# Recovery Plan

# for the

# Topeka shiner (*Notropis topeka*)

# in Kansas

*Prepared by*

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**Approved:** ______________________ **Date:** 5/17/04
**J. Michael Hayden**
**Secretary of the Kansas Department of Wildlife & Parks**

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**DISCLAIMER:** This recovery plan outlines actions believed reasonable to maintain and/or restore self-sustaining populations of the state-threatened, federally-endangered Topeka shiner (*Notropis topeka*). However, budgetary constraints and/or social concerns may impede or delay progress toward the stated recovery objectives. While implementation tasks have been proposed and scheduled over a five year period, it will likely take much longer to reverse the current trend of declining populations and ongoing habitat degradation. This recovery plan does not obligate other state or federal government agencies, non-government organizations, or private individuals to undertake specific tasks and may not represent the views or the official positions of any individuals, agencies, or organizations involved in the development of this plan. Approved recovery plans are subject to modification based on new findings, changes in species status, and the completion of recovery tasks. By approving this document, the Secretary of the Kansas Department of Wildlife and Parks certifies that the data used in its development represents the best scientific and commercial data available at the time it was written.

**ACKNOWLEDGMENTS:** As required through K.S.A. 32-960a(b), whenever a species is added to the list of threatened or endangered species, the secretary shall establish a volunteer local advisory committee composed of members broadly representative of the area(s) affected by the addition of the species to the list. The advisory committee is to work with the Department to adapt the recovery plan and disseminate information to the public. The Department greatly appreciates the invaluable assistance provided by the following members of the Topeka Shiner Advisory Committee:

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# I. INTRODUCTION

On December 15, 1998, the United States Fish and Wildlife Service determined the Topeka shiner (*Notropis topeka*) to be an endangered species under the authority of the Endangered Species Act of 1973 (USFWS, 1998). In a subsequent action, a task force commissioned by the Kansas Department of Wildlife & Parks (KDWP), finalized recommendations to Department administration for listing the Topeka shiner as a threatened species under the Kansas Nongame and Endangered Species Conservation Act of 1975. Final action on this listing was published in the Kansas Register, Vol. 18, No. 45, November 11, 1999. By authority granted under K.S.A. 32-960(a), the KDWP is required to develop recovery plans for threatened, endangered, and species in need of conservation (SINC). Recovery planning is governed by K.A.R. 115-15-4 and is defined as "a designated strategy or methodology that, if funded and implemented, is reasonably expected to lead to the eventual restoration, maintenance, or delisting of a species." This recovery plan identifies immediate needs for the conservation and restoration of the Topeka shiner, and actions to address those needs.

# II. SPECIES ACCOUNT

A. <u>*Current Description*</u>: The Topeka shiner is a small, stout-bodied minnow, not exceeding 3 inches in length at maturity. The head is short with a small, terminal mouth. The snout is rounded and shorter than or nearly equal to the eye diameter. The dorsal fin is large, plain, originates over the insertion of the pectoral fins, and contains 8 rays. The pectoral, pelvic, and anal fins are also plain and contain 7, 8, and 13 rays respectively. There is a distinct, chevron-shaped spot at the base of the caudal fin. Dorsally the body is olive-green, with a distinct dark stripe preceding the dorsal fin. There are 32 to 37 lateral line scales and a dusky stripe extending the entire length of the lateral line. The scales above this line are darkly outlined, giving a cross-hatched appearance. Below the lateral line, the body lacks pigment, appearing silvery-white. Breeding males display red-orange fins and orange-tinted cheeks and opercles (Cross and Collins, 1995).

B. <u>*Life History*</u>: Early studies indicated that Topeka shiners were benthic insectivores, feeding primarily on midges (chironomids), true flies (dipterans), and mayflies (ephemeropterans), with zooplankters (cladocerans and copepods) also contributing to their diet (Cross and Collins, 1995; Kerns and Bonneau, 2002). More recent studies have found feeding at a variety of trophic levels and diverse food use by the Topeka shiner. Stark et al. (2002) observed Topeka shiners consuming eggs from fathead minnow nests in Willow Creek, Wallace County, Kansas. In Minnesota, food included several kinds of zooplankton, a variety of immature aquatic insects, larval fish, algal and vascular plant matter, including seed capsules (Hatch and Besaw, 1998). These authors suggested that Topeka shiners function both as benthic and nektonic feeders and may also feed from the surfaces of aquatic plants. Topeka shiners have also been observed feeding on surface-dwelling insects (Mammoliti, unpubl. observations, 1998).

Topeka shiners spawn in pool habitats, over green sunfish (*Lepomis cyanellus*) and orangespotted sunfish (*Lepomis humilis*) nests, from late May to August in Kansas and Missouri (Cross and Collins, 1995; Pflieger, 1997; Kerns and Bonneau, 2002). Stark et al. (2002) observed Topeka shiners spawning on the periphery of green sunfish nests and suggested that the habitats provided by these nests are important for the reproductive success of Topeka shiners. These same authors reported aggregations of Topeka shiners in close association with fathead minnow and orangespotted sunfish nests, but no spawning activities were observed. In Minnesota, Hatch (2001) found that Topeka shiners utilized rubble, boulder, and concrete rip-rap at the margins of pools and slow runs. Several authors have reported the defense of small territories by breeding male Topeka shiners (Pflieger, 1997; Katula, 1998; Hatch, 2001; Kerns and Bonneau, 2002; Stark et al., 2002). In Jack Creek, Chase County, Kansas, two male Topeka shiners were observed defending a longear sunfish (*Lepomis megalotis*) nest as the male sunfish loafed nearby (Mammoliti, unpubl. observations, 1998). Other authors have noted upstream movement as reproductive behavior in Topeka shiners (Minckley and Cross, 1959; Kerns, 1983; Barber, 1986).

The Topeka shiner is a short-lived species, rarely surviving to their third summer (Minckley and Cross, 1959; Kerns, 1983; Cross and Collins, 1995; Pflieger, 1997; Hatch, 2001). While they mature at 12-14 months of age (Kerns, 1983; Cross and Collins, 1995; Pflieger, 1997), size seems to be the primary determining factor rather than age (Kerns, 1983). Based on ovarian development, Hatch (2001) suggested that Topeka shiners are multiple-clutch spawners.

The Topeka shiner is primarily a schooling fish and found throughout the water column. Pflieger (1997) noted that the species schooled with other cyprinids in midwater or near the surface. Other studies have reported Topeka shiners schooling in the lower portion of the water column with central stonerollers (*Campostoma anomalum*) (Kerns, 1983; Stark et al., 1999). While typical of small, headwater streams, the species is occasionally reported from larger streams, downstream of known populations (Kerns, 1983; Tabor, pers. comm., 1999). A study conducted in the upper Cottonwood River Basin of the Kansas Flint Hills, reported that Topeka shiner populations were comprised of two groups of individuals: a larger sedentary group and a smaller mobile group (Barber, 1986). In the spring, as precipitation and water temperatures increased, adults males tended to move upstream or downstream. In many instances, the fish later moved back to their original pool. Young-of-the-year fish tended to move downstream in the fall. Others have reported displacement of fish downstream during periods of high flow (Cross, pers. comm., 1994; Tabor, pers. comm., 1994). Kerns and Leon (1982) reported the collection of a single adult Topeka shiner in Buck Creek, Jefferson County, Kansas. While the authors considered it a small probability that this individual was a vagrant, entering Buck Creek via the Kansas River, subsequent surveys have failed to document other specimens. Although it is evident that the species has some capacity to disperse, at present, the degree of dispersal and its ability to "tributary hop" is unknown. Metcalf (1966) suggested that populations found in short, direct tributaries of the Missouri River were evidence of an historic dispersal eastward by "tributary hopping." However, Deacon and Metcalf (1961) found the Topeka shiner to be one of several fishes having a lesser capacity for dispersal after drought conditions. In addition, a range-wide genetic analysis suggested that successful migration, even between adjacent populations, is fairly rare and that movement over long distances is unlikely (Michels, 2000).

C. *Habitat*: Topeka shiners are typically found in small, low order, prairie streams with good water quality, relatively cool water temperatures, and low fish diversity (Minckley and Cross, 1959; Barber, 1986; Cross and Collins, 1995; Pflieger, 1997). Although Topeka shiners can tolerate a range of water temperatures, cooler, spring-maintained systems are considered optimum (Cross and Collins, 1995; Pflieger, 1997). The stream may or may not be bordered by trees. These streams generally maintain perennial flow but may become intermittent during summer. Everman and Cox (1896), reporting on surveys from the Nebraska portion of the Big Blue River watershed, collected Topeka shiners in "pond-like, isolated portions of streams which dry up in parts of their course during dry weather." Minckley and Cross (1959) found Topeka shiners "almost exclusively in quiet, open pools of small, clear streams that drain upland prairies." They also noted that even when streams approach intermittency the "pools are maintained at fairly stable levels by percolation through the gravel or by springs." Similar habitat characteristics are described for populations in Missouri by Pflieger (1997). Although characteristic of pools with stable water levels, it appears that the Topeka shiner is well adapted for the periodic drought conditions common to prairie streams. For example, Kerns (1983) found that even though mortality of several species was high in desiccating pools, juvenile Topeka shiners seemed especially drought resistant. In South Dakota, Blausey (2001) found that runs were the dominant habitat type associated with Topeka shiner presence although higher densities of the species were collected in pools.

In Kansas, Missouri, and South Dakota, Topeka shiners typically occur in streams with clean gravel, cobble, or sand bottoms (Pflieger, 1971; Kerns, 1983; Barber, 1986; Cross and Collins, 1995; Pflieger, 1997; Blausey, 2001). However, bedrock and clay hardpan covered by a thin layer of silt are not uncommon (Minckley and Cross, 1959). In western Kansas pools containing Topeka shiners, Stark et al. (2002) determined the primary substrate to be coarse sand overlain by silt and detritus. Similarly, Michl and Peters (1993) reported the collection of Topeka shiners from a Nebraska stream having a sand and detritus substrate. While main channel areas may be typical of Kansas and Missouri populations, Topeka shiners in Minnesota and Iowa appear to be more abundant in off-channel oxbows and excavated pools (Menzel, pers. comm., 1999; Hatch, 2001). These seasonally flooded habitats also appear to have a connection with the water table, enabling temperature and dissolved oxygen to stay within the tolerance levels of the species during dry periods. It is also suggested that the groundwater connection may prevent complete freezing of these pools in winter. Groundwater availability was a primary predictor of Topeka shiner presence in South Dakota (Blausey, 2001).

Recently, the species has been found to exist at some stream sites with degraded water quality characterized by excessive sedimentation (Tabor, pers. comm., 1995; Berry, pers. comm., 2000, Hatch, pers. comm., 2000). It is unknown whether the species utilizes these locations year-round, for portions of the year, or were vagrants.

## III. SPECIES DISTRIBUTION

A. <u>*Historical*</u>: Historically, the Topeka shiner was widespread and abundant in headwater streams throughout the prairie region of the central United States. It's range included portions of Kansas, Missouri, Nebraska, Iowa, South Dakota, and Minnesota (Johnson, 1942; Harlan and Speaker, 1956; Bailey and Allum, 1962; Cross and Collins, 1995; Pflieger, 1997; Eddy and Underhill, 1976). The species is known from the Smoky Hill, Saline, Solomon, Upper Republican, Big Blue, Nemaha, and Lower Kansas watersheds in the Kansas River Basin in northern Kansas; the

Neosho, Walnut, and Lower Arkansas watersheds in the Arkansas River Basin in southcentral Kansas; the Missouri, Grand, Lamine, Chariton, Des Moines, Loutre, Middle, Hundred and Two, and Blue watersheds in the Missouri River Basin in central and northern Missouri; the Big Blue, Elkhorn, Missouri, and Loup watersheds in Nebraska; the Des Moines, Raccoon, Boone, Missouri, Big Sioux, Cedar, Shell Rock, Rock, and Iowa watersheds in Iowa; the Big Sioux, Vermillion, and James watersheds in eastern South Dakota and; the Des Moines, Cedar, and Rock watersheds in southwestern Minnesota. The species has exhibited major declines in distribution and abundance throughout its historic range. The number of historic known occurrences of Topeka shiners has been reduced by approximately 80 percent, with approximately 50 percent of this decline occurring within the last 40-50 years (USFWS, 2001).

In Kansas, the earliest reported records of the Topeka shiner (1882-1889) were exclusively from areas other than the Flint Hills (Minckley and Cross, 1959). Subsequent habitat modifications, both natural and human-induced, have reversed this situation. As noted by Cross and Moss (1987), the species began to decline throughout the central and western portions of the Kansas River basin in the early 1900's. While the species was reported from the Solomon and Smoky Hill River basins in 1885, it had disappeared before 1935. Similarly, the last record of the species from the Arkansas River basin, excluding the Cottonwood River watershed, was 1891 near Wichita (Cross and Moss, 1987). Minckley and Cross (1959) noted that the Topeka shiner had disappeared from Shunganunga Creek, the type locality, by 1951. Populations known from the Wakarusa River watershed were apparently extirpated during the 1970's (Cross, pers. comm., 1995). Although the Topeka shiner was reported from Dragoon Creek in 1942 (Marais des Cygnes River basin) and Cherry Creek in 1947 (Upper Republican River basin), subsequent surveys have not documented their continued presence (KDWP, unpublished locational records). Documentation of Topeka shiner occurrence in Flint Hills streams was first reported in the 1950's (Cross, 1954).

