012; AWAP 2006). A summary of these species and their global ranking can be found in Appendix C, tables A - E.

2.3. Summary of Mitigation Activities

A map showing the proposed actions for each area is shown in Appendix A, Figures 5-7. The overall mitigation plan concept for this site is to design and implement river restoration on the West Fork White River that will 1) create and enhance aquatic habitat, 2) stabilize streambanks and eliminate them as a source of contaminants that

degrade water quality and impair aquatic species, 3) restore, enhance, and preserve riparian areas along the WFWR, tributaries, and side channels, and 4) preserve and restore wetland areas. Natural channel design principles will be used as a basis for the mitigation plan and design variables.

- *River Channel:* Reference reach data will be used to develop the new channel dimensions, pattern, and profile. The channel width to depth ratio will be decreased by building back eroded streambanks with multiple benches whose elevations are based on the river's ability to transport flow and bedload. Construction materials will be mostly rock, wood, and natural fiber erosion control fabrics. Toe-wood bench structures made of predominantly rock and trees will be constructed with a face of root wads that serve as a hard surface to dissipate stream energy, but at the same time provide habitat for fisheries. Toe-wood structures will be built along eroding cut-banks. Two elevations of benches will be constructed to help dissipate flood waters as they rise. The benches will be finished with soil mattresses that serve as a medium for establishing native plants that provide habitat and reduce surface erosion. Rock vanes will be used to help deflect flow away from the bank where appropriate. These vanes also create scour pools that make excellent fish habitat. Both the toe-wood benches and rock vanes will maintain healthy pool depths and provide cover for fish. The design will also result in stable riffle, glide, and run bed features that will support habitat diversity for aquatic species . Areas where there is not severe streambank erosion will be enhanced and preserved.
- *Riparian Areas:* Forested riparian will be established in conjunction with channel stabilizing methods, where the eroding streambanks are cutting into the pasture land. Existing forested riparian will be enhanced, preserved, or extended. Pasture land between forested areas will be converted to tall grass prairie species of plants, though in time, it will eventually convert back to forest on its own. Riparian areas along tributaries and wetlands will be established, enhanced, and preserved.
- *Wetland Areas:* Existing wetlands will be preserved. If opportunities arise based on the site conditions, wetlands will be established.

3. Proposed Service Area

The proposed service areas are shown in Figure 8. The proposed primary geographic service areas are:

- Beaver Reservoir HUC 11010001
- Bull Shoals Lake HUC11010003

The proposed secondary service areas are:

- Buffalo HUC 11010005
- Middle White River HUC 11010004
- North Fork White HUC 11010006

4. Bank Ownership and Long-term Management Strategy

4.1. Sponsor and Landowner

The WCRC is the bank Sponsor of the WFWR Mitigation Bank and will manage the bank property for the operational life of the bank. Area 1 will be the first location where mitigation actions will be undertaken. The property associated with Area 1 is owned by a private landowner who has agreed to hold the property in a conservation easement according to the banking instrument to ensure perpetual protection of the mitigation site. The operational life of the bank ends once the mitigation credits have been sold and the restoration is deemed to be self-sustaining.

4.2. Financial Assurances

If necessary, the Sponsor will make available adequate financial assurances in the form of a bond or escrow account based on the estimated repair and maintenance costs determined by the Sponsor and in coordination with the LR District Engineer.

4.3. Monitoring, Reporting, and Long-term Management

The Sponsor shall monitor and report on the progress and condition of the WFWR Mitigation Bank toward achieving the goals and performance standards stated in the banking instrument. The Sponsor shall take all reasonable actions necessary to maintain or repair the site due to any problems that arise that may prevent the site from achieving the goals outlined in the final banking instrument. The Sponsor will maintain and protect the site until it is self-sustaining. When mitigation actions are initiated on Areas 2 and 3, conservation easements that will protect these areas to perpetuity will be obtained.

4.4. Bank Expansion

The Sponsor may request that additional mitigation sites in need of river restoration be added to the WFWR Mitigation Bank at a future time. The Sponsor will submit a mitigation plan to the LR District for each proposed expansion of the WFWR Mitigation Bank for their approval.

5. References

Arkansas Department of Environmental Quality (ADEQ), *Draft Water Quality Inventory Report*, Agency Report Prepared Pursuant to Section 305(b) of the Federal Water Pollution Control Act, 2012.

ADEQ, Environmental Preservation Division. S.J. Formica, M.A. Van Eps, M.A. Nelson, A.S. Cotter, T.L. Morris, J.M. Beck. *West Fork - White River Watershed - Data Inventory and Non-point Source Pollution Assessment*. ANRC – EPA 319(h) Project Final Report. 2004.

Arkansas Natural Heritage Commission (ANHC), Webpage "Research & Data, Rare Species Search," http://www.naturalheritage.com/research-data/rarespecies-search.aspx: Accessed, July 19, 2012.

Arkansas Natural Resource Commission (ANRC), Webpage "arkansaswater.org," Retrieved July 21, 2012.

Arkansas Wildlife Action Plan (AWAP), 2006, Webpage "Species of Greatest Conservation Need", http://www.wildlifearkansas.com/strategy.html: Accessed, July 19, 2012.

Department of Defense (DOD) and Environmental Protection Agency (EPA), April 10, 2008. Compensatory Mitigation for Losses of Aquatic Resources. Final Rule. Federal Register. Vol. 73, No. 70: pp. 19594-19705.

Formica, S.J. and Van Eps, M.A., *West Fork White River Watershed Restoration of Priority Stream Reaches Project Plan*, Watershed Conservation Resource Center, Fayetteville, Arkansas 2010

Formica, S.J., Van Eps, M.A., Nelson, M.A., Cotter, A.S., Morris, T.L., Beck, J.L., West Fork White River Watershed - Sediment Source Inventory and Evaluation. Proceedings from ASAE Conference "Self-Sustaining Solutions for Streams, Wetlands, and Watersheds," held September 12-15, 2004, St. Paul, MN.

Rosgen, D.L., 1996, *Applied Fluvial Geomorphology,* Wildland Hydrology, Pagosa Springs, CO.

Schueler, T. R. and H. K. Holland. The Practice of Watershed Protection. Center for Watershed Protection. 2000.

Standard Operating Procedures, Compensatory Mitigation, Little Rock District Regulatory Office, U.S. Army Corps of Engineers,

http://www.swl.usace.army.mil/regulatory/pdf/compensatorymitigationguidelines.pdf: Accessed August 2010.

TetraTech, *Beaver Lake Watershed Protection Strategy*, Prepared for Northwest Arkansas Council, Sept. 2009.

