



## State of Utah

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Columbia Spotted Frog and Least Chub Status, Distribution, Habitat requirements, Conservation Agreements and Strategies, Utah's Role in Conservation of the Species and Potential Groundwater Withdrawal Impacts to Wetland Dependent Species

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#### **Status of Columbia Spotted Frog in Utah**

Columbia spotted frog (*Rana luteiventris*) is distributed from southeastern Alaska to Oregon and western Wyoming with isolated populations occurring in Utah and Nevada. Historically, spotted frog populations were common throughout the Bonneville Basin. Today many of these historic populations have been extirpated and the remainder are vulnerable to a variety of physical and biological impacts (Perkins and Lentsch 1998, Bailey et al. 2006).

The U. S. Fish and Wildlife Service (Service) recognizes two Distinct Population Segments (DPS) in Utah: the Wasatch Front population and the West Desert population. In 1989, the Service was petitioned to list the spotted frog (referred to as *Rana pretiosa*) under the Endangered Species Act (Federal Register 54(1989): 42529). The Service ruled on April 23, 1993 that the listing of spotted frog was warranted as a priority 3 for the Wasatch Front populations and a priority 6 for the West Desert populations, but precluded due to higher priorities (Federal Register 58(87): 27260). One of the main concerns behind the petition was the reduction in distribution associated with impacts from urban and water developments and the introduction of nonnative species in Utah. On September 19, 1997 (Federal Register 62 (182): 49401), the Service maintained the same status for spotted frog; however, they updated the common and scientific name of the Utah populations. The Service now refers to the spotted frog in Utah as the Columbia spotted frog (*Rana luteiventris*).

Spotted frog is listed as a "conservation species" on Utah's Sensitive Species list (UDWR 1998, amended 2005) and a Tier I species in Utah's Comprehensive Wildlife Conservation Strategy (Sutter et al. 2005). An interagency Conservation Agreement and Strategy (Agreement) was developed and finalized in January 1998 (Perkins and Lentsch 1998, amended Bailey et al. 2006) to ensure the long-term conservation of the spotted frog within its historical range. The spotted frog was removed as a candidate for listing in October 1999 subsequent to the various conservation activities and studies conducted pursuant with the Agreement. In June 1999, petitioners filed a complaint against the Service challenging the "not warranted" findings as a violation of the Endangered Species Act and the Administrative Procedure Act. A settlement was reached in August 2001 with the stipulation that the Service remand for reconsideration of the 1999 "not warranted" finding and start a new status review and 12 month finding on the Wasatch

Front population. The Service status review of the Wasatch Front Columbia Spotted Frog was completed in August 2002 (Federal Register 67 (169):55758) and concluded that the Wasatch Front populations were not warranted for listing as candidate status.

The Columbia Spotted Frog Conservation Agreement and Strategy was developed to expedite implementation of conservation measures for spotted frog in Utah as a collaborative and cooperative effort among resource agencies. Signatories to the Agreement include Utah Department of Natural Resources, Division Wildlife Resources (Division), U.S. Bureau of Reclamation, U.S. Forest Service, U. S. Bureau of Land Management, Utah Reclamation Mitigation Conservation Commission, U.S. Fish and Wildlife Service, Confederated Tribes of Goshute Nation, and Central Utah Water Conservancy District. Threats that warrant spotted frog listing as a sensitive species by state and federal agencies and as threatened or endangered under the Endangered Species Act of 1973, as amended (ESA), should be significantly reduced or eliminated through implementation of the Agreement. The goal of the Agreement is to ensure the long-term persistence of spotted frog within its historic range and support development of statewide conservation efforts.

#### **Spotted Frog Distribution in Utah**

The overall distribution of spotted frog is continuous from southeastern Alaska and western Alberta, to the Pacific coast in Washington and Oregon. Its southern extent ranges into Nevada and Utah where populations are isolated and highly fragmented (*in* Bailey et al. 2006). The Utah and Nevada populations represent the southern extent of the species.

Spotted frogs have been recorded to occur historically in the West Desert in the Tule Valley, Snake Valley, and Ibapah Valley drainages. In 1993, Utah Division Wildlife Resources conducted a comprehensive survey during the breeding season of all known and potential spotted frog habitat to assess spotted frog distribution and habitat characteristics in the West Desert. Areas surveyed consisted of saline mud flats, terminal lakes, and spring complexes in the Tule, Snake, and Ibapah Valley drainages. Spotted frogs were found to occur in all historic localities in abundant numbers. Specific areas where populations of spotted frog were found included: North and South Tule Spring, Willow Spring, Coyote Spring, the Tule turnoff to Tule Valley, the Leland Harris/Miller spring complex, Gandy Marsh, and the Bishop Spring complex in Snake Valley, and in the valley floor of Ibapah Valley (*in* Perkins et al. 1998). In 2005 a new population of spotted frog was found south of the town of Garrison, Utah, northwest of the Great Basin National Park (Wheeler et al. 2005).