B. *Current*: At the present time, Topeka shiners exist as fragmented populations within a small portion of its historic range. During the 1990's and early 2000's, extensive surveys have occurred throughout the known range of the species. Currently, the species still occurs at isolated locations in the Smoky Hill, Big Blue, and Lower Kansas watersheds in the Kansas River Basin in northern Kansas; the Neosho watershed in the Arkansas River Basin in southcentral Kansas; the Missouri, Grand, Lamine, Chariton, and Des Moines watersheds in the Missouri River Basin in central and northern Missouri; the Elkhorn and Loup watersheds in Nebraska; the Des Moines, Raccoon, Boone, Big Sioux, and Rock watersheds in Iowa; the Big Sioux, Vermillion, and James watersheds in eastern South Dakota and; the Big Sioux and Rock watersheds in southwestern Minnesota.

In Kansas, the species is almost exclusively restricted to tributary streams in, or very near the Flint Hills, with the exception of one remnant population in western Kansas. Topeka shiners are currently known to occur in the mainstem or tributaries of the following Kansas stream systems: Bloody Creek, South Fork, Middle Creek, Diamond Creek, Fox Creek, and Mud Creek in the Cottonwood River watershed (Neosho River basin); Willow Creek and Lyons Creek in the Smoky Hill River basin; Clark's Creek, Seven-mile Creek, Wildcat Creek, Deep Creek, Mill Creek and Mission Creek in the Lower Kansas River basin; Walnut Creek, Carnahan Creek, Clear Fork Creek and North Elm Creek in the Big Blue River basin. The remnant population in Willow Creek (Wallace County, Kansas) is the last remaining occurrence on the High Plains and separated from core populations by approximately 450 kilometers, two federal reservoirs, and many miles of dewatered stream channel. Michels (2000) found this population to be genetically distinct from the core populations located in eastern Kansas. Stark et al. (1999) gave credit to the good stewardship of local landowners for the continued existence of Topeka shiners in Willow Creek.

Until recently, Topeka shiner populations inhabiting streams draining into Tuttle Creek Reservoir were considered extirpated due to reservoir construction. In pre-construction surveys, Minckley (1959) found the Topeka shiner to be locally common in upland streams. Later surveys failed to document the species. The recent capture of a single adult Topeka shiner in Walnut Creek and in Carnahan Creek (Tabor, pers. comm, 1993; Schrank et al., 2000) indicates the need for additional survey work within this basin. Similarly, by 1959 the species was considered extirpated from Wildcat Creek due to sedimentation from agricultural and urban development (Minckley and Cross, 1959). Extensive recent surveys of Wildcat Creek and it's tributaries have documented the continued presence Topeka shiners within the watershed (Mammoliti, unpubl. observations, 1996; Quist, 1999). Current populations in Kansas exist almost entirely on privately-owned land. Exceptions are populations on lands in public ownership: Deep Creek (KDWP); Mission Creek (Wabaunsee County); three unnamed tributaries on the Tallgrass National Prairie Park (National Park Service); Seven-mile Creek, Wildcat Creek, and Little Arkansas Creek (Ft. Riley, Department of Defense). Two populations occur on properties owned by conservation organizations: South Fork River (The Nature Conservancy) and Rock Springs Creek (Kansas 4-H Foundation).

Due to a lack of recent survey data, the status of Topeka shiner populations in the following streams is unknown: *Cottonwood River basin* - Sharpes Creek, Crocker Creek, and Den Creek in the South Fork Cottonwood watershed; Pickett Creek in the Diamond Creek watershed; Jacob's Creek and Cedar Creek, direct tributaries to the Cottonwood River; *Lower Kansas River basin* - Thomas Creek in the Clark's Creek watershed; Swede Creek in the McDowell Creek watershed.

Based on current knowledge, populations of the Topeka shiner are assumed extirpated from the following streams: *Cottonwood River basin* - Stribby Creek and three additional tributaries in the Middle Creek watershed; *Smoky Hill River basin* - Saline River; North Fork Solomon River; Big Creek; Lime Creek in the Lyons Creek watershed; *Lower Arkansas River basin* - Elm Creek and Little Mule Creek in the Medicine River watershed; Timber Creek in the Walnut River watershed; Sand Creek in the Little Arkansas watershed; *Upper Republican River basin* - Sappa Creek and Cherry Creek; *Kansas/Lower Republican basin* - Mill Creek (Riley Co.) and the South Fork Black Vermillion in the Big Blue River watershed; Dry Creek in the Mill Creek watershed (Wabaunsee Co.); Buck Creek, Blacksmith Creek and Shunganunga Creek, direct tributaries to the Kansas River; Strowbridge Creek, Deer Creek, Rock Creek, Bury's Creek, and Camp Creek in the Wakarusa River watershed; Tomahawk Creek in the Blue River watershed; *Marais des Cygnes River basin* - Dragoon Creek.

## IV. REASONS FOR DECLINE

No one factor can be considered the sole cause for the decline of the Topeka shiner throughout its range. The decline most likely results from a variety land use changes that have caused the destruction, degradation, modification, and fragmentation of essential habitat features. Factors considered to be detrimental to the species include: historic climate changes, intensive cultivation, domestic and livestock pollution, tributary impoundment, urbanization, and highway construction (Minckley and Cross, 1959; Deacon, 1961; Cross and Moss, 1987; Pflieger, 1997; USFWS, 1998; Gelwicks and Bruenderman, 1996; Missouri Department of Conservation, 1999; Schrank et al., 2000). Although many hypotheses on species decline have been advanced over the years, little quantitative data exist relating the influence of landscape-level features on Topeka shiner distribution.

Historic changes in climate have led to reduced average runoff and instability of water tables leading to more frequent intermittency of streams and higher water temperature in residual pools (Minckley and Cross, 1959). These effects have been magnified by the cultivation of prairies causing many streams to cease flow and become warm and turbid during summer months (USFWS, 1998). Minckley and Cross (1959) reported that watersheds with a high level of cultivation, and subsequent sedimentation were unsuitable for the species. In Kansas, sedimentation and eutrophication resulting from intensive agricultural development is considered the most damaging impact to Topeka shiner habitat west of the Flint Hills. The majority of populations occurring in western Kansas existed in areas now characterized by intensively cultivated row crop farming. By 1935, most of these western Kansas populations were believed extirpated (Cross and Moss, 1987). Eberle et al. (1989) compared past and recent assemblages of fish inhabiting Big Creek, Ellis County, Kansas. Five species of fish, including the Topeka shiner, were considered extirpated due to increased turbidity and siltation of the creek from cultivated land. Pflieger (1997) considered increased sedimentation from intensive row crop production and the more widespread application of pesticides to be reasons for the decline of the Topeka shiner habitat in Missouri. Menzel et al. (1984) noted the intensive row crop activity, accelerated rates of soil erosion, and in-channel sedimentation throughout many Iowa streams encompassed by the former range of the species. Blausey (2001) found Topeka shiners to be absent from streams with a high percentage of finer substrates. In contrast, shallow rocky soils and numerous limestone exposures allow little cultivation in the Flint Hills of Kansas. As a result, the streams are bordered primarily by grasslands. Similarly, the Willow Creek population occurs in an area bordered by grasslands with little cultivated crop land (Stark et al., 1999).

Other studies indicate that some of the areas where depletion of the species has occurred also coincide with areas having naturally poor aquifers or increased irrigation withdrawals affecting the quantity of water (Minckley and Cross, 1959; Cross, 1970; Cross and Moss, 1987). Cross and Braasch (1968) noted that feedlot operations on or near streams impacted prairie fish due to organic input and eutrophication of the system. The establishment of large, confined livestock operations were considered to be one factor that may have reduced the amount of Topeka shiner habitat in Missouri (Pflieger, 1997). Overgrazing riparian zones and the removal of riparian vegetation will also increase the eutrophication and sedimentation of a stream system by reducing the filtration of overland runoff (Manci, 1989; Zale et al., 1989; Missouri Department of Conservation, 1999). In South Dakota, Blausey (2001) found that as livestock grazing increased, Topeka shiner presence decreased. Although not specifically implicated in the decline of Topeka shiners, these activities diminish the physical and chemical habitat quality of streams within the species' range. In addition, it is thought that several populations of Topeka shiners were extirpated as a result of highway construction and urbanization (Minckley and Cross, 1959; Pflieger, 1997; Mammoliti, 2002). Due to ongoing urban development, the Missouri Department of Conservation has adopted specific strategies to minimize the effects of urbanization on watersheds containing Topeka shiners (Missouri Department of Conservation, 1999). In Kansas, urbanization is considered to be the primary factor in the extirpation of Topeka shiners from Shunganunga Creek (Shawnee Co.), their type locality, and from reaches of Wildcat Creek (Riley Co.).

The construction of small, mainstem impoundments is considered to be a significant factor in the decline of Topeka shiners (Pflieger, 1997; USFWS, 2001). Deacon (1961) suggested that small impoundments block the movement of Topeka shiners, thus eliminating upstream recolonization following droughts. Prophet et al. (1981) stated that a proposed plan to construct watershed impoundments may constitute a serious threat to the continued prominence of the Topeka shiner in the South Fork River basin, Chase County, Kansas. The Kansas Department of Health and Environment (1981), in conjunction with the Natural Resource Conservation Service (formerly Soil Conservation Service), conducted a study to determine the effects of small watershed dams on intermittent stream communities. This study noted that 12 species, including four cyprinids, were less abundant below impoundments, and three species, including the Topeka shiner, were absent below impoundments when compared with nearby control streams. Comparisons between fish populations above impoundments and in the upper portions of control streams revealed that eight species, including the Topeka shiner, were less abundant in impounded streams. Layher (1993) noted that five cyprinids present in 1983 and 1984 (including the Topeka shiner) were absent from Stribby Creek, Chase County, Kansas following impoundment. In a quantitative assessment, Schrank et al. (2001) determined that the number of small impoundments within a watershed was associated with the extirpation of Topeka shiners in Kansas. A recent literature review suggests a negative relationship between impoundments and obligate stream species such as the Topeka shiner (Mammoliti, 2002). Similar situations have been noted in Missouri and Iowa (Pflieger, 1997; Missouri Department of Conservation, 1999).

Large mainstem impoundments have also been implicated as a factor in the decline of the Topeka shiner. The completion of Clinton Reservoir coincided with the large scale development of tributary impoundments throughout the upper Wakarusa River watershed. Currently, all populations previously known from the Wakarusa River watershed are believed extirpated. Although the Topeka shiner still exists in two tributaries (Walnut Creek, Carnahan Creek) to Tuttle Creek Reservoir, other recently extant populations are believed to be extirpated (Fancy Creek, Mill Creek). In recent surveys of Walnut Creek and Carnahan Creek, only a single Topeka shiner was captured from each stream (Schrank et al., 2001; Kansas Department of Wildlife & Parks, 2003).

It has also been noted that the introduction of game fish into small impoundments increases the vulnerability of Topeka shiners to predation hazards in the stream above and below the impoundment. In a comparative study, the Kansas Department of Health and Environment (1981) found that predacious game species increased in abundance, and several cyprinid species, including the Topeka shiner, decreased in abundance upstream and downstream from dam sites following impoundment. Topeka shiners have also been reported extirpated from a small impoundment and tributary stream, which previously lacked largemouth bass (*Micropterus salmoides*), shortly after that species was stocked (Prophet et al., 1981). Layher (1993) noted that after impoundment, largemouth bass were found in Stribby Creek pools, both upstream and downstream from the dam while cyprinid species were essentially absent from these same pools. No cyprinids were absent from control stream samples during this study. Schrank et al. (2001) found that increasing catch per effort of largemouth bass in pools was an important predictor of the extirpation of Topeka shiners. The authors were unable to determine whether largemouth bass were influencing Topeka shiners through direct predation or whether the presence of largemouth bass was indicative of other changes in the stream or watershed, such as tributary impoundment. In Missouri, competition with introduced nongame species (western mosquitofish, *Gambusia affinis*; blackstripe topminnow, *Fundulus notatus*) has been cited as a possible reason for the decline of Topeka shiners (Pflieger, 1997). Although the absence of Topeka shiners from historic locations, which now contain these introduced species, has been documented in Kansas, the extent of potential competition among them has not been documented.

In Kansas, a substantial watershed dam construction program has developed to prevent or reduce damages caused by floodwater, scour erosion, and excessive sedimentation. This program is authorized and funded through the federal Watershed Protection and Flood Prevention Act (Public Law 83-566) and the Kansas Watershed District Act (K.S.A. 24-1201 thru 24-1237). At present, there are 86 organized watershed districts in Kansas which cover 11.5 million acres (22 percent) of the state. To date, there are approximatley 3,600 small flood control dams proposed for construction in approved watershed district plans. Of that number, approximately 1,100 have been constructed. Within the current range of the Topeka shiner, six organized watershed districts are actively pursuing impoundment construction. These activities are occurring within the Diamond Creek, Middle Creek, Jacob’s Creek, South Fork Cottonwood River, Mill Creek, and Lyons Creek watersheds. In these drainage areas, 88 impoundments have been constructed with an additional 109 proposed for construction. However, the governing bodies for Mill Creek, Middle Creek, and Diamond Creek have entered into separate conservation agreements with the United States Fish &Wildlife Service and KDWP to conserve the species. These agreements allow for continued dam construction in portions of the basin without Topeka shiners or in areas where there are less viable populations, but eliminates construction in areas with viable populations. These agreements also allow for ongoing population monitoring and habitat enhancements throughout the occupied segments of each watershed. A conservation agreement between the South Fork board of directors, USFWS, and KDWP is in development. Currently, no agreement has been pursued by the Lyons Creek or Jacob’s Creek watershed districts. While recent surveys indicate that Topeka shiners are present within the Lyons Creek watershed, no data are available for Jacob’s Creek.