United States Census Bureau. (2010). State & County QuickFacts: Washington County, AR, Retrieved July 21, 2012 from http://quickfacts.census.gov/qfd/states/05/05143.html

U.S. Department of Agriculture (USDA), Natural Resources Conservation Service, SSURGO Soils, General Information, Washington County Arkansas, 2004

Appendix A

Figures

Proposed WFWR Mitigation Bank

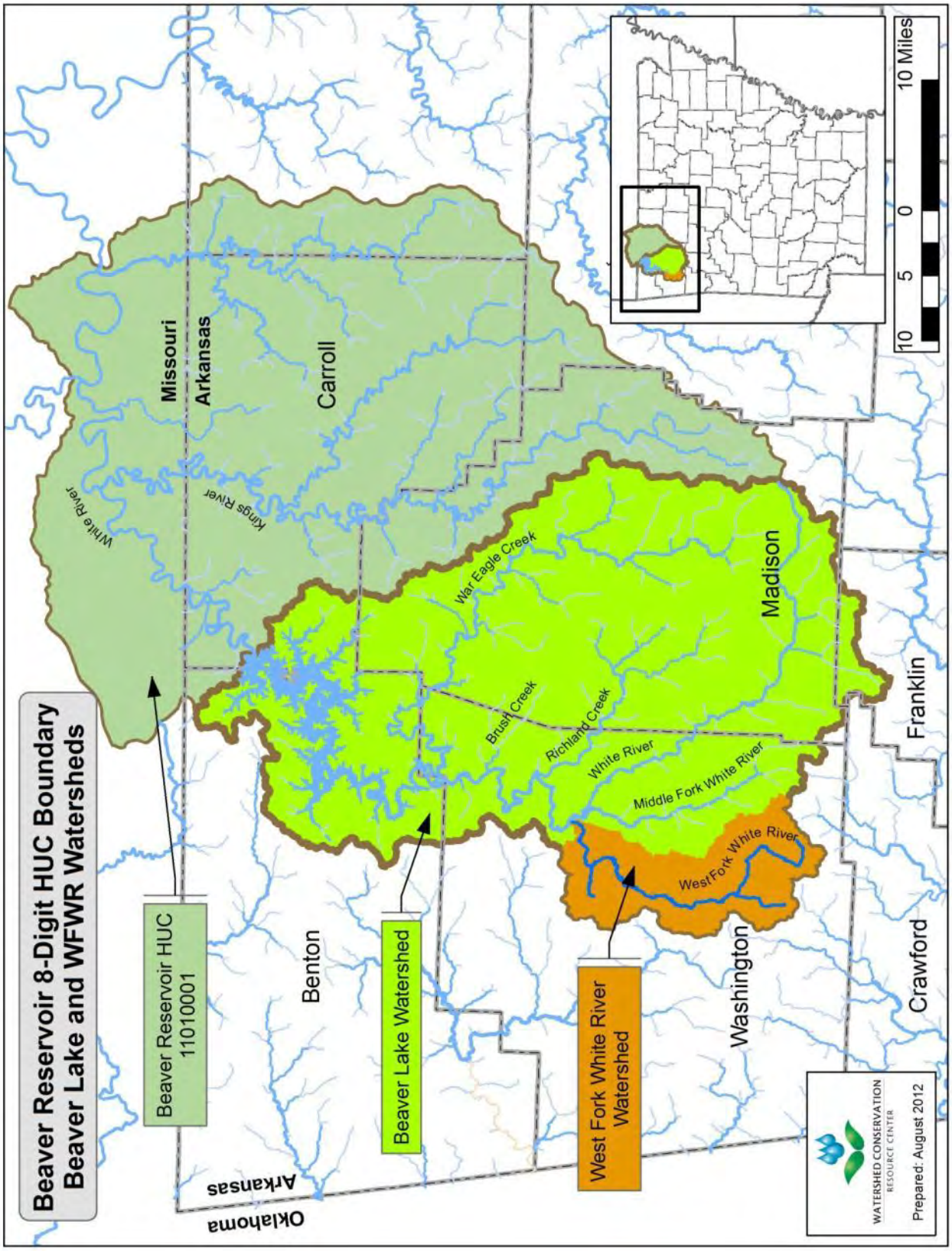

Figure 1 Location of the proposed WFWR Mitigation Banking Site in relationship to Beaver Reservoir HUC and Sub-basins

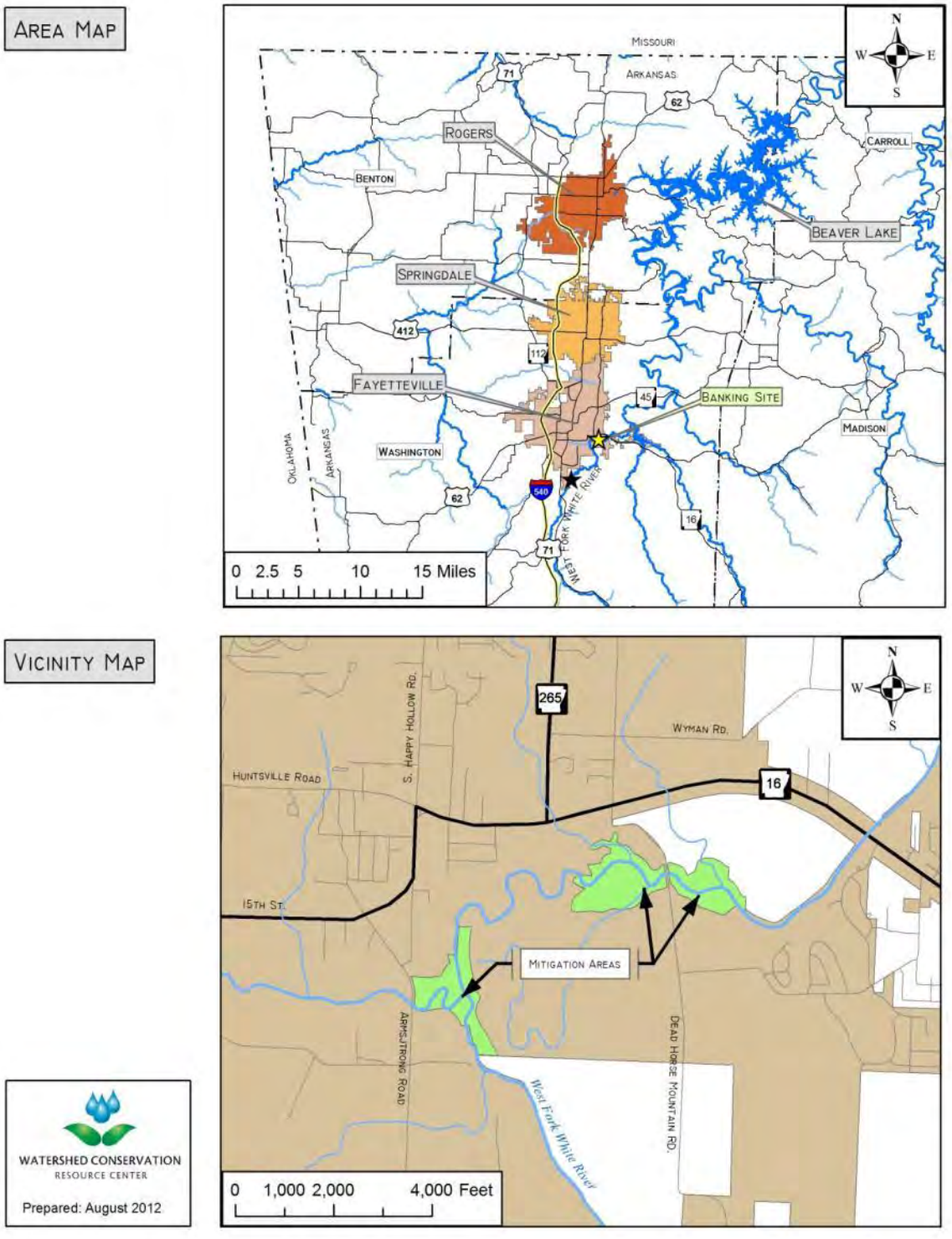

Figure 2 Location of proposed WFWR Mitigation Bank – Dead Horse Mountain site in relationship to the regional area and local vicinity

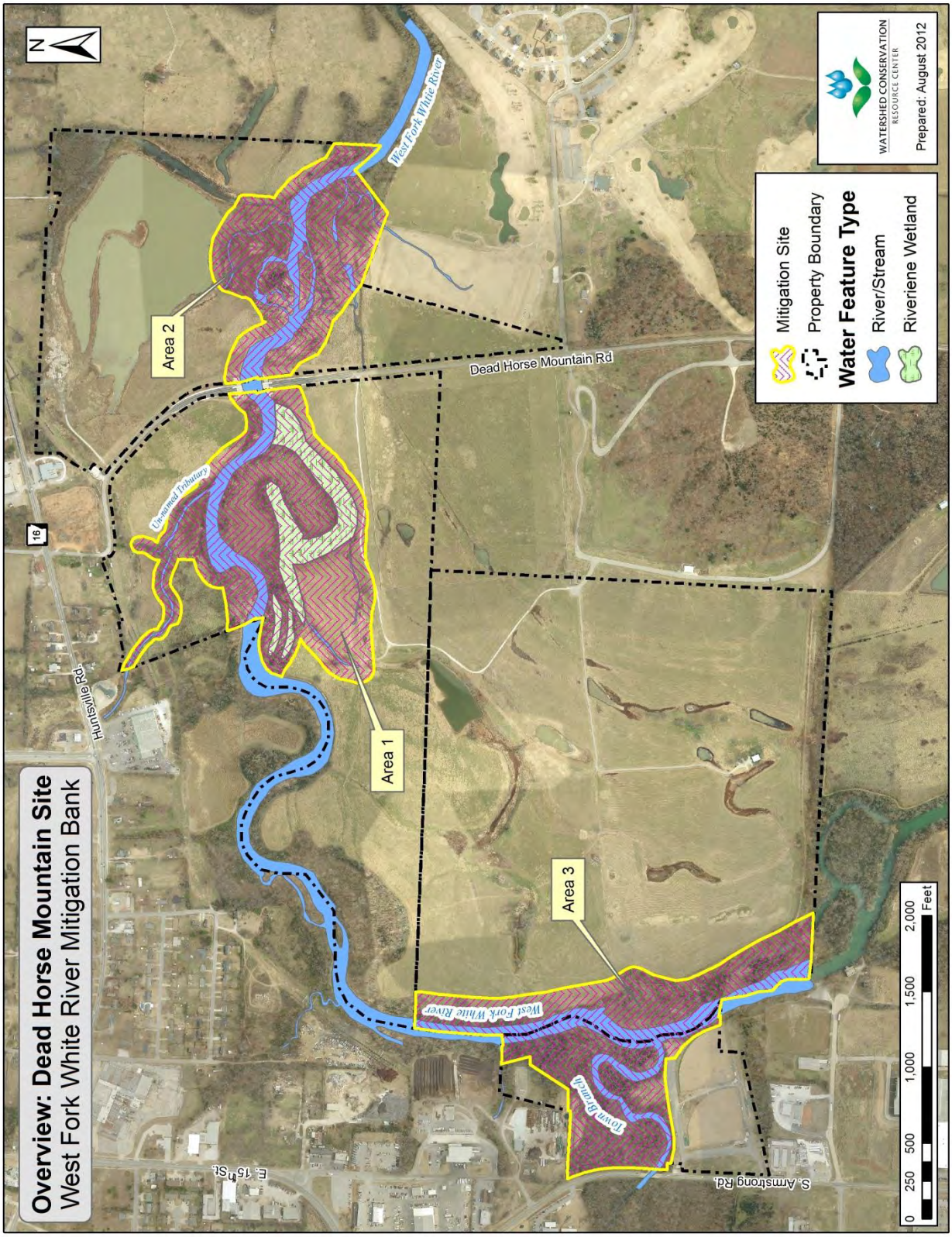

Figure 3 Overview of the proposed WFWR mitigation bank – Dead Horse Mountain Site