Stream channelization may also contribute to the decline of Topeka shiner populations. In Kansas, stream channelization occurs throughout the range of the Topeka shiner but is typically limited to short modifications associated with road and bridge construction. Intensive channelization of low order streams is considered to be an important factor in the drastic decline of Topeka shiners in Iowa (Menzel and Fierstine, 1976). Blausey (2001) noted the absence of Topeka shiners in channelized reaches of the Vermillion River basin of South Dakota. An additional factor having the same general effect as channelization is the extraction of gravel by dredging or scraping. The Missouri Department of Conservation considers eliminating or minimizing both activities as an important component of their efforts to stabilize and enhance Topeka shiner populations in that state (Missouri Department of Conservation, 1999). Although the effect of channelization and gravel extraction on fisheries resources has been well documented in the literature, little has been published about these effects in Kansas. In general, these activities significantly degrade in-channel habitat conditions by altering bank stability, channel width and depth, flow patterns and bedload transport, reducing water quality, deep pool habitats, instream debris, and woody riparian vegetation (Simpson et al., 1982; Zale et al., 1989; Kanehl and Lyons, 1992; Brown and Lytle, 1992). Currently, extensive gravel extraction occurs in the Mill Creek watershed (Wabaunsee County), and moderate levels of extraction occur in the South Fork Cottonwood (Chase County) and Deep Creek (Riley County) watersheds. Little is known about the level of gravel extraction in other Topeka shiner watersheds.

## V. RECOVERY

A. *Objective*: The goals of this recovery plan are to: 1) stabilize, protect, and enhance existing populations of Topeka shiner and its habitat in Kansas; 2) identify unoccupied areas of historic habitat capable of supporting, or capable of being restored to support the species, and reintroduce populations to these areas; 3) downlist and delist the species as identified by criteria outlined in this section.

B. *Recovery Units*: This plan identifies four separate and distinct recovery units (RU) in Kansas: Lower Kansas River Basin, Blue River Basin, Cottonwood River Basin, Willow Creek/Upper Smoky Hill River Basin (Appendix A, Figure 1). The boundaries of each RU are based on watershed units, the genetic variability between existing populations, and the degree of geographic isolation. Each RU supports known populations and contains habitat features that provide the physiological, behavioral, and ecological requirements essential for the species. Conservation of the known populations within each RU is considered critical for the survival and recovery of the species. The reestablishment of additional populations within each RU is necessary for the eventual delisting of the species. Enhancement of habitat conditions and reestablishment of Topeka shiner populations in watersheds with only historic records will be undertaken if further investigation concludes this activity to be feasible and/or an important component of species recovery. The following is a general description of each RU:

1. Lower Kansas River Basin - All direct and indirect tributaries to the Kansas River from its confluence with the Missouri River, Wyandotte County to: Kanopolis Dam on the Smoky

Hill River, Ellsworth County; Wilson Dam on the Saline River, Russell County; Glen Elder Dam on the Solomon River, Mitchell County; Milford Dam on the Republican River, Geary County; and Tuttle Creek Dam on the Blue River. This basin contains multiple populations and variable habitat conditions.

2. Big Blue River Basin - All direct and indirect tributaries to the Big Blue River from the flood pool of Tuttle Creek Reservoir upstream to their headwaters and/or to the Kansas/Nebraska border. This basin contains multiple populations and variable habitat conditions.

3. Cottonwood River Basin - All direct and indirect tributaries to the Cottonwood River upstream from its confluence with the Neosho River, Lyon County, to its headwaters. This basin contains multiple populations and variable habitat conditions.

4. Willow Creek/Upper Smoky Hill River Basin - All direct and indirect tributaries to the Smoky Hill River from Cedar Bluff Dam, Trego County, to the Kansas/Colorado border. This basin has one isolated population and minimal habitat availability.

C. *Criteria*: The following recovery criteria are established to guide downlisting or delisting decisions. Baseline population levels will be used to determine if populations are stable, increasing, or decreasing. To determine population distribution, abundance, and trends, scientifically sound monitoring protocols have been developed and made a part of this plan (Appendix B). Reclassification of the species from threatened to species in need of conservation (SINC) will be recognized as achieved when:

1. All naturally occurring populations within the Lower Kansas, Big Blue, and Cottonwood river basins are determined to be stable or increasing over a period of 10 years.

2. A minimum of 8 reintroduction efforts in the Lower Kansas (3), Big Blue (2), and Cottonwood (3) river basins have been implemented and actively monitored for three years.

3. The natural population in Willow Creek (Wallace County) is determined to be stable or increasing over a period of 10 years; and a minimum of two reintroduction efforts have been implemented in the Upper Smoky Hill river basin and actively monitored for a minimum of three years.

Delisting of the species will be undertaken when:

1. All populations (natural and reintroduced) in the Lower Kansas, Big Blue, Cottonwood, and Upper Smoky Hill river basins are determined to be stable or increasing for a period of 10 years.

## VI. NARRATIVE OUTLINE

The following narrative outline briefly describes the action items that, if implemented, will result in achieving the Recovery Plan objective. The chronological sequence of action items does not indicate the relative priority of an item.

1. Protect existing populations and occupied habitats in the Primary Recovery Units.

Preservation of existing populations and essential habitat features is critical to success of this recovery effort.

1.1 Identify state and federal conservation programs to enhance, conserve, and mitigate Topeka shiner habitat. As the majority of the known populations and critical habitat are on privately owned streams, existing conservation programs that target and fund water quality or habitat improvement measures on private land should be encouraged.

1.1.1 Determine priority watersheds within each PRU for implementation of conservation strategies that address the individual factors identified under "**Reasons For Decline**."

1.1.2 Identify and prioritize specific stream reaches and/or sites to implement appropriate conservation practices.

1.1.3 Monitor the implementation of conservation practices to determine their effect on habitat features and Topeka shiner populations.

1.1.4 Seek assistance from producer organizations such as the Kansas Farm Bureau and Kansas Livestock Association as well as local Conservation Districts to encourage member participation in conservation programs in priority watersheds.

1.1.5 Utilize the expertise within existing government agencies such as the Natural Resources Conservation Service, the United States Fish & Wildlife Service, the Kansas State Conservation Commission, and the Kansas Department of Agriculture to apply appropriate conservation programs in priority watersheds.

1.2 Enter into conservation agreements (i.e. safe harbor, no take) with federal and state agencies, political subdivisions of the state, and private landowners to carry out management actions that meets the goals of recovery. Landowner concern about the regulatory burden of an endangered species being discovered or introduced on their property is a deterrent to habitat enhancement and species reestablishment. Conservation agreements provide assurance to landowners by allowing specific management activities without penalties of law enforcement action or permitting requirements.

1.2.1 Develop/promote incentive programs that encourage landowner participation in conservation agreements.

1.3 Utilize existing state and federal regulatory authority to protect the species and its habitats. Habitat and water quality degradation are the primary factors impacting Topeka shiners. Enforcement of current laws and regulations that address environmental protection is essential to successful recovery.

2. Conduct studies on the life history, ecological requirements, population dynamics, and community interactions of the Topeka shiner. Additional information regarding Topeka shiner biology, competitive interactions with associated native and introduced species, and limiting habitat factors is needed to meet recovery goals.

2.1 Update distributional data with additional sampling in unsurveyed stream reaches. Fill in distributional data gaps using Aquatic Gap analysis developed by Kansas State University.

2.2 Determine population dynamics and mobility of the species. The size and extent of Topeka shiner populations are not well quantified. Due to a lack of information on the mobility and/or transitory nature of the species, population stability appears weak.

2.2.1 Determine habitat preferences and recruitment rates for early life stages. Well developed studies that assess the spatial distribution, growth, and survival of young-of-year Topeka shiner will improve conservation efforts.

2.2.2 Determine dispersal characteristics of populations and barriers to movement. Analyses of immigration/emigration, distance of movement, seasonal hydrologic influences, channel morphology, natural and man-made barriers to movement will assist understanding of distinct populations for conservation management.

2.2.3 Determine food habits, preferences, and availability.

2.2.4 Determine the extent and effect of interspecific competition and predation between Topeka shiners and other native and introduced species. The introduction of exotic, non-native and native, piscivorous fish species has been identified as one reason for the decline of the Topeka shiner. Also, little data exists regarding the relationships among Topeka shiner and associated native stream species.

2.2.5 Determine and quantify physical and chemical habitat characteristics, and limiting factors to reproduction and recruitment.

2.2.6 Determine the impacts of stream alterations including increased sediment and nutrient input, gravel excavation, tributary impoundment, and road and bridge construction on the species.

2.3 Continue genetic studies to define population boundaries and genetic limitations that may impact the species. Further genetic analysis should be the basis for defining conservation units and maintaining the historical geographic distribution.

3. Develop a plan to implement long-term monitoring of populations and habitats. A long-term monitoring program must be developed, funded, and implemented to determine population status and trends. The plan must provide sufficient statistical power to allow classification of Topeka shiner populations as stable, increasing, or decreasing.

3.1 Monitor annually Topeka shiner populations and instream habitats within all occupied habitats of each PRU.

3.2 Develop an instream habitat and riparian assessment methodology to quantify conditions and trends as they relate to Topeka shiner conservation.

4. Initiate reintroduction efforts in suitable, non-occupied habitats within each PRU. To meet recovery goals and achieve downlisting/delisting of the species, additional populations must be established.

4.1 Determine the minimum number of individuals, age structure, and male/female ratios required to ensure population viability.

4.2 Develop criteria to identify and evaluate potential reintroduction sites. Criteria should take into account the source stock of Topeka shiners, geographic location and connectivity to other populations, physical and chemical habitat features (including habitat stability), presence of associated stream fishes, and availability of preferred food items.

4.3 Establish priority sites for reintroduction based upon established criteria.

4.4 Continue development of culture techniques to produce fish for reestablishment efforts.

4.5 Monitor all reintroduced populations to determine success/failure. Monitoring should follow the methodologies and procedures established under Section 3.

5. Develop and implement a public awareness and educational program about the Topeka shiner. Public interest and support of the proposed recovery actions are essential to the success of this plan and the continued survival of the Topeka shiner.

5.1 Develop articles, notices, and informational material regarding the status of the Topeka shiner recovery effort. The use of news releases, magazine articles, brochures, and the Department web site will achieve a wide distribution of information related to the species and its recovery.

5.2 Develop various visual aids to highlight the species, its needs, and recovery efforts. Slide and/or video presentations, posters, and trading cards developed and made available to landowners, educators, District Biologists, legislators, producer and environmental organizations will provide basic educational information.

5.2.1 Provide input and support for educational programs such as StreamLink and Project Wet.

5.3 Work directly with local organizations and landowners to develop pilot projects that restore water quality and enhance habitat conditions for the species. Projects should not only convey a benefit to the Topeka shiner but also benefits to producers and the local community.

5.4 Develop a program to recognize landowners whose stewardship has provided relatively intact stream systems that maintain Topeka shiner populations.

6. Implement an adaptive management program to ensure that appropriate actions are taken to attain recovery and eventual downlisting of the species. As additional information becomes available, this recovery plan may require amendment to order to recover the species while minimizing economic and social impacts.

6.1 Maintain a volunteer advisory committee composed of members representative of the areas affected by recovery actions, other governmental resources agencies, and species experts from academia. Involvement of the advisory committee may include: review of research proposals, evaluation of recovery actions, amendments to the recovery plan, evaluation of new data, prioritization of pilot projects and reintroduction efforts.

6.2 Review and revise research and management activities to further define the needs and threats to the Topeka shiner.

6.3 Reevaluate recovery criteria and implementation actions every five years and recommend appropriate amendments. The recovery plan will only be as effective as the method of evaluation. Periodic review is needed to determine if objectives and tasks are in line with current research knowledge. Delisting the species is dependent on successfully meeting the recovery criteria of stabilizing existing populations and the reestablishment of the species in new portions of its historic range. Recurrent evaluation is necessary to determine if recovery criteria have been met.

## VII. IMPLEMENTATION TASKS

The schedule found in Appendix C is a guide for implementing the action items (tasks) identified in Part VI of this plan. The schedule indicates task priorities, task numbers, task description, task duration, and estimated costs. It should be noted that not all the monetary needs involved in recovery are known. Therefore, Part VII reflects the total estimated financial requirements for research and data collection, and administrative actions. Other costs will be determined as specific action items are undertaken.

The tasks necessary to recover the Topeka shiner are ranked in three categories:

*Priority 1* - an action that must be taken to prevent a species from irreversible decline or extirpation.

*Priority 2* - an action that must be taken to prevent a further decline in species abundance, range, or other negative impacts to a species short of extirpation.

*Priority 3* - all other actions necessary to meet recovery objectives.

## VIII. DESIGNATED CRITICAL HABITAT

Under K.A.R. 115-15-4(c)(1)(E), a recovery plan shall include critical habitat designations required for conservation of the species under consideration. Critical habitat is defined as: a) specific areas documented as currently providing essential physical and biological features and supporting a self-sustaining population of a listed species; or b) specific areas not documented as currently supporting a listed species, but determined essential for the listed species by the Secretary (K.A.R. 115-15-3). Operationally, documentation relies on occurrence records of the species or identification of the essential habitat requirements as obtained through field assessment and scientific studies conducted by KDWP, state universities, and other qualified individuals or organizations.

For a particular area to be designated, the following criteria are considered:

1) Is the candidate area within the listed species current probable range?
2) Are there documented occurrence records of the species within the past 35 years?
3) Are there documented historic (greater than 35 years old) occurrence records?
4) Does the candidate area possess those habitat features known to be essential to support a population of the species?
5) Does the species occur in the state as a migrant, seasonal resident, or permanent

resident?

For a permanent resident species such as the Topeka shiner, a candidate area must meet criteria 1 and 4 before further consideration as critical habitat. If the candidate area also meets criteria 2, it is then designated as critical habitat. In cases where only historical occurrence records exist, professional judgement by KDWP personnel is utilized to determine whether a population is likely to occur. If so, the candidate area is designated critical habitat.