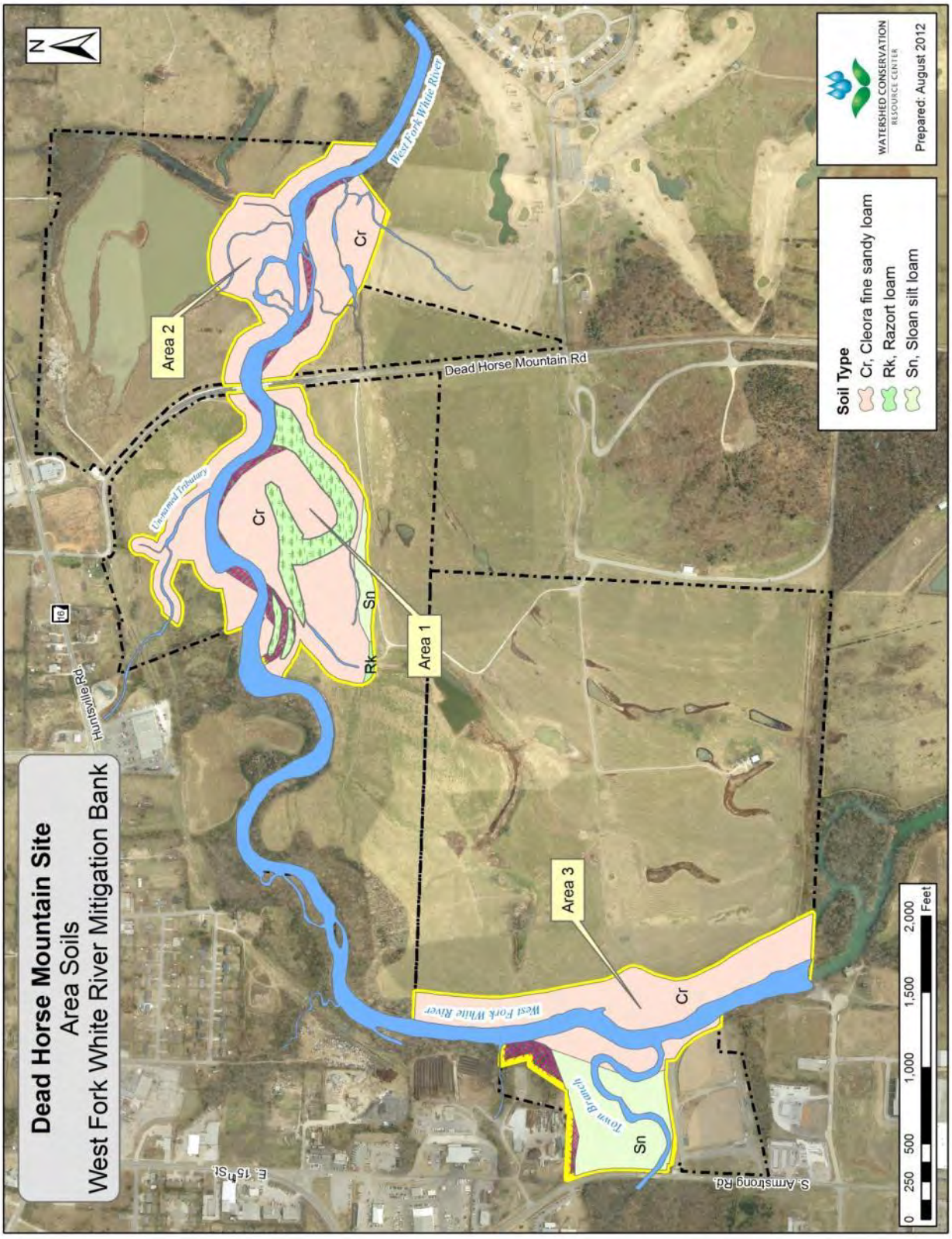

Figure 4 Soil types found within the WFWR Mitigation Bank – Dead Horse Mountain site

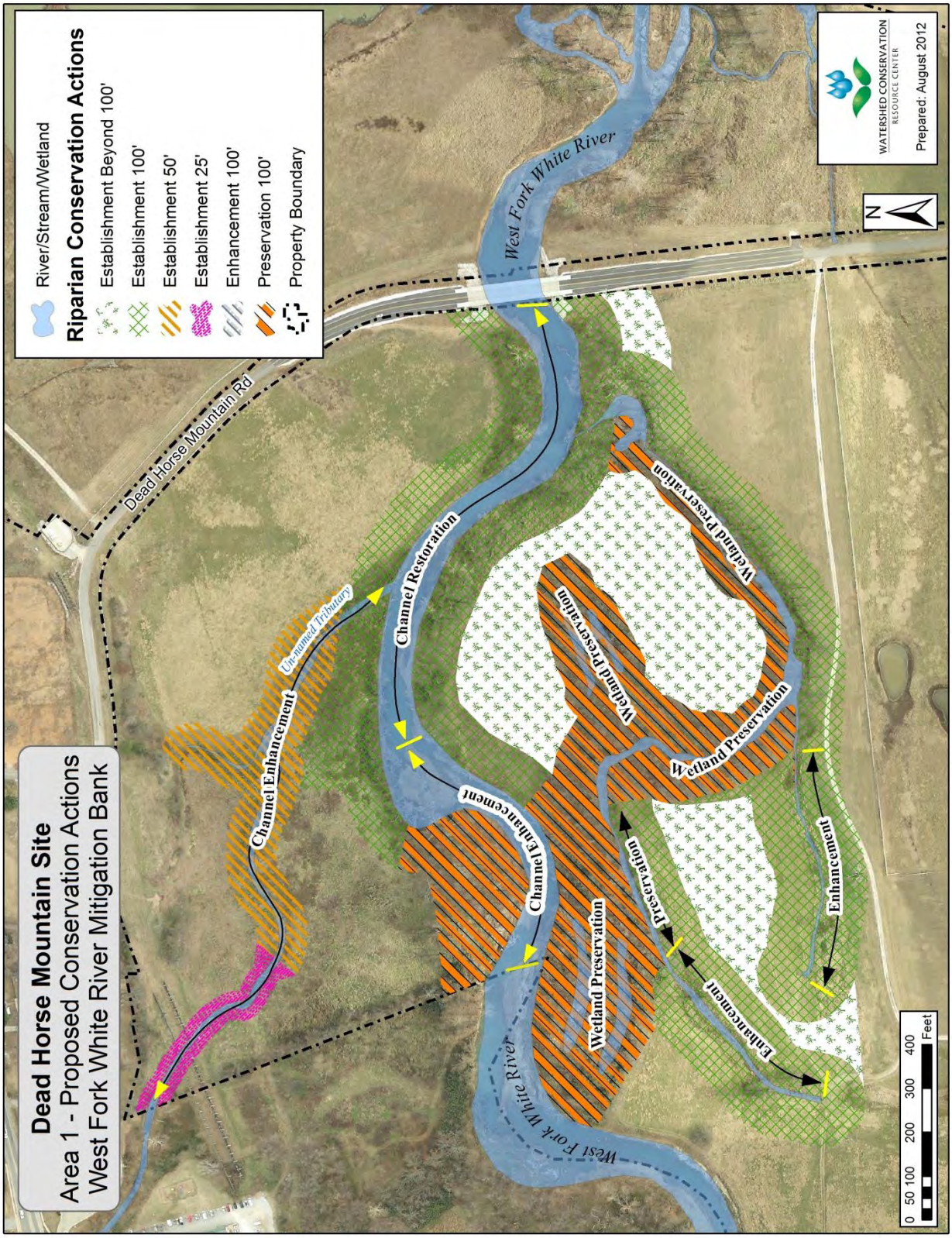

Figure 5 Proposed conservation actions to be undertaken at Area 1 of the WFWR Mitigation Bank – Dead Horse Mountain Site