Stream habitat conditions in Kansas are dynamic and fish species may move from one area to another over time. These movement patterns will vary seasonally with changing hydrologic conditions, community interactions, and reproductive behavior. Species adapted to intermittent flow typically spawn in headwater pools, and several authors have noted the importance of intermittent streams as nursery areas for juveniles and fry (Erman and Leidy, 1975; Williams and Coad, 1979; Barber, 1986; Zale and others, 1989; Liechti, 1994; Kerns and Bonneau, 2002; Mammoliti, 2002). Of specific interest for this recovery plan, upstream movement as reproductive behavior has been documented in Topeka shiners (Minckley and Cross, 1959; Barber, 1986; Kerns and Bonneau, 2002). As such, for candidate areas meeting the above criteria, all perennial and many intermittent reaches upstream of the most downstream point of known or historic occurrence were designated critical habitat for the Topeka shiner. Some upstream, intermittent areas were not designated based on knowledge of topographic or hydrologic factors that prohibit use by the Topeka shiner. In addition, significant consideration was given to those stream segments proposed by the USFWS as federal critical habitat (USFWS, 2002).

To reduce the impact of habitat fragmentation within a watershed, critical habitat was designated for certain reaches of larger streams to maintain connectivity between tributary sub-populations. For example, while there are no records of Topeka shiner in the Diamond Creek mainstem, the designated reach constitutes a pathway for movement among several tributaries with known occurrences. The Diamond Creek mainstem provides a connection for the exchange of individuals between populations, colonization of new areas, and recolonization of areas where localized extirpation may occur. Should the reach between populated tributaries serve as a barrier, the isolated populations are then exposed to an increased risk of extirpation from random environmental fluctuations. As habitat fragmentation is considered by some to be the most basic threat to many species, the concept of habitat connectivity was applied throughout the process of critical habitat designation.

Currently, the following areas are proposed for formal designation as critical habitat for Topeka Shiners:

A. ***Cottonwood River Basin*** (Appendix A, Figure 2)

South Fork Cottonwood Complex - This system is characterized by high-quality aquatic habitat draining large tracts of tallgrass prairie. Portions of the bottomland along the South Fork are utilized for row crop agriculture. Numerous tributary streams are known to contain populations of the Topeka shiner. A plan to construct flood control impoundments throughout the system has been partially implemented but is currently on hold pending development and approval of a Conservation Agreement.

Thurman Creek mainstem from where it enters the South Fork Cottonwood River (Sec. 28, T22S, R8E,Chase County) upstream through Sec. 17, T23S, R9E, Greenwood County.

An unnamed tributary from its point of entry to Thurman Creek (Sec. 1, T23S, R8E, Greenwood County) upstream through Sec. 5, T23S, R9E (Greenwood County) and Sec. 32, T22S, R9E (Chase County).

South Fork Cottonwood River mainstem in Chase County from its point of exit at Sec. 33, T20S, R8E, upstream through Sec. 21, T23S, R8E, Butler County.

Mercer Creek mainstem and its three major tributaries (including Jack Creek) in Chase County from where it enters the South Fork Cottonwood River (Sec. 8, T22S, R8E) upstream to the Chase/Butler County line Sec. 31, T22S, R8E and through Sec. 14 and 26, T22S, R7E and Sec. 30, T22S, R8E.

Crocker Creek mainstem and its major tributary in Chase County from where it enters the South Fork Cottonwood River (Sec. 31, T21S, R8E) upstream through Sec. 1, T22S, R7E and Sec. 36, T21S, R7E.

Rock Creek mainstem in Chase County from where it enters the South Fork at Sec. 33, T20S, R8E upstream through Sec. 1, T21S, R7E.

An unnamed tributary from where it enters Rock Creek (Sec. 1, T21S, R7E) upstream through Sec. 4 and 9, T21S, R7E.

Den Creek mainstem in Chase County from where it enters Rock Creek (Sec. 31, T20S, R8E) upstream through Sec. 23, T20S, R7E.

Little Cedar Creek mainstem and one minor tributary in Chase County from where it enters the South Fork Cottonwood River (Sec. 8, T22S, R8E) upstream through Sec. 23 and 24, T22S, R9E.

Shaw Creek mainstem in Chase County from where it enters Little Cedar Creek (Sec. 16, T22S, R8E) upstream through Sec. 14, T22S, R8E.

Sharpes Creek mainstem in Chase County from where it enters the South Fork (Sec. 34, T20S, R8E) upstream through Sec. 36, T21S, R8E.

<u>Fox Creek Complex</u> - This system is characterized by high-quality aquatic habitat draining

the lower reaches of the Fox Creek watershed. All designated reaches occur on the Tallgrass Prairie National Preserve which is managed by the United States National Park Service.

Fox Creek mainstem from its point of exit at Sec. 8, T19S, R8E (Chase County) upstream through Sec. 29, T18S, R8E.

An unnamed tributary on the Tallgrass Prairie National Preserve from where it enters Fox Creek (Sec. 29, T18S, R8E) upstream to its headwaters.

An unnamed tributary on the Tallgrass National Prairie Preserve from where it enters Fox Creek (Sec. 32, T18S, R8E) upstream to its headwaters.

Diamond Creek Complex - This system includes the mid- and lower reaches of Diamond Creek and several major tributaries. The area is characterized by high-quality aquatic habitat draining large tracts of tallgrass prairie. Recent collection records exist. A plan for tributary impoundment is partially implemented with remaining development governed by an approved Conservation Agreement.

Diamond Creek mainstem from where it enters the Cottonwood River (Sec. 14, T19S, R7E, Chase County) upstream to its confluence with Sixmile Creek (Sec. 22, T17S, R6E, Morris County).

An unnamed tributary to Diamond Creek in Chase County from their confluence (Sec. 9, T19S, R7E) upstream to the western line of Section 9.

Gannon Creek mainstem and its major upper tributary in Chase County from where it enters Diamond Creek (Sec. 10, T19S, R7E) upstream to its headwaters (Sec. 11 and 24, T18S, R7E).

Mulvane Creek mainstem in Chase County from where it enters Diamond Creek (Sec. 33, T18S, R7E) upstream through Sec. 16, T18S, R6E.

Schaffer Creek mainstem in Chase County from where it enters Diamond Creek (Sec. 19, T18S, R7E) upstream to where it crosses the Chase/Morris County line (Sec. 4, T18S, R7E).

Dodds Creek mainstem in Morris County from its confluence with Diamond Creek (Sec. 26, T17S, R6E) upstream through Sec. 1, T17S, R6E.

Sixmile Creek mainstem in Morris County from where it enters Diamond Creek (Sec. 22, T17S, R6E) upstream to its confluence with Mulberry Creek (Sec. 21, T17S, R6E).

Mulberry Creek mainstem and two of its upper tributaries in Morris County from where it enters Sixmile Creek (Sec. 21, T17S, R6E) upstream through Sec. 30, T17S, R6E.

An unnamed tributary to Diamond Creek in Morris County from their confluence (Sec. 35, T17S, R6E) upstream to its headwaters (Sec. 33, T17S, R6E).

Middle Creek Complex - This system includes the mid-reaches and tributaries of Middle Creek. It is characterized by high-quality aquatic habitat draining large tracts of tallgrass prairie. A plan for tributary impoundment is partially implemented with remaining development governed by an approved Conservation Agreement.

Middle Creek mainstem in Chase County from its point of exit at Sec. 19, T19S, R7E, upstream through Sec. 8, T19S, R6E.

Collett Creek mainstem and its major upper tributaries in Chase County from where it enters Middle Creek (Sec. 18, T19S, R7E) upstream through Sec. 27, T18S, R6E.

An unnamed tributary in Chase County from where is enters Middle Creek (Sec. 10, T19S, R6E) upstream through Sec. 33 and 34, T18S, R6E.

Other Direct Cottonwood River Tributaries - These areas consist of high-quality aquatic habitat draining large tracts of tallgrass prairie.

Bloody Creek mainstem in Chase County from where it enters Sec. 29, T19S, R9E upstream through Sec. 3, T21S, R9E.

An unnamed tributary in Chase County from where it enters the Cottonwood River (Sec. 13, T19S, R7E) upstream to its headwaters on the Tallgrass Prairie National Park (Sec. 30, T18S-R8E).

Mud Creek mainstem in Marion County beginning from its point of exit at Sec. 13, T19S, R3E, upstream through Sec. 28, T18S, R3E.

B. ***Lower Kansas River Basin*** (Appendix A, Figure 3)

Lyon Creek Complex - This system contains a wide range of aquatic habitat quality. The basin is a mixture of native grasslands, domestic grass pasture, and row crop agriculture. A plan for tributary impoundment is partially implemented with remaining development on hold pending development and approval of a approved Conservation Agreement (Appendix A, Figure 3a).

Lyon Creek main stem from its point of exit at Sec. 31, T13S, R5E (Geary County) upstream to its confluence with West Branch Lyon Creek (Sec. 2, T15S, R4E, Dickinson County).

Unnamed tributary in Dickinson County from where it enters Lyon Creek (Sec. 8, T16S, R4E) upstream through Sec. 26, T16S, R3E.

Unnamed tributary in Dickinson County from where it enters the above unnamed tributary (Sec. 18, T16S, R4E) upstream through Sec. 13, T16S, R3E.

Rock Springs Creek from where it enters Lyon Creek (Sec. 31, T13S, R5E, Geary County) upstream through Sec. 5, T14S, R5E, Dickinson County.

Cary Creek main stem from where it enters Lyon Creek (Sec. 31, T13S, R5E, Geary County) upstream through Sec. 28, T15S, R3E, Dickinson County.

Unnamed tributary from where it enters Cary Creek (Sec. 19, T14S, R4E, Dickinson County) upstream through Sec. 24, T14S, R3E, Dickinson County.

West Branch Lyon Creek main stem in Dickinson County from where it enters Lyon Creek (Sec. 2, T15S, R4E) upstream through Sec. 16, T16S, R3E.

Unnamed tributary in Dickinson County from where it enters the West Branch Lyon Creek (Sec. 19, T15S, R4E) upstream through Sec. 24, T15S, R3E.

Unnamed tributary in Dickinson County from where it enters the West Branch Lyon Creek (Sec. 36, T15S, R3E) upstream through Sec. 35, T15S, R3E.

<u>Clark's Creek Complex</u> - This system is characterized by high-quality aquatic habitat draining tallgrass prairie uplands and moderately cultivated bottomlands (Appendix A, Figure 3a).

Clark's Creek main stem from its confluence with Dry Creek (Sec. 23, T12S, R6E, Geary County) upstream to its confluence with Thomas Creek (Sec. 34, T12S, R6E).

Thomas Creek mainstem from where it enters Clark's Creek (Sec. 34, T12S, R6E, Geary County) upstream to the Geary/Morris County line (Sec. 34, T13S, R6E).

Davis Creek mainstem from where it enters Thomas Creek (Sec. 2, T13S, R6E, Geary County) upstream through Sec. 31, T13S, R7E.

Dry Creek mainstem and one major tributary (West Branch) from where it enters Clark's Creek (Sec. 23, T12S, R6E, Geary County) upstream through Sec. 21 and 22, T13S, R7E.

<u>Fort Riley Complex</u> - This system includes Wildcat Creek and one major tributary and Sevenmile Creek a direct tributary to the Kansas River. The area contains high-quality aquatic habitat with widely varying land uses. The majority of this system is contained within the Fort Riley Military Reservation (Appendix A, Figure 3b).

Wildcat Creek mainstem from its point of exit at Sec. 16, T10S, R7E, Riley County, upstream to U.S. Highway 77 (Sec. 3, T9S, R5E).

Little Arkansas Creek mainstem and one major tributary from where it enters Wildcat Creek (Sec. 28, T9S, R6E, Riley County) upstream through Sec. 24, T9S, R5E.

Sevenmile Creek mainstem from its point of exit at Sec. 36, T10S, R6E, Riley County, upstream through Sec. 18, T10S, R6E.

Deep Creek Complex - This area is characterized by high-quality aquatic habitat draining tallgrass prairie uplands and moderately cultivated bottomlands (Appendix A, Figure 3c). Deep Creek main stem from where it exits Riley County (Sec. 22, T10S, R9E) upstream to Interstate Highway 70 (Sec. 25, T11S, R9E).

School Creek from where it enters Deep Creek (Sec. 6, T11S, R9E, Riley County) upstream through Sec. 2, T11S, R8E.

Mill Creek Complex - This area is characterized by high-quality aquatic habitat draining large tracts of tallgrass prairie uplands and extensively cultivated bottomlands. A plan for tributary impoundment is partially implemented with remaining development governed by an approved Conservation Agreement (Appendix A, Figure 3c).

Mill Creek main stem in Wabaunsee County from it's confluence with Mulberry Creek (Sec. 25, T11S, R11E) upstream to its confluence with the West Branch Mill Creek and the South Branch Mill Creek (Sec. 15, T12S, R10E).

Mulberry Creek main stem in Wabaunsee County from where it enters Mill Creek (Sec. 25, T11S, R11E) upstream through Sec. 10, T11S, R11E.

Snokomo Creek mainstem in Wabaunsee County from where it enters Mill Creek (Sec. 25, T11S, R11E) upstream through Sec. 18, T12S, R12E.

Spring Creek main stem in Wabaunsee County from where it enters Mill Creek (Sec. 28, T11S, R11E) upstream through Sec. 21, T11S, R11E.

Kuenzli Creek main stem in Wabaunsee County from where it enters Mill Creek (Sec. 33, T11S, R11E) upstream through Sec. 21, T12S, R11E.

Paw Paw Creek main stem in Wabaunsee County from where it enters Mill Creek (Sec. 31, T11S, R11E) upstream through Sec. 11, T11S, R10E.

Pretty Creek main stem in Wabaunsee County from where it enters Mill Creek (Sec. 36, T11S, R10E) upstream to Kansas Highway 99 (Sec. 22, T11S, R10E).

Hendricks Creek main stem in Wabaunsee County from where it enters Mill Creek (Sec. 2, T12S, R10E) upstream through Sec. 31, T11S, R10E.

West Branch Mill Creek main stem in Wabaunsee County from its confluence with South Branch Mill Creek (Sec. 15, T12S, R10E) upstream through Sec. 19, T13S, R9E.

Loire Creek main stem in Wabaunsee County from where it enters West Branch Mill Creek (Sec. 29, T12S, R10E) upstream through Sec. 2, T12S, R9E.

Illinois Creek main stem in Wabaunsee County from where it enters West Branch Mill Creek (Sec. 30, T12S, R10E) upstream through Sec. 24, T13S, R9E.

Spring Creek main stem in Wabaunsee County from where it enters West Branch Mill Creek (Sec. 30, T12S, R10E) upstream through Sec. 21, T12S, R9E.

South Branch Mill Creek main stem in Wabaunsee County from its confluence with West Branch Mill Creek (Sec. 15, T12S, R10E) upstream to Kansas Highway 4/99 (Sec. 26, T13S, R10E).

East Branch Mill Creek main stem in Wabaunsee County from its confluence with South Branch Mill Creek (Sec. 35, T12S, R10E) upstream through Sec. 22, T13S, R11E.

Nehring Creek main stem in Wabaunsee County from where it enters East Branch Mill Creek (Sec. 1, T13S, R10E) upstream through Sec. 15, T13S, R11E.

Mission Creek - This area is characterized by high-quality aquatic habitat draining tallgrass prairie uplands and moderately cultivated bottomlands (Appendix A, Figure 3c).

Mission Creek main stem from where it crosses State Highway 4 (Sec. 9, T12S, R14E, Shawnee County) upstream through Sec. 2, T13S, R12E, Wabaunsee County.

C. ***Blue River Basin*** (Appendix A, Figure 3b)

Big Blue River Complex - This system includes four widely separate and geographically isolated streams having varying habitat quality. North Elm Creek is a direct tributary to the Big Blue River with row crop agriculture as the predominant land use within the watershed. Habitat quality is moderately degraded by sedimentation. Clear Fork Creek is a tributary to the Black Vermillion and located upstream of the Tuttle Creek Reservoir flood pool. This area is characterized by high-quality aquatic habitat draining tallgrass prairie uplands and moderately cultivated bottomlands. Walnut Creek is characterized by good quality aquatic habitat draining tallgrass prairie uplands and moderately cultivated bottomlands. This stream is a direct tributary to Fancy Creek and its lower reaches are occasionally inundated by the Tuttle Creek Reservoir flood pool. Carnahan Creek is characterized by good quality aquatic habitat draining tallgrass prairie uplands. This stream drains directly into Tuttle Creek Reservoir and its lower reaches are occasionally inundated by the Tuttle Creek Reservoir flood pool.

North Elm Creek main stem in Marshall County from where it enters the Big Blue River (Sec. 11, T1S, R7E) upstream through Sec. 21, T1S, R8E.

Clear Fork Creek main stem from its confluence with Jim Creek (Sec. 17, T5S, R9E, Marshall County) upstream through Sec. 18, T6S, R10E, Pottawatomie County.

Walnut Creek main stem from its point of exit at Sec. 19, T7S, R6E, Riley County, upstream through Sec. 1, T8S, R5E.

Carnahan Creek main stem from its point of exit at Sec. 14, T8S, R7E, Pottawatomie County, upstream through Sec. 31, T7S, R8E.

D. ***Willow Creek/Upper Smoky Hill Basin*** (Appendix A, Figure 4)

The available habitat in this system is restricted to a series of spring fed pools. The land use in the watershed is primarily shortgrass prairie with sporadic irrigated and dryland row crop production.

Willow Creek main stem in Wallace County from where it enters the Smoky Hill River (Sec. 17, T13S, R41W) upstream through Sec. 3, T13S, R41W.

## IX. CONSERVATION ASSISTANCE PROGRAMS

Although the Kansas Department of Wildlife & Parks will have primary responsibility for implementation of this recovery plan, other State, Federal, and local government agencies, private organizations and private landowners will play a fundamental role in the success of this effort. Of primary importance will be the involvement of private landowners, utilizing existing conservation programs. Funding is currently available for a wide variety of watershed enhancement projects from state and federal conservation programs that will benefit the recovery of the Topeka shiner. The following is a brief description of organizations and their programs that can provide for incentive-based opportunities on private lands.

A. <u>Federal Agencies</u>

**Natural Resources Conservation Service -** The NRCS is an agency of the U.S. Department of Agriculture whose mission is to provide leadership and assistance in the conservation of soil and water resources. The NRCS oversees a variety of programs and practices that would provide conservation benefits to the Topeka shiner.

Conservation Reserve Program: CRP encourages landowners to convert highly erodible cropland or other environmentally sensitive land to permanent vegetative cover, such as native grasses, wildlife plantings, trees, filterstrips, and/or riparian buffers. Farmers receive and annual rental payment for the term of the multi-year contract. Cost sharing is provided to establish the vegetative cover. Implementation of this program in Topeka shiner watersheds would reduce sedimentation and nutrient impact from cropland runoff.

Environmental Quality Incentives Program: EQIP is a voluntary conservation program for farmers and ranchers that promotes agricultural production and environmental quality as compatible national goals. EQIP offers financial and technical help to assist eligible participants install or implement structural and management practices on eligible agricultural land. Program objectives are achieved through the implementation of a conservation plan, which includes structural, vegetative, and land management practices. Incentive payments may be made to implement one or more eligible practices such as animal waste storage systems, nutrient and manure management, irrigation water management, terraces, filterstrips, tree planting, and wildlife habitat management. Implementation of this program in Topeka shiner watersheds would reduce sedimentation and nutrient impacts from cropland and/or animal feeding facilities.

Forestry Incentives Program: FIP provides forest maintenance and reforestation practices that encourage numerous natural resource benefits, including reduced wind and soil erosion and enhanced water quality and wildlife habitat. Available practices under FIP are conversion from nonforest land into forest land (tree planting), improved forest management; and site preparation for natural regeneration. These practices would reduce sedimentation and nutrient inputs from adjacent agricultural land.

Soil and Water Conservation Assistance: SWCA provides cost share and incentive payments to farmers and ranchers to voluntarily address threats to soil, water, and related natural resources, including grazing land, wetlands, and wildlife habitat. SWCA will help landowners comply with Federal and state environmental laws and make beneficial, cost-effective changes to cropping systems, grazing management, nutrient management, and irrigation.

Wildlife Habitat Incentives Program: WHIP is a voluntary program for people who want to develop and improve wildlife habitat primarily on private land. Up to 15% of funds made available annually to a State may be used for increased cost-share payments to participants who restore and protect essential wildlife habitat using a WHIP agreement with a duration of at least 15 years. Essential habitats are those areas designated as “critical habitat” by the USFWS or the appropriate State wildlife agency. WHIP may pay up to 100% of the eligible costs associated with implementation of practices that develop or improve essential habitats for at-risk species.

**United States Fish and Wildlife Service -** The USFWS is an agency of the U.S. Department of the Interior. Protecting endangered and threatened species and restoring them to a secure status is a primary role of this agency. The USFWS oversees several programs that would provide funding for conservation of the Topeka shiner.

Partners for Fish and Wildlife: Partners is a voluntary program to encourage cooperation and financial incentives to restore degraded or marginal habitats for fish and wildlife benefits. In Kansas, the program has been used to cost share alternative livestock watering facilities and bank stabilization in streams known to support Topeka shiners.

Endangered Species Habitat Planning and Habitat Acquisition: These two programs were established to help reduce the conflicts between the conservation of threatened and endangered species and land development and use. Under the Habitat Conservation Plan Land Acquisition Program, the Service provides grants to States or Territories for land acquisitions associated with approved Habitat Conservation Plans. The Habitat Conservation Planning Assistance Program provides grants to States and Territories to support the development of Habitat Conservation Plans, through support of baseline surveys and inventories, document preparation, outreach, and similar planning activities.

Private Stewardship Program: PSP provides grants and other assistance on a competitive basis to individuals and groups engaged in local, private, and voluntary conservation efforts that benefit federally listed, proposed, or candidate species, or other at-risk species. A ten percent (10%) match of cash or through in-kind contributions is required. The program is available to private landowners and their partners.

Cooperative Endangered Species Conservation Fund (Section 6 of the ESA): Section 6 funding is available to provide grants to States and Territories to participate in a wide array of voluntary conservation and research projects for candidate, proposed and listed species. KDWP is cost-sharing three Section 6 projects from 2002 through 2004 regarding Topeka shiner research and management. The status and a brief description of these projects can be found in Appendix E.

B. *State Agencies*

**Kansas State Conservation Commission -** The SCC works with the 105 local conservation districts, the 86 organized watershed districts and state and federal agencies, to administer programs that improve water quality, reduce soil erosion, conserve water and reduce flood potential. The SCC programs are designed to assist local entities and individuals with financial assistance and technical expertise regarding natural resource concerns.

Water Quality Buffer Initiative: The goal of the WQBI is to enhance participation under the

federal Conservation Reserve Program (CRP) for the installation of riparian forests buffers and grass filter strips. The state provides per acre rental payments supplementing federal rental payments received through the CRP to restore water quality in high priority watersheds.

Water Quality Best Management Practices: WQBMP provides cost-share assistance to landowners for the installation of Best Management Practices (BMP's) to protect or improve water quality. These practices address projects related to: erosion/sediment control; livestock waste management; rangeland management; riparian area protection; forest buffer; wetland development/restoration.

Water Resources Cost-Share Program: WRCSP provides state financial assistance to landowners for the establishment of enduring water conservation practices to protect and improve water quality. Practices include: tree planting, fencing, waterways. The assistance is provided through policies established by local conservation districts.

Non-point Source Pollution Control Fund: NPSPCF provides financial assistance for NPS pollution control practices such as riparian buffers and streambank stabilization. Funding is provided to local conservation districts and allocated through established policies.

Riparian and Wetland Protection Program: RWPP is designed to protect and restore riparian areas and wetlands through comprehensive conservation plans. Financial and technical assistance are available for projects such as alternative livestock water supplies, riparian fencing, tree plantings, and streambank stabilization.

Stream Rehabilitation Program: SHP provides financial assistance for planning and implementing approved stream rehabilitation projects. This program addresses streams that have been adversely modified by channel modification.

**Kansas Forest Service** - The KFS promotes long-term sustainability of forest resources by encouraging landowners to actively manage their woodlands and windbreaks. The KFS provides technical and financial assistance, and publications to rural landowners for windbreak design, timber management, disease diagnosis, timber harvest information, timber marking, and wildlife habitat.

Forest Land Enhancement Program: FLEP covers 75% of the cost to plant trees and manage woodlands and windbreaks to enhance the productivity of timber, fish, wildlife habitat, soil and water quality, wetlands, and recreational resources. FLEP 5 (Water Quality Improvement and Watershed Protection) includes tree planting adjacent to streams and rivers to improve water quality and protect riparian areas.

**Kansas Department of Health and Environment** - The Watershed Management Section within the KDHE Division of Environment implements Section 319 of the Clean Water Act, coordinating programs designed to eliminate or minimize nonpoint source pollution. The section develops and reviews strategies, management plans, local environmental protection plans, and county environmental codes intended to control pollution.

Clean Water Neighbors: CWN provides small grants ($5,000 maximum) to implement projects that demonstrate nonpoint source pollution control practices. Examples of physical measures that are eligible for funding include: biotechnical streambank stabilization; construction of small wetlands; and revegetation of bare soils. Forty percent of the project cost must be supplied by the grant applicant.

Stream Stewardship Program: SSP operates similarly to CWN but is restricted to projects that demonstrate riparian area management for water quality protection. Eligible projects include: riparian buffer strips; biotechnical streambank stabilization; livestock management in riparian areas; stream restoration; and wetland creation or restoration.

## X. KDWP MONITORING, RESEARCH, AND REGULATORY ROLE

A. Monitoring and Research: In 1994, Kansas Department of Wildlife and Parks started an extensive statewide stream survey program. The major purpose of the program is to document the current range and distribution of lotic aquatic species. Other objectives include: establish recent baseline data on stream fishes and macroinvertebrates to enhance stream management decisions, assess the effects of human disturbances on stream communities, and assess overall physical, chemical, and biological health of Kansas streams and examine these relationships.

A portion of our program involves extensive three-year surveys in each major river basin. Basin surveys allow for a comprehensive review of the status of lotic aquatic species. Other surveys are statewide or very localized. The statewide or local surveys are generally tied to specific research goals, such as "Status of rare fish and mussel species in Kansas streams."

KDWP uses standard methods for stream surveys designed by the Environmental Protection Agency for their Regional-Environmental Monitoring and Assessment Program. Our methods are slightly modified. The major parameters we measure include water chemistry, physical habitat variables, and fish and macroinvertebrate community characteristics. All data are kept in a geo-referenced database. From 1994 through 2003 KDWP has conducted stream surveys on approximately 100 sites per year. The number of sites sampled each year depend on grant fund availability.

Because relatively few statewide surveys have been conducted in Kansas, especially in the last 20 years, the stream survey program has increased the knowledge of known ranges and distributions of fishes and macroinvertebrates. Through statewide sampling efforts, the stream surveys help to increase the likelihood of detecting peripheral populations or new locations of the Topeka shiner thus furthering our understanding of the population structure and distribution of this species. The Stream Survey Program is an ongoing effort and is dependent on grant support and federal cost-sharing. KDWP's plan is to continue to survey and expand on the aforementioned aquatic knowledge. The Department plans on adding long-term monitoring sites to examine changes in lotic aquatic communities over time. These monitoring efforts could include basins where the Topeka shiner currently occurs.