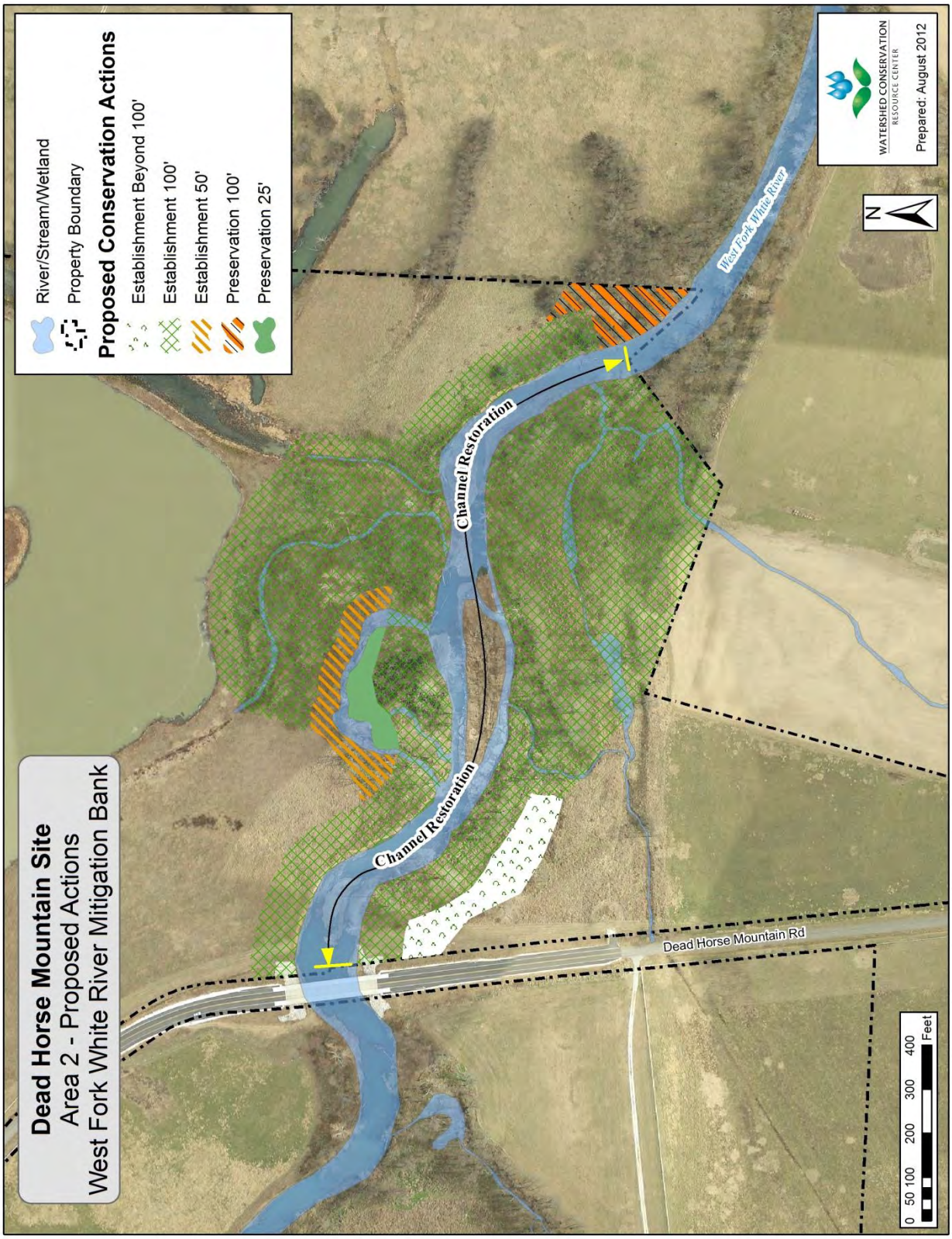

Figure 6 Proposed conservation actions to be undertaken at Area 2 of the WFWR Mitigation Bank – Dead Horse Mountain Site