B. Regulatory Role: State and federally listed species are protected in Kansas as designated by the Kansas Nongame and Endangered Species Conservation Act of 1975 (Kansas Statutes Annotated 32-957 through 963, 32-1009 through 1012, and 32-1033). The Act was implemented to protect species listed as threatened (T), endangered (E), or species in need of conservation (SINC) within Kansas. The act places the responsibility for identifying and undertaking appropriate conservation measures for T and E species directly upon the Department of Wildlife and Parks through regulations (Kansas Administrative Regulations 115-15-1 through 4). The Department must also undertake efforts to conserve listed species and pursue increasing their populations to the point they are no longer listed as T or E.

K.S.A. 32-963 and K.A.R. 115-15-3 require the Department of Wildlife and Parks to issue special action permits for activities that affect species listed as T and E where an action means "an activity resulting in the physical alteration of a listed species' critical habitat, physical disturbance of a listed species, or destruction of individuals of a listed species." These activities must be publicly funded, state or federally assisted, or require a permit from another state or federal government agency to be included as activities that fall under the Department's regulatory purview where action permits could be required. Critical habitats are defined in K.A.R. 115-15-3 and are defined as either of the following: specific areas documented as currently providing essential physical and biological features and supporting a self-sustaining population of a listed species; or specific areas not documented as currently supporting a listed species, but determined essential for the listed species by the secretary. Critical habitats are designated by the Department.

The Department's Environmental Services Section (ESS) is responsible for reviewing proposed activities that fall under KDWP's regulatory purview. ESS personnel conduct environmental reviews of these projects including potential effects to T and E species and state-designated critical habitats. ESS personnel issue action permits for activities that will affect listed species or their critical habitats. Special conditions are incorporated into the aforementioned permits to help offset negative effects to listed species and critical habitats. Permit conditions can limit where and when (e.g., spawning date restrictions) construction activities occur and require restoration, creation, and perpetual protection of existing habitats. The Department can refuse to issue action permits for activities that affect listed species and critical habitats if these activities cannot be adequately mitigated to offset the negative effects to a listed species and its critical habitats.

Each calendar year, ESS personnel conduct environmental reviews for approximately 750 new proposed activities that fall under the Department's regulatory purview. Since the Topeka shiner was listed at the state level on 11 November 1999 and through 31 December

2003, ESS personnel have conducted environmental reviews for 2,814 new proposed activities of which 59 included the shiner as a species of concern. Of those 59 projects, only 5 required an action permit by the Department. This represents only 0.08% of the environmental review projects in which the shiner was considered as a species of concern and 0.002% of the total new proposed activities since the shiner was listed in Kansas.

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# Appendix A

## Figures

# FIGURE 1. Recovery Units

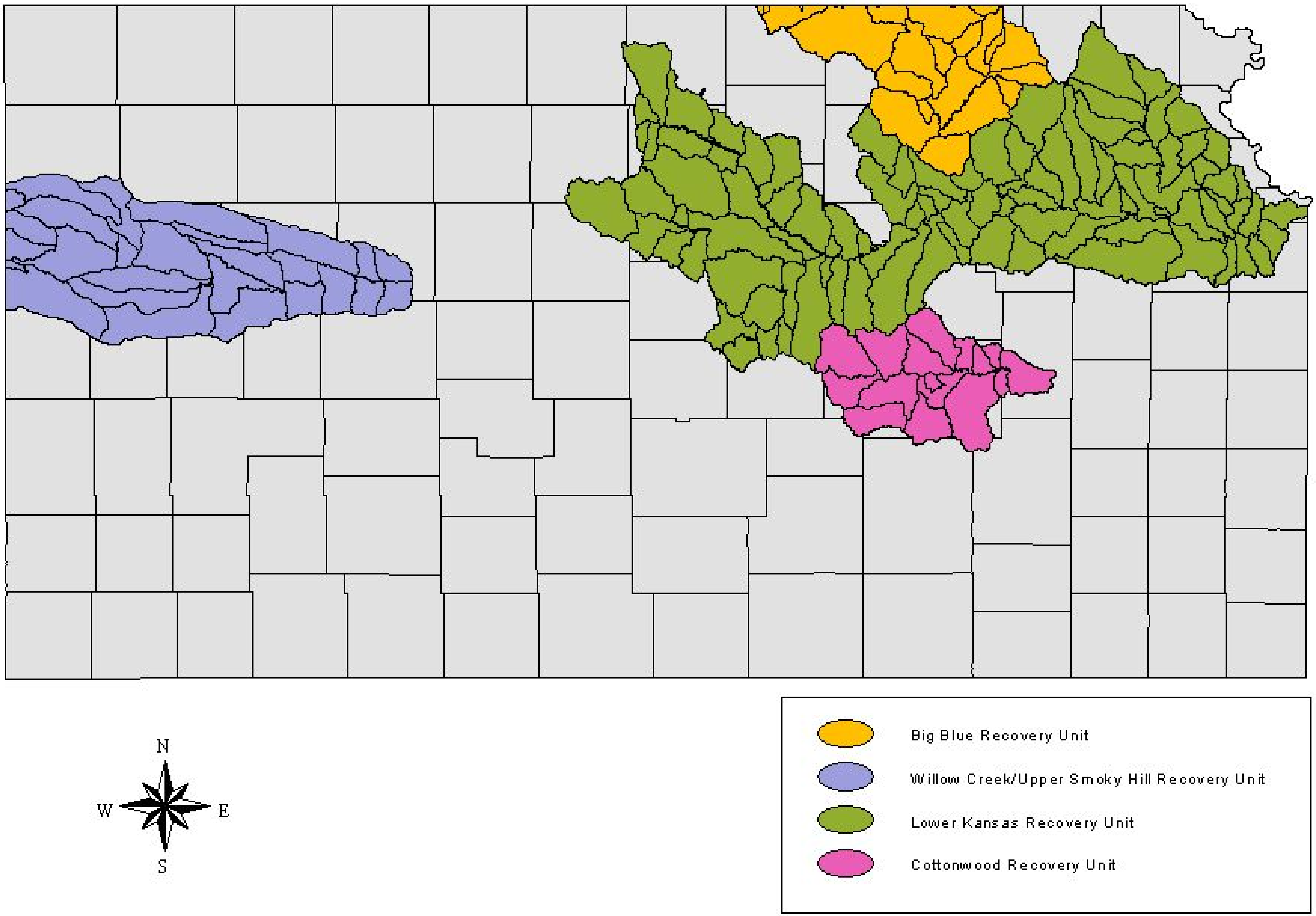


FIGURE 2. Cottonwood River Basin - Designated Critical Habitat Reaches.

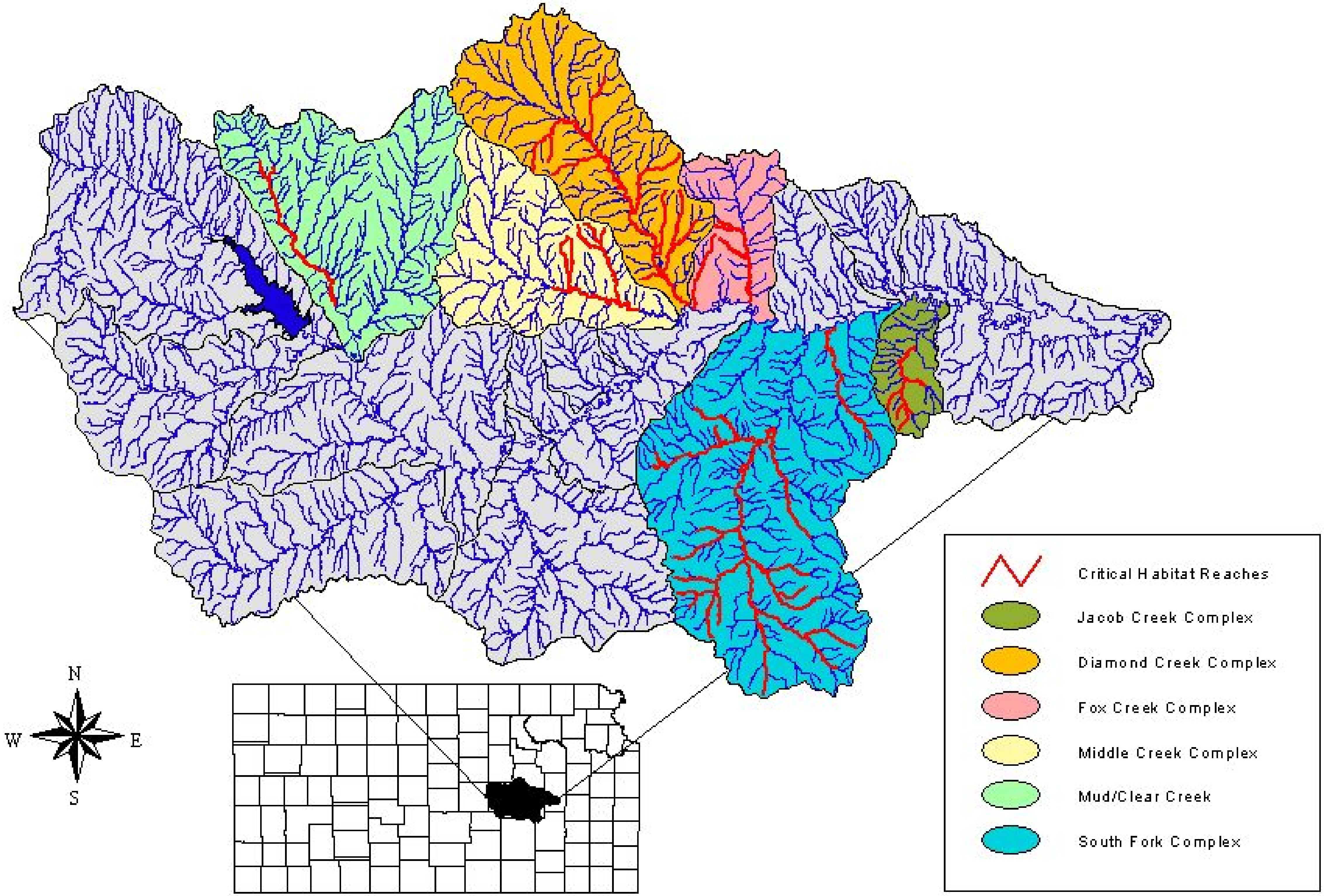


FIGURE 3. Lower Kansas River and Big Blue River Basins - Designated Critical Habitats.

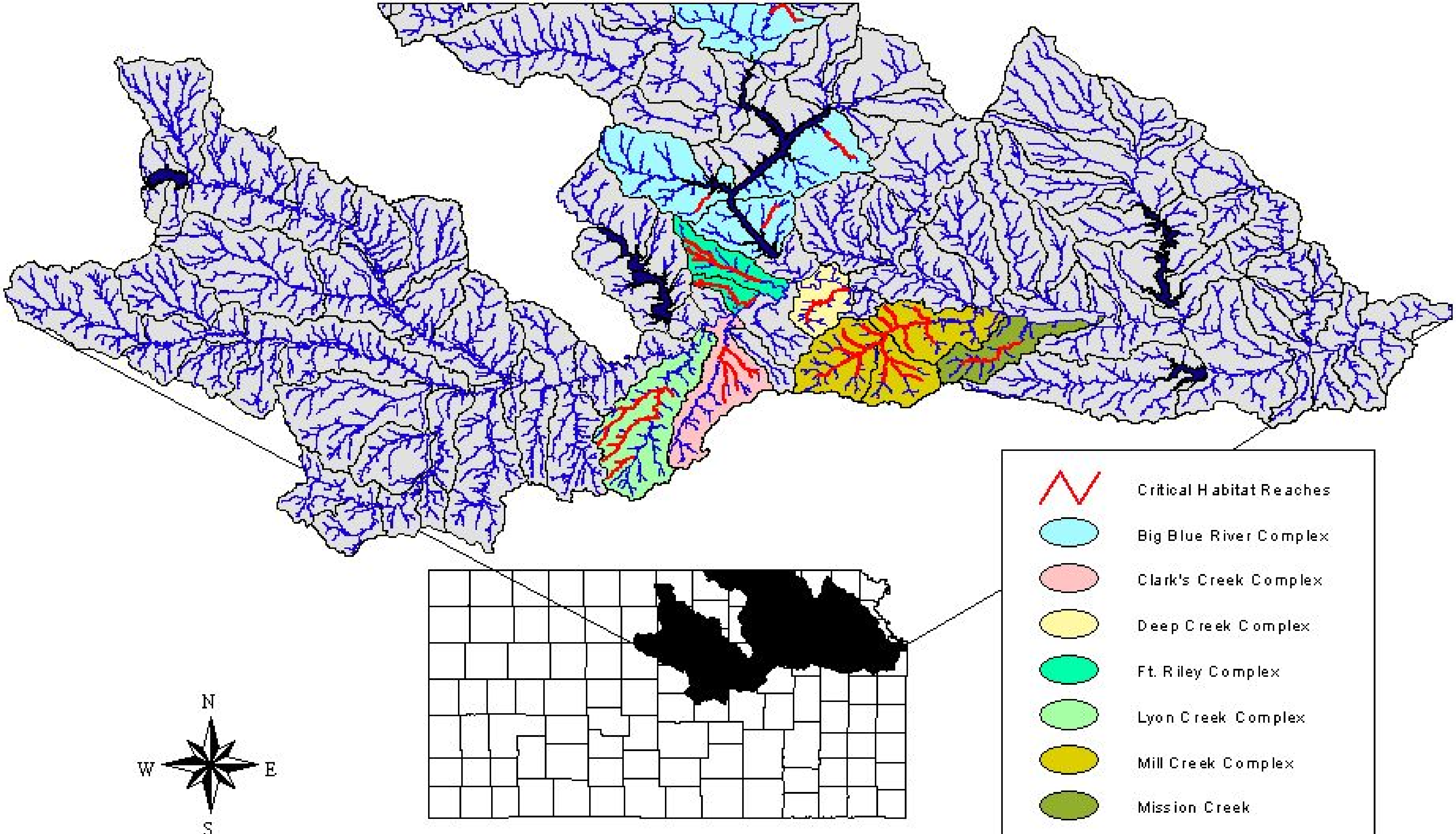


**FIGURE 3a. Lyon Creek and Clark's Creek - Designated Critical Habitats.**

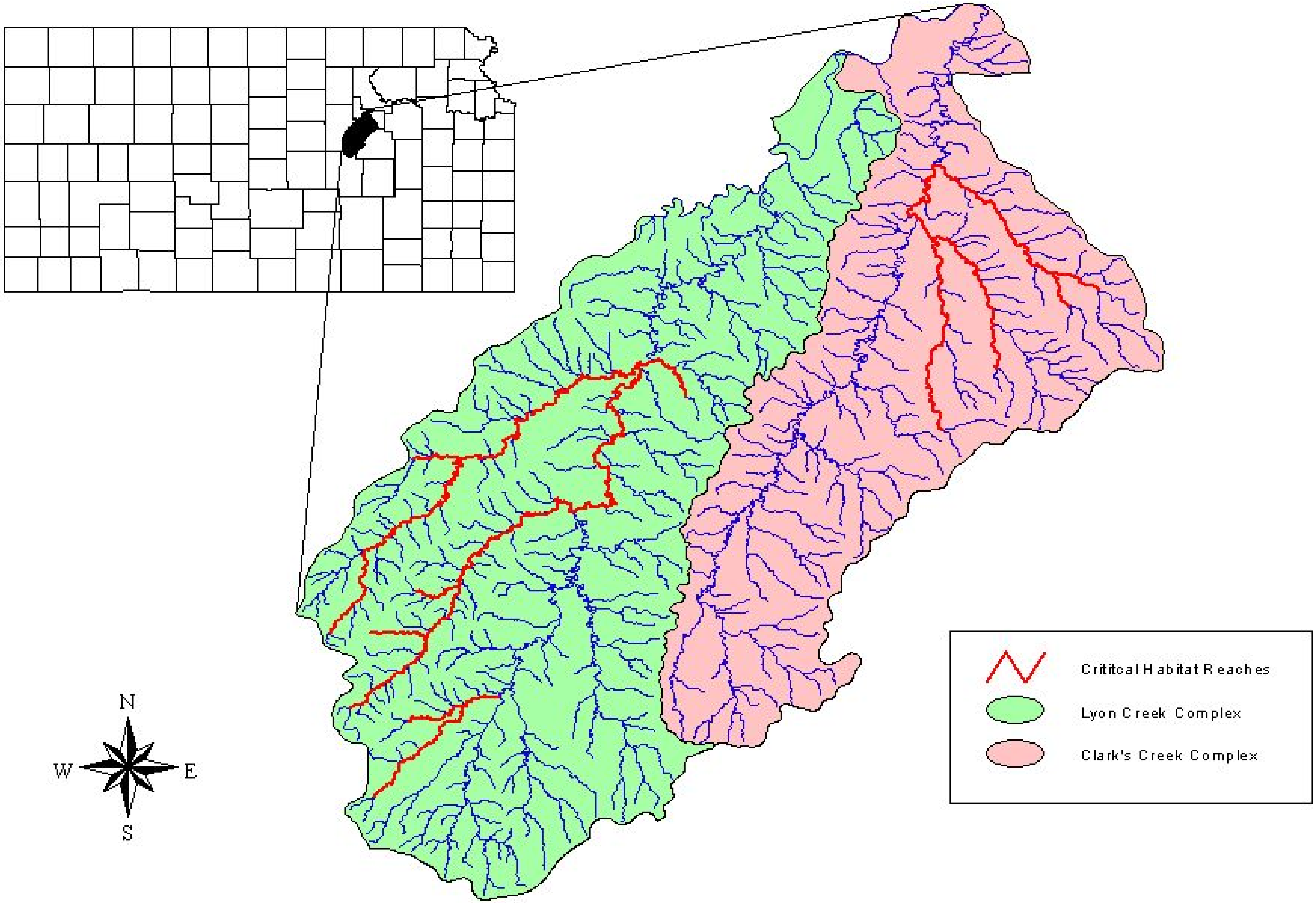


**FIGURE 3b. Fort Riley and Big Blue River Basin - Designated Critical Habitats.**

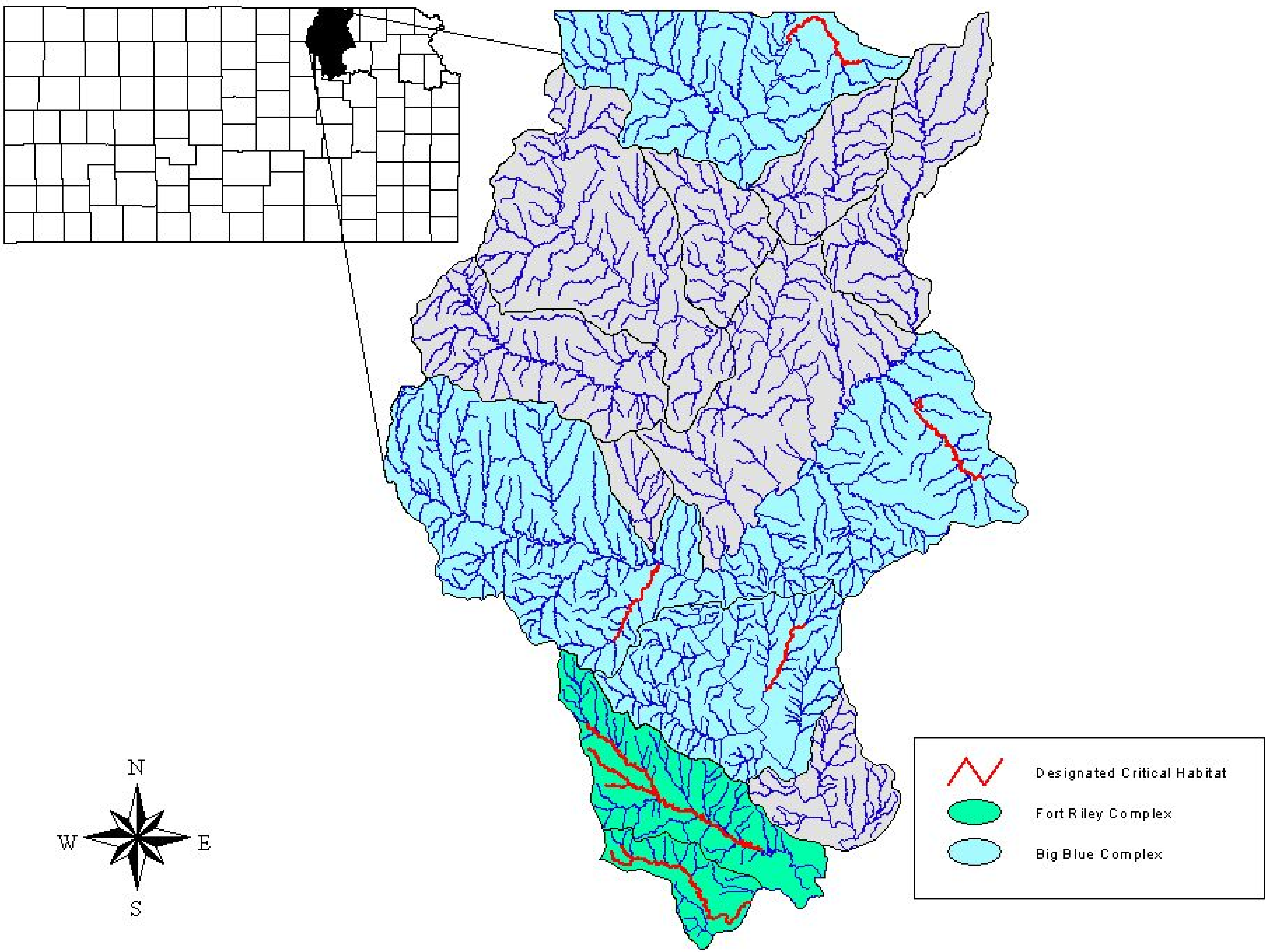


**FIGURE 3c. Deep Creek, Mill Creek, and Mission Creek - Designated Critical Habitats.**

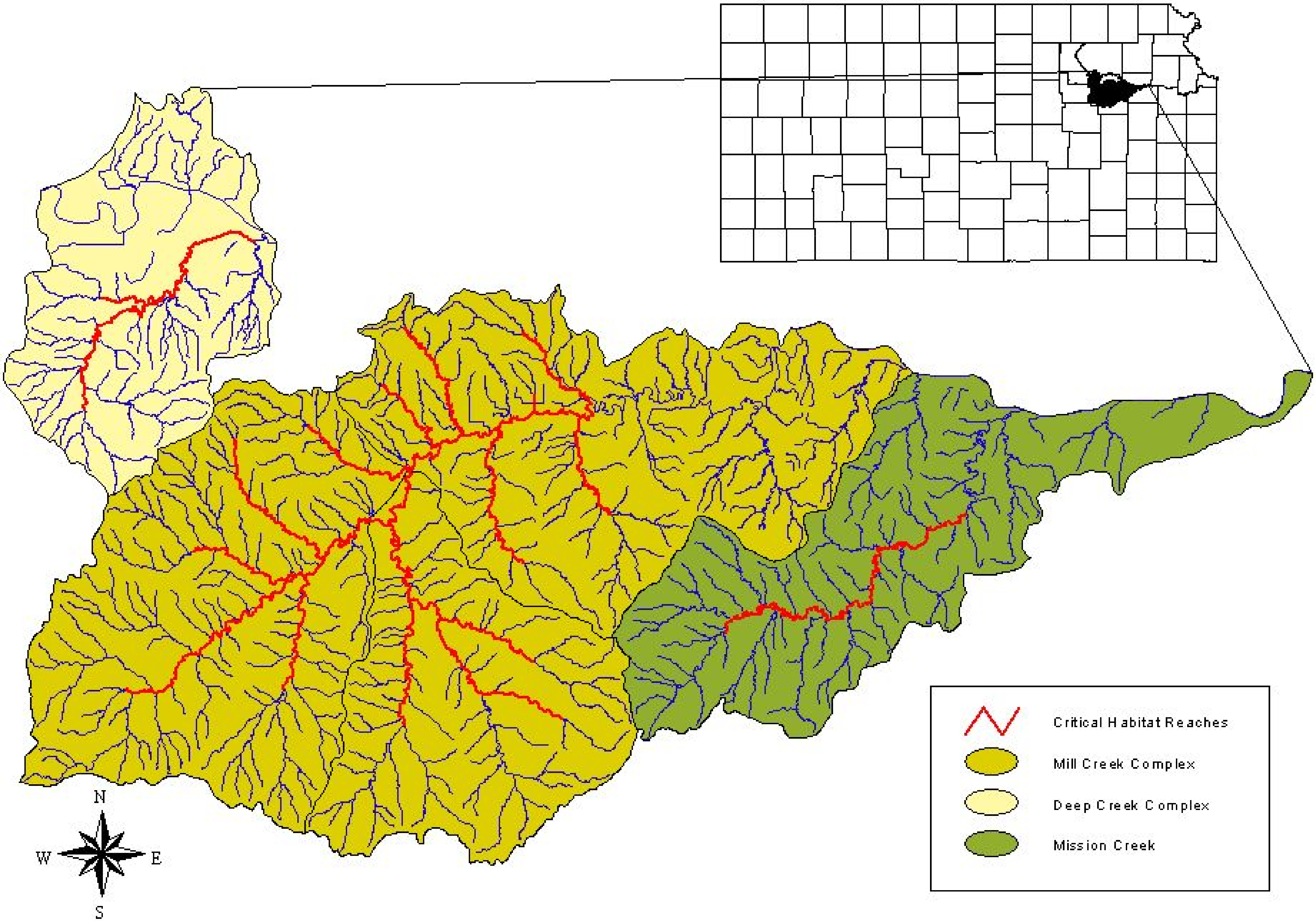
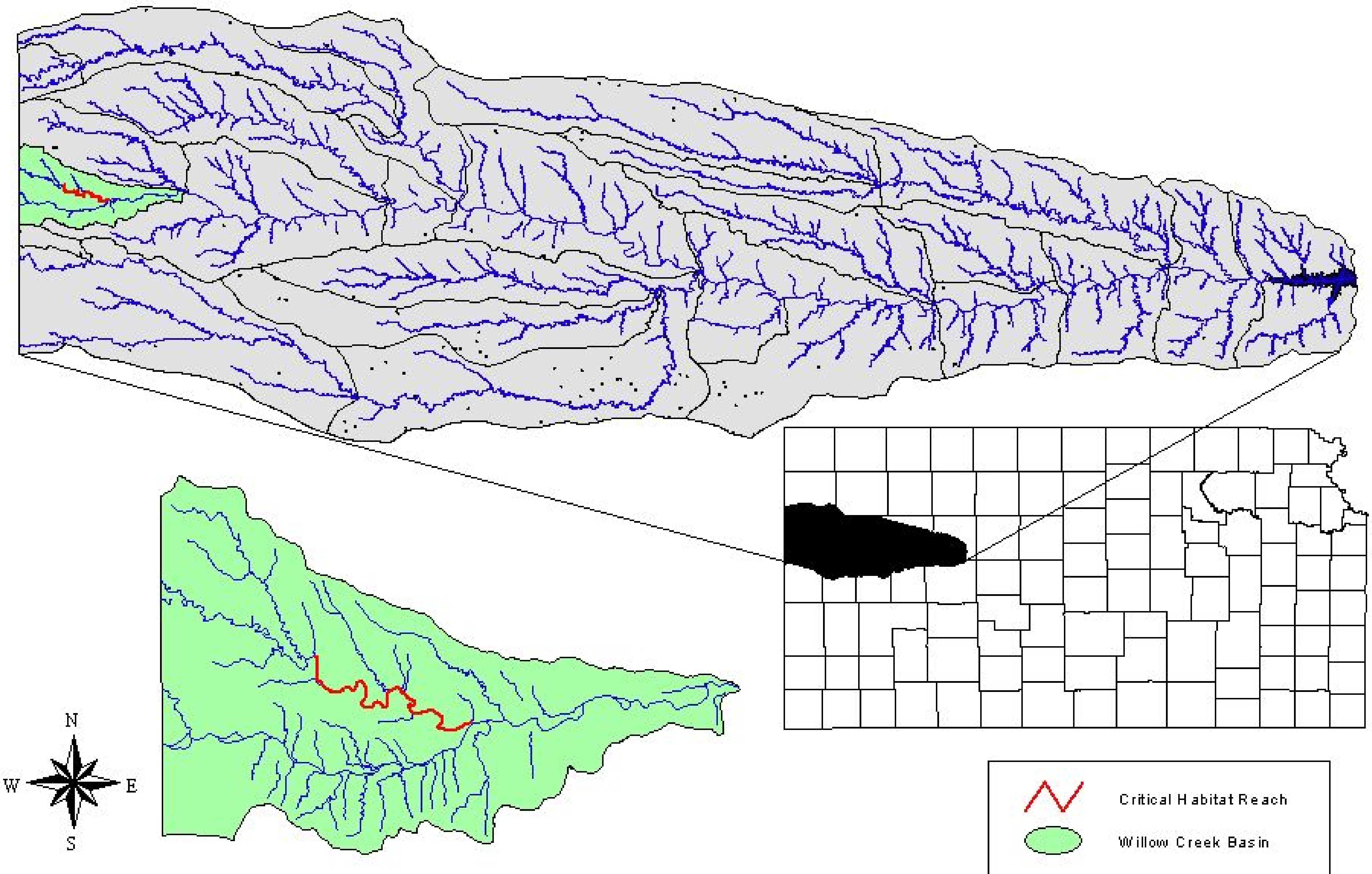