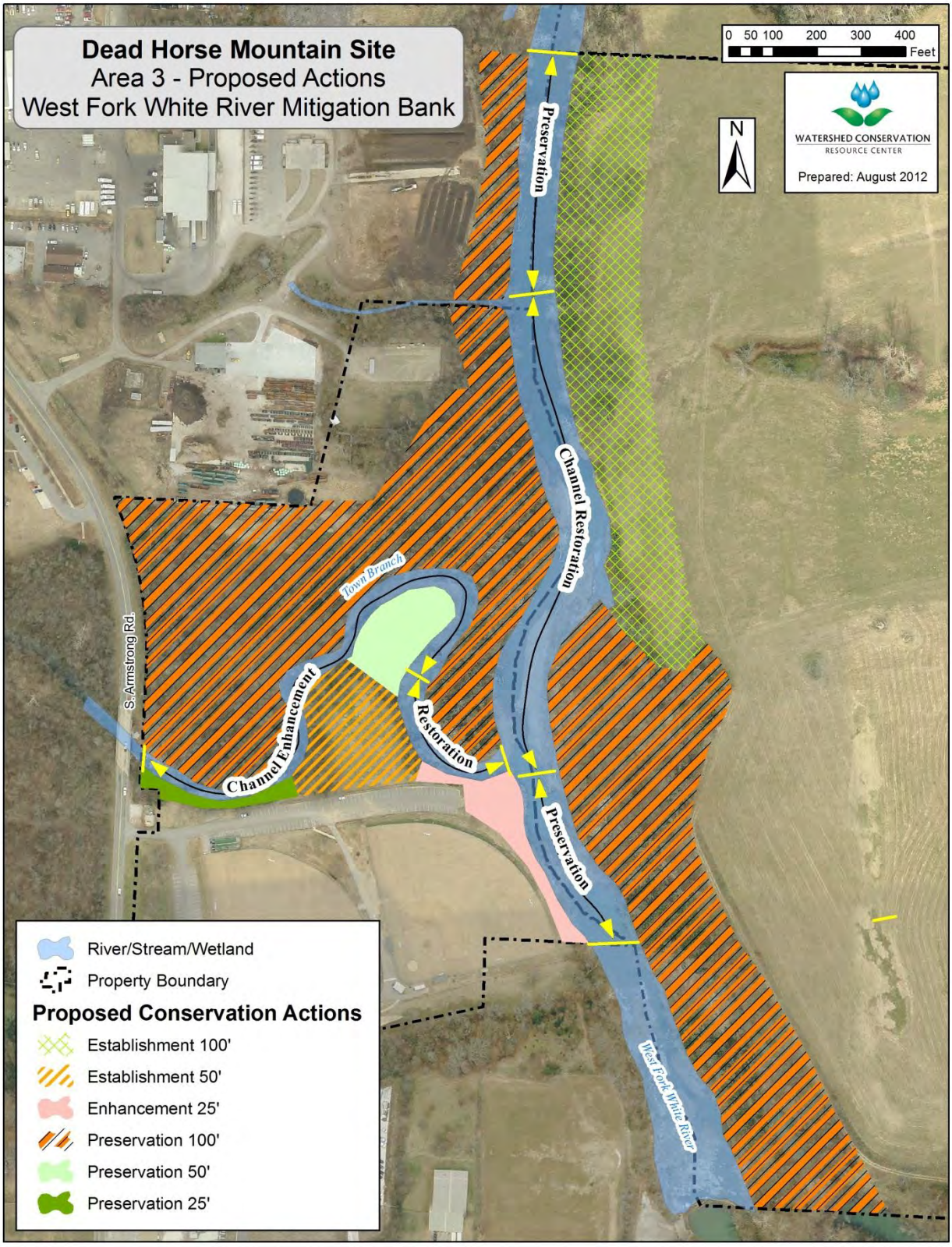

Figure 7 Proposed conservation actions to be undertaken at Area 3 of the WFWR Mitigation Bank – Dead Horse Mountain Site