**FIGURE 4. Willow Creek/Upper Smoky Hill River Basin - Designated Critical Habitat.**



# Appendix B

# Long Term Monitoring Protocols

## LONG-TERM MONITORING

Population monitoring is necessary to estimate the current population status, evaluate the success of recovery efforts, and to guide down listing or delisting decisions. Monitoring activities will be focused on each recovery unit and located within sub-watersheds known to currently support Topeka shiners and streams identified by the Kansas Aquatic Gap program as having the requisite habitat features, based on statistical models, for the species. Due to the paucity of relative abundance data, and the highly cyclic nature of Topeka shiner populations, we have made the assumption that species presence and spatial extent are more useful determinants of population stability than mean abundance values. Therefore, this monitoring strategy is based upon historical presence/absence data from fisheries surveys within watersheds known to support populations of the Topeka shiner. These data were obtained from a variety of published and unpublished collection records dated from 1953 through 2003. See below for all data sources reviewed.

We were able to obtain fish collection information at 677 locations throughout the identified recovery units. We documented 307 fish collections within Topeka shiner watersheds in the Lower Kansas River basin. Of these, Topeka shiners were collected at 129 (42%) sites. We found 306 documented collection records in the Cottonwood River basin. Topeka shiners were collected at 100 (33%) of the sites. While numerous fish collections have been conducted in the Big Blue River basin, we selected only those having predominantly gravel substrates (Minckley and Cross, 1959; Gido et al., 2002). We documented 64 fish collections in gravel bottom streams, 21 (33%) of which contained Topeka shiners. For this monitoring strategy, we have designated the percent occurrence for each basin as the baseline to compare future surveys and determine population trends. We have assumed that 7.0% or less variation around the baseline percentage occurrence is sufficient to conclude a stable population. Greater than 7.0% variation will be considered as either an increasing or decreasing population. We calculated the required sample size based on a binomial distribution with the probability of occurrence equal to our baseline percentage and 7.0% as the coefficient of variation. This calculation yielded a sample size of 420 pools within the Big Blue River basin, 420 within the Cottonwood River basin, and 275 pools within the Lower Kansas River basin.

We propose to accomplish this level of sampling with two consecutive 5-year efforts. We intend to stratify each recovery unit by sub-watersheds known to support Topeka shiner populations. Within each sub-watershed, sample reaches of one kilometer will be delineated and randomly selected. We will randomly select new reaches within each sub-watershed each year for five consecutive years. Within each random reach, we will sample five pools documenting the fisheries' community as well as select physical and chemical habitat features. By sampling 17 reaches per year in the Big Blue and Cottonwood, and 11 reaches per year in the Lower Kansas, we will meet the required sample size for each recovery unit (17 reaches x 5 pools x 5 years = 425 pools; 11 reaches x 5 pools x 5 years = 275 pools). Beginning year six, we will repeat the previous survey. While the reaches sampled will remain the same, we will not require fixed pool sites within the reach. Due to the changing nature of flow conditions in areas known to support Topeka shiners, we believe that sliding pool sites within the reach will give needed flexibility. Data analysis will be ongoing but determinations on population stability will not occur until the two 5-year surveys have been completed.

In addition to the above referenced monitoring, we will conduct an ongoing assessment of Topeka shiners in the Willow Creek/Upper Smoky Hill Recovery Unit. Willow Creek contains the only known extant population of Topeka shiners on the High Plains of Kansas. While individuals may occasionally be found throughout an approximate 8.5 km of Willow Creek, the primary population appears restricted to a 500-meter, spring-fed reach. Due to the limited spatial extent of Topeka shiners within the Recovery Unit, we will rely on mean relative abundance data to evaluate population trends. During a 7-year period (1994-2000), the Department surveyed Willow Creek on five separate occasions. A total of 4299 fish were collected, 530 of which were Topeka shiners. Based on these data, we will consider a mean relative abundance value of 12.0 to constitute a stable population. An annual survey of all permanent pools within the primary population concentration of Willow Creek will be conducted for a period of 10 years. The relative abundance values will be calculated and analyzed at the end of this time period to determine population trend.

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# Appendix C

## Implementation Tasks/Schedule

*Implementation tasks for recovery of the Topeka shiner in Kansas. Task numbers correspond with those in Section VI - Narrative Outline.*

| Priority No. | Task Number | Task Description | Task Duration (Years) | Cost Estimate (in $1,000 units) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Total Costs | FY05 | FY06 | FY07 | FY08 | FY09 |
| 1 | 1.1.1 | Determine priority watersheds within each PRU for conservation strategies. | 1 | 1 | 1 | | | | |
| 1 | 1.1.2 | Identify and prioritize specific stream reaches for conservation strategies. | 1 | 1 | 1 | | | | |
| 1 | 1.1.3 | Monitor the implementation of conservation strategies. | ongoing* | 4.5 | | | 1.5 | 1.5 | 1.5 |
| 1 | 1.1.4 | Seek assistance from producer organizations. | ongoing | 2.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| 1 | 1.1.5 | Use agency expertise in application of appropriate conservation programs. | ongoing | TBD** | | | | | |
| 1 | 1.2.1 | Develop incentive programs that encourage landowner participation. | ongoing* | TBD** | | | | | |
| 1 | 1.3 | Use existing regulatory authority to protect the species and its habitats. | ongoing | TBD** | | | | | |
| 1 | 2.1 | Update distributional data. | ongoing | 5 | 1 | 1 | 1 | 1 | 1 |
| 2 | 2.2.1 | Determine habitat preferences and recruitment for early life stages. | 2 | 36 | | 18 | 18 | | |
| 3 | 2.2.2 | Determine dispersal characteristics and barriers to movement. | 2 | 36 | | | | 18 | 18 |
| 3 | 2.2.3 | Determine food habits, preferences, and availability. | 2 | 36 | | | | 18 | 18 |
| 1 | 2.2.4 | Determine the extent and effect of competition and predation. | 2 | 36 | 18 | 18 | | | |
| 2 | 2.2.5 | Quantify physical and chemical habitat characteristics, and limiting factors. | 4 | 72 | | 18 | 18 | 18 | 18 |
| 2 | 2.2.6 | Determine the impacts of man-made stream alterations. | 4 | 72 | | 18 | 18 | 18 | 18 |

*This activity is contingent on availability of funding and personnel.
**To be determined.

| Priority No. | Task Number | Task Description | Task Duration (Years) | Cost Estimate (in $1,000 units) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Total Costs | FY05 | FY06 | FY07 | FY08 | FY09 |
| 3 | 2.3 | Continue genetic studies to define population boundaries. | 2 | TBD** | | | | | |
| 2 | 3.1 | Annually monitor populations and habitats. | ongoing* | 40 | 8 | 8 | 8 | 8 | 8 |
| 2 | 3.2 | Develop instream habitat assessment methodology. | 1 | 1 | 1 | | | | |
| 3 | 4.1 | Determine the minimum number of individuals required for viable population. | 3 | TBD** | | | | | |
| 3 | 4.2 | Develop criteria to evaluate potential reintroduction sites. | 1 | 1 | 1 | | | | |
| 3 | 4.3 | Establish priority sites for reintroduction. | 1 | 2.5 | 2.5 | | | | |
| 3 | 4.4 | Continue development of culture techniques. | 2 | 50 | 25 | 25 | | | |
| 3 | 4.5 | Monitor all reintroduced populations. | ongoing* | 7.5 | | | 2.5 | 2.5 | 2.5 |
| 1 | 5.1 | Develop educational and informational material regarding species status. | ongoing* | 6 | 4 | 0.5 | 0.5 | 0.5 | 0.5 |
| 2 | 5.2.1 | Provide support for educational programs (StreamLink, Project Wet). | TBD** | TBD** | | | | | |
| 1 | 5.3 | Develop pilot habitat enhancement programs with local entities/landowners. | ongoing* | TBD** | | | | | |
| 1 | 5.4 | Develop a landowner recognition program. | 1 | 1.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| 3 | 6.1 | Maintain advisory committee. | ongoing | TBD** | | | | | |
| 3 | 6.2 | Review research and management activities. | ongoing* | TBD** | | | | | |
| 3 | 6.3 | Reevaluate recovery criteria every five years. | ongoing | TBD** | | | | | |

*This activity is contingent on availability of funding and personnel.
**To be determined.

# Appendix D

# Section 6 Projects Regarding Topeka Shiner Research and Management in Kansas (2002-2004)

**KS culture techniques for production of Topeka shiner, Notropis topeka (Gilbert, 1884) in aquatic mecocosms.**

Frank deNoyelles (Principal Investigator)
Kansas Biological Survey
2021 Constant Ave.
Lawrence, KS 66047-3729

Preliminary results of this work demonstrated the practical feasibility of propagating and rearing Topeka shiners in captivity. Indicators of habitat variables that favor reproduction were identified. Eight ponds and eight tanks were paired for comparison of reproductive success across manipulated conditions involving different substrate types and presence/absence of associated sunfish. Objectives of the study were to: 1) determine spawning requirements including obligate associations, habitat requirements, and temperature preferences; 2) refine captive rearing methods, establish captive populations; 3) produce Topeka shiners for experimental and recovery purposes; 4) develop a protocol for bringing Topeka shiners from the wild into captivity; and 5) develop culture techniques for Topeka shiners using individuals from abundant populations before relocation of critically endangered populations to captivity.

This project has been funded for one year under Section 6, continued a second year through The University of Kansas. Continuation for the third year's research is pending the approval of funding from University sources.

**Effects of largemouth bass on habitat use by Topeka shiners, red shiners, and bluntnose minnows: implications for susceptibility to predation.**

Dr. Keith Gido (Principal Investigator)
Kansas Cooperative Fish and Wildlife Research Unit
Kansas State University, Division of Biology
205 Leasure Hall
Manhattan, KS 66506

The objectives of this project were to: 1) determine if habitat use overlaps spatially among Topeka shiner, red shiner, bluntnose minnow and largemouth bass, and 2) determine if Topeka shiners are more susceptible to predation by largemouth bass than red shiners or bluntnose minnows.

One year of Section 6 funded research on this project was completed (2003). Preliminary results show that Topeka shiners respond differently to predators than other stream minnows. There are plans to continue this project pending funds from other sources.

**Development of a safe harbor refuge for the genetically distinct population of Topeka shiners in Willow Creek, Wallace County, Kansas.**

Dr. Bill Stark (Principal Investigator)
Department of Biological Sciences
Ft. Hays State Univ.
Hays, KS 67601

The objectives of this proposed study are to: 1) establish a safe harbor on publicly held lands for a portion of the Willow Creek population of Topeka shiners, and 2) evaluate the success of the reintroduction of Topeka shiners in the safe harbor to ensure the reintroduced population does become self-sustaining. The reintroduction of Willow Creek individuals to Bureau of Reclamation property downstream of the Cedar Bluff Reservoir (Trego County, Kansas) is planned. Proposed habitat modifications on the stream include current deflecting logs to simulate riffle-run complexes similar to those found on Willow Creek. Funding for this project has been extended pending the results of ESA Section 7 consultations.