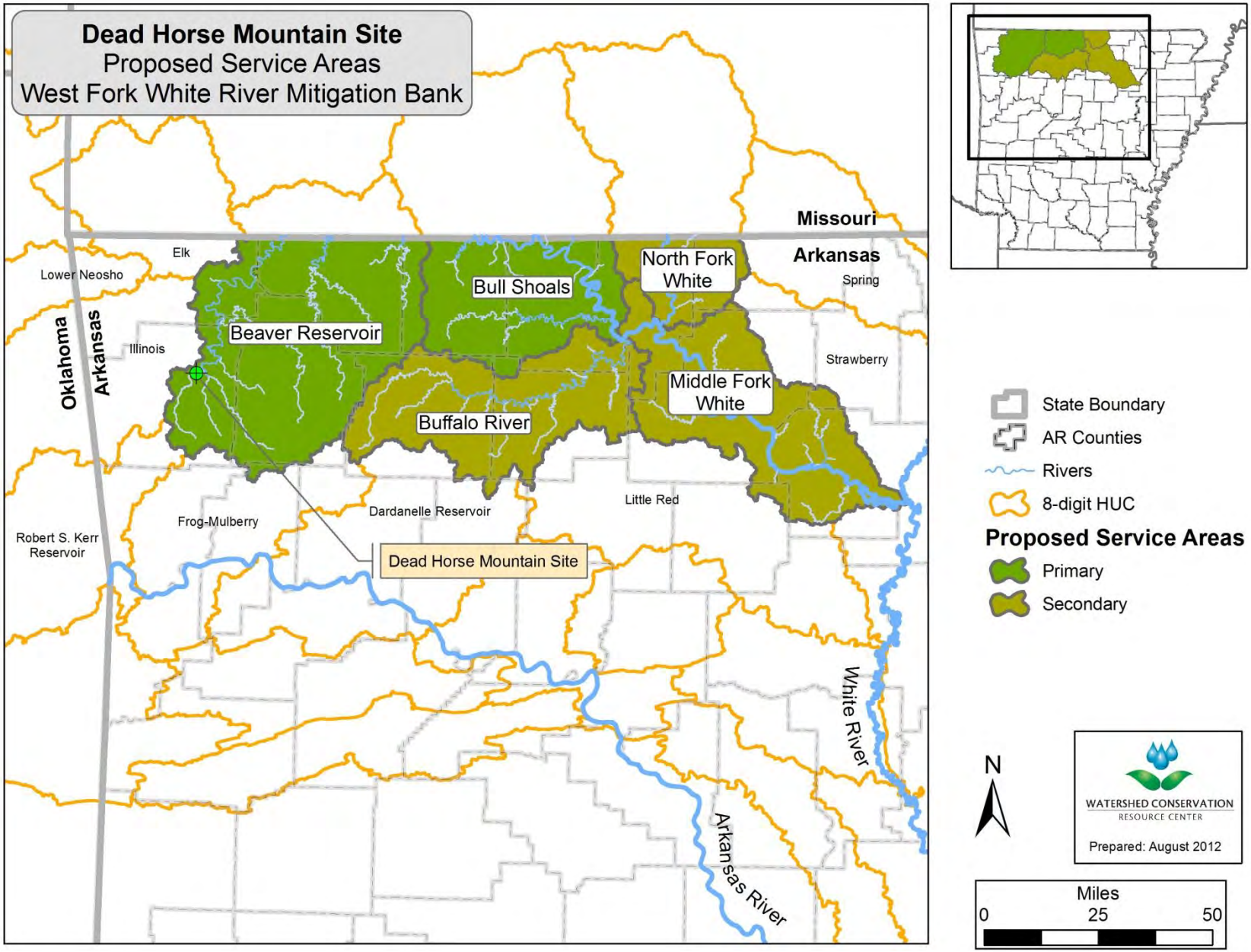

Figure 8 Proposed service areas for the WFWR Mitigation Bank

Appendix B

Site Photographs

Proposed WFWR Mitigation Bank Sites

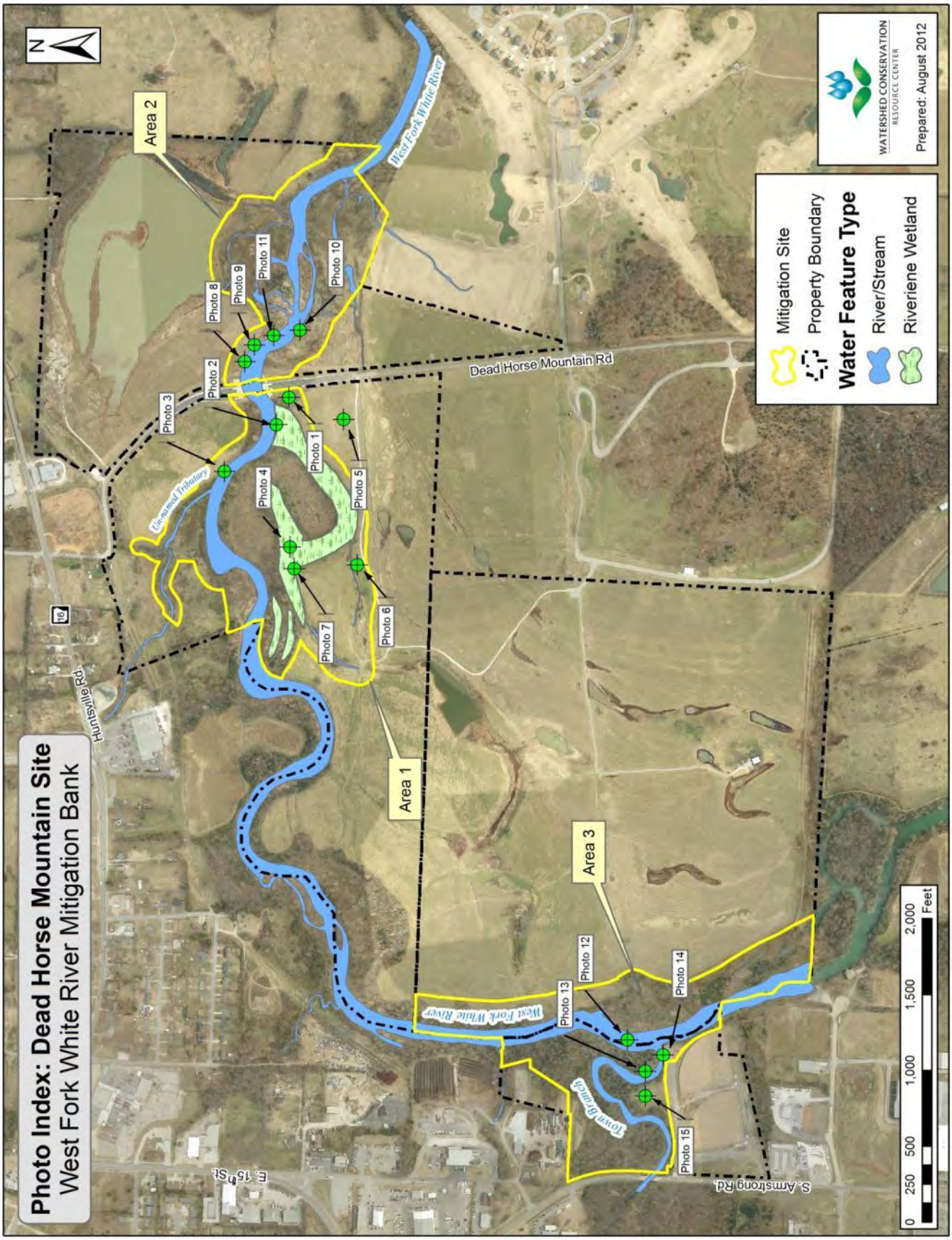

Figure 1 Index of areas depicted in site photographs

Photo 1 – Area 1 looking west from Dead Horse Mountain Rd. towards old channel meander scars, associated wetlands and forested area. Grassed area in foreground will be converted to forest.

Photo 2 Area 1 looking west from Dead Horse Mountain Rd. The eroding bank on the left of the picture will be stabilized as part of the river restoration component of the established bank site.

Photo 3 Area 1 looking east-northeast towards eroding riverbank that will be restored

Photo 4 Area 1 looking southeast at old river meander scars that serve as riverine wetlands. This area will be preserved as part of the established bank area.

Photo 5 Area 1: Pastures adjacent to the mitigation area are managed for hay production. Portions of the mitigation area will be converted from pasture to forested riparian.

Photo 6 Area 1 looking west along ephemeral tributary. A forested riparian area will be established and the stream channel will be enhanced where appropriate

Photo 7 Area 1 looking east at Virginia wild rye understory in a forested riparian that will be preserved

Photo 8 Area 2 looking east from Dead Horse Mountain Rd. at eroding riverbank. The 14 ft. high cut-bank will be stabilized using a toe wood bench. A riparian forest will be established on the floodplain adjacent to the restored river bank

Photo 9 Area 2 looking north towards eroding riverbank. The dimensions of the channel will be adjusted during restoration to reduce the width to depth ratio.

Photo 10 Area 2: Typical near-channel vegetative community near stable sections of the river that will be preserved

Photo 11 Area 2 looking northwest towards eroding riverbank

Photo 12 Area 3 looking north-east towards alternating eroding riverbanks on the WFWR. The channel will be restored and the banks stabilized.

Photo 13 Area 3 looking north-northwest up Town Branch tributary to the WFWR. The riverbank on the left of the photo frame is eroding and will be restored as part of the implementation phase for Area 3.

Photo 14 Area 3 looking north towards field that where a forested riparian area will be established.

Photo 15 Area 3: Tension cracks are visible (center of frame) along a length of the eroding streambank on Town Branch. The cracks are located approximately 10 feet from the edge of the streambank.

Appendix C

Summary Tables: Species of Greatest Conservation Need

Proposed WFWR Mitigation Bank

Federal-listed Species of Greatest Conservation Need					
Name	**Common Name**	**Federally Listed**	**Global Ranking**	**State Ranking**	**Ecoregions**
Fish					
Amblyopsis rosae	Ozark cavefish	Threatened	G3	S1	Ozark Highlands
Mammals					
Corynorhinus townsendii ingens	Ozark big-eared bat	Endangered	G4, T1	S1	Ozark Highlands, Boston Mountains
Myotis grisescens	gray bat	Endangered	G3	S2, S3	Ozark Highlands, Boston Mountains
Myotis sodalis	Indiana bat	Endangered	G2	S1	Ozark Highlands, Boston Mountains

Table A. Federally-listed SGCN near mitigation site in the White River Basin and Washington County

State-listed Species of Greatest Conservation Need Near Mitigation Site				
Name	**Common Name**	**Global Ranking**	**State Ranking**	**Ecobasin**
Mussels				
Cyprogenia aberti	western fanshell	G2, G3Q	S2	N/A
Venustaconcha pleasii	bleedingtooth mussel	G3, G4	S3	N/A
Crustaceans				
Stygobromus ozarkensis	Ozark cave amphipod	G4	S2	Ozark Highlands, Boston Mountains
Cambarus causeyi	a crayfish	G2	S1	Boston Mountains
Orconectes williamsi	William's crayfish	G3	S1	Boston Mountains
Caecidotea ancyla	an isopod	G3, G4	S2	Ozark Highlands, Boston Mountains
Insects				
Heterosternuta ouachita	Ouachita diving beetle	GNR	S2	Ozark Highlands, Boston Mountains
Rhadine ozarkensis	a ground beetle	GH	SH	Boston Mountains
Calephelis muticum	swamp metalmark	G3	S1	Ozark Highlands, Boston Mountains
Gomphus ozarkensis	Ozark clubtail dragonfly	G4	S1	Ozark Highlands, Boston Mountains
Allocapnia jeanae	winter stonefly	G2	S1?	Ozark Highlands, Boston Mountains
Allocapnia ozarkana	winter stonefly	G2	S1?	Ozark Highlands, Boston Mountains
Paduniella nearctica	nearctic paduniellan caddisfly	G1, G2	S1?	Ozark Highlands, Boston Mountains
Fish				
Polyodon spathula	paddlefish	G4	S2?	N/A
Cyprinella camura	bluntface shiner	G5	SH	N/A
Erimystax harryi	Ozark chub	G3, G4Q	S3, S4	Boston Mountains
Lythrurus snelsoni	Ouachita shiner	G3	SNR	N/A
Crystallaria asprella	crystal darter	G3	S2?	N/A
Percina nasuta	longnose darter	G3	S2	Ozark Highlands, Boston Mountains

Table B. State-listed SGCN near mitigation site in the White River Basin and Washington County

Table B Continued

Name	Common Name	Global Ranking	State Ranking	Ecobasin
Amphibians				
Ambystoma annulatum	ringed salamander	G4	S3	N/A
Ambystoma tigrinum tigrinum	eastern tiger salamander	G5, T5	S3	N/A
Eurycea spelaea	grotto salamander	G4	S3	N/A
Plethodon angusticlavius	Ozark zigzag salamander	G4	S3	N/A
Reptiles				
Cemophora coccinea copei	northern scarlet snake	G5, T5	S3	N/A
Crotaphytus collaris	eastern collared lizard	G5	S3	N/A
Regina grahamii	Graham's crayfish snake	G5	S2	N/A

Table B. State-listed SGCN near mitigation site in the White River Basin and Washington County

Species of Greatest Conservation Need in Mitigation Site Vicinity					
Name	**Common name**	**Federal Listing**	**Global Rank**	**State Rank**	**Ecobasin**
Flatworm					
Dendrocoelopsis americana	a cave obligate planarian	-	G2, G3	S1	N/A
Snails					
Marstonia ozarkensis	Ozark Pyrg	-	G1	S1?	Ozark Highlands
Somatogyrus crassilabris	thicklipped pebblesnail	-	GX	SX	Ozark Highlands
Mussels					
Epioblasma florentina curtisi	Curtis pearlymussel	Endangered	G1T1	S1	Ozark Highlands
Epioblasma turgidula	turgid blossom	Endangered	GX	SX	Ozark Highlands
Lampsilis abrupta	pink mucket	Endangered	G2	S2	Ozark Highlands
Lampsilis streckeri	speckled pocketbook	Endangered	G1Q	S1	Boston Mountains
Leptodea leptodon	scaleshell	Endangered	G1, G2	S1	Ozark Highlands
Ptychobranchus occidentalis	Ouachita kidneyshell	-	G3,G4	S3	N/A
Crustaceans					
Orconectes nana	a crayfish	-	G3	S3	Ozark Highlands, Boston Mountains
Caecidotea dimorpha	an isopod	-	G2, G3	S2	N/A
Caecidotea oculata	an isopod	-	G2, G3	S1	Boston Mountains
Caecidotea salemensis	an isopod	-	G4	S1	N/A
Caecidotea steevesi	an isopod	-	G3, G4	S1	N/A
Caecidotea stiladactyla	an isopod	-	G3, G4	S3	N/A
Lirceus bicuspidatus	an isopod	-	G3Q	S2	N/A

Table C. SGCN in White River Basin and general vicinity of mitigation site

Table C Continued

Insects					
Schaefferia alabamensis	A Cave Obligate Springtail	-	G1, G2	SNR	Ozark Highlands, Boston Mountains
Cicindela duodecimguttata	twelve-spotted tiger beetle	-	G5	S3, S4	Ozark Highlands, Boston Mountains
Cicindela lepida	little white tiger beetle	-	G3, G4	S2, S3	Boston Mountains
Cicindela macra	sandy stream tiger beetle	-	G5	S2, S3	Boston Mountains
Cicindela obsoleta	scrubland tiger beetle	-	G5	S1, S2	Ozark Highlands
Cicindela purpurea	cow path tiger beetle	-	G5	S3	Ozark Highlands
Cicindela unipunctata	woodland tiger beetle	-	G4, G5	S2	Boston Mountains
Heterosternuta phoebeae	a predaceous diving beetle	-	G2	S2	Ozark Highlands, Boston Mountains
Lucanus elaphus	giant stag beetle	-	G3, G5	S2	Ozark Highlands, Boston Mountains
Nicrophorus americanus	American burying beetle	Endangered	G2, G3	S1	Ozark Highlands
Pseudactium ursum	Ozark pseudactium	-	GNR	S1	Ozark Highlands, Boston Mountains
Rimulincola divalis	a beetle	-	G1	S1	Ozark Highlands, Boston Mountains
Scaphinotus inflectus	a ground beetle	-	GNR	S1	Boston Mountains
Hesperia meskei	Meske's skipper	-	G3, G4	S1, S2	Ozark Highlands
Poanes yehl	Yehl skipper	-	G4	S1, S3	Boston Mountains
Speyeria diana	Diana	-	G3, G4	S2, S3	Boston Mountains
Allocapnia warreni	a winter stonefly	-	GH	SH	Ozark Highlands, Boston Mountains
Lampetra appendix	American brook lamprey	-	G4	S2?	Ozark Highlands, Boston Mountains

Table C. SGCN in White River Basin and general vicinity of mitigation site

Global Rank Codes	
G1	Critically imperiled globally because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.
G2	Imperiled globally because of rarity (6-20 occurrences or few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.
G3	Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range (e.g., a single western state, a physiographic region in the East) or because of other factors making it vulnerable to extinction throughout its range; in terms of occurrences, in the range of 21 - 100.
G4	Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.
G5	Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.
GH	Of historical occurrence throughout its range, i.e., formerly part of the established biota, with the expectation that it may be rediscovered (e.g., Bachman's Warbler).
GU	Possibly in peril range-wide but status uncertain; more information is needed.
GX	Believed to be extinct throughout range (e.g., Passenger Pigeon) with virtually no likelihood that it will be rediscovered.
T-RANKS	T subranks are given to global ranks when a subspecies, variety, or race is considered at the state level. The subrank is made up of a "T" plus a number or letter (1, 2, 3, 4, 5, H, U, X) with the same ranking rules as a full species.
GNR	Not yet ranked.

Table D. Global ranking codes for conservation status

State Rank Codes	
S1	Extremely rare. Typically 5 or fewer estimated occurrences in the state, or only a few remaining individuals, may be especially vulnerable to extirpation.
S2	Very rare. Typically between 5 and 20 estimated occurrences or with many individuals in fewer occurrences, often susceptible to becoming extirpated.
S3	Rare to uncommon. Typically between 20 and 100 estimated occurrences, may have fewer occurrences but with large number of individuals in some populations, may be susceptible to large-scale disturbances.
S4	Common, apparently secure under present conditions. Typically 100 or more estimated occurrences, but may be fewer with many large populations, may be restricted to only a portion of the state, usually not susceptible to immediate threats.
SH	Historically known from the state, but not verified for an extended period, usually 15 years.
SX	Apparently extirpated from state.
SNR	Not yet ranked.

Table E. State ranking codes for conservation status