#### **Spotted Frog Ecology and Habitat Requirements**

The spotted frog is more of an aquatic specialist than most ranids. The majority of sightings and captures of this species have occurred while the frogs were submersed in water. Spotted frogs require wet corridors to move from one habitat to another thereby restricting dispersal between wetland complexes to those that are connected by wet corridors. Spotted frog typically inhabit a variety of habitat types including cold water ponds, streams, lakes, and springs adjacent to mixed coniferous and subalpine forest, grassland and brush land. In Utah, it is usually found in semipermanent ponds with cool, clear spring-fed water and organic substrates. Habitat usually consists of a small spring, pond or slough with a variety of herbaceous emergent, floating, and

submergent vegetation. Vegetation most commonly associated with spotted frog includes: bullrush (*Scirpus sp.*), sedges (*Carex spp*), cattails (*Typha sp.*), duckweed (Lemnaceae), rushes (*Juncus spp.*), watercress (*Nasturtium officinale*), grasses (Graminae) and algae. Additional species of vegetation associated with the West Desert populations include saltgrass (*Distichlis spicata*), Elodea (*Elodia*), pondweed (*Xanthium spinosum* and *strumarium*), giant reed (*Phragmites*) and sandbar willow (*Salix sp.*). The occurrence of spotted frog populations in the West Desert is ecologically intriguing because this highly aquatic ranid frog has life history traits that enable them to survive in isolated springs of high salinity and temperature (*in* Perkins and Lentsch 1998, Fridell et al. 2000, Fridell et al. 2001, Wilson and Olsen 2001, Wilson and Olsen 2002, Wheeler et al. 2002, Wilson and Davidson 2003, Wheeler et al. 2003, Fridell et al. 2004, Mills et al. 2004, *in* Bailey et al. 2006).

**Breeding occurs in early spring and although spotted frog are known to use temporary bodies of water for breeding in more mesic parts of their range, in Utah, breeding sites are predominantly associated with a spring or some other permanent water source.** In the West Desert, spotted frogs begin breeding in early-March and continue to the middle of April. One male usually begins vocalizing, stimulating the other males to call simultaneously. Egg deposition is stimulated by a single pair of frogs followed by other spotted frogs depositing eggs in the same area. Egg masses are usually deposited in open areas with shallow water (<20 cm) and within 2 m of the shoreline with water temperatures ranging between 11°C and 20°C (*in* Perkins and Lentsch 1998). Egg masses are weakly adhesive and form an irregular mass or globular cluster approximately 7.5 to 20 cm in diameter. Number of eggs per egg mass are quite variable, ranging from 147 to 1160 eggs. Hatching rate varies directly with water temperature but generally occurs within 21 days (*in* Perkins and Lentsch 1998, Fridell et al. 2000, Fridell et al. 2001, Wilson and Olsen 2001, Wilson and Olsen 2002, Wheeler et al. 2002, Wilson and Davidson 2003, Wheeler et al. 2003, Fridell et al. 2004, Mills et al. 2004, *in* Bailey et al. 2006).

### **Status of Least Chub in Utah**

The least chub (*Notichthys phlegethontis*) is a small monotypic minnow endemic to the Bonneville Basin of Utah. The least chub is the sole representative of the genus *Notichthys*. Although information on historic distribution is scarce, least chub have been documented in the Provo River, Utah Lake, Beaver River, Parowan Creek, Little Salt Lake, and Big Cottonwood Creek and wetland complexes within the Snake Valley in the West Desert (Sigler and Miller 1963, Sigler and Workman 1975).

In 1972 and 1979, least chub was recognized as a threatened species by the Endangered Species Committee of the American Fisheries Society (Miller 1972; Deacon et al. 1979 *in* Perkins et al. 1998). In 1980, the U.S. Fish and Wildlife Service (Service) reviewed existing information on least chub and determined that there was insufficient data to warrant listing as endangered or threatened. This finding was based on status reviews conducted by the Service. On December 30, 1982, the Service classified this species as a Category 2, Candidate (47 FR 58454, *in* Perkins et al. 1998). After preparation of a 1989 status report, the Service reclassified least chub as a Category 1, Candidate species (54 FR 554, *in* Perkins et al. 1998). In 1995, the Service determined that listing least chub as an endangered species was warranted and, on September 29, 1995, proposed

to list the species as endangered with critical habitat, pursuant to the ESA (60 FR 50518). Least chub is listed as a "conservation species" on Utah's Sensitive Species list (UDWR 1998, amended 2005) and a Tier I species in Utah's Comprehensive Wildlife Conservation Strategy (Sutter et al. 2005). An interagency Conservation Agreement and Strategy (Agreement) was developed and finalized in January 1998 (Perkins et al. 1998, amended Bailey et al. 2005). Signatories to the Agreement include Utah Department of Natural Resources, Division Wildlife Resources, U.S. Bureau of Reclamation, U. S. Bureau of Land Management, Utah Reclamation Mitigation Conservation Commission, U.S. Fish and Wildlife Service, Confederated Tribes of Goshute Nation, and Central Utah Water Conservancy District. The commitments made by the signatories to the Agreement led the FWS to withdraw the listing proposal on July 29, 1999.

The Least Chub Conservation Agreement and Strategy was developed to expedite implementation of conservation measures for least chub in Utah as a collaborative and cooperative effort among resource agencies (Perkins et al. 1998, amended by Bailey et al. 2005). Threats that warrant least chub listing as a sensitive species by state and federal agencies and as threatened or endangered under the Endangered Species Act of 1973, as amended (ESA), should be significantly reduced or eliminated through implementation of the Agreement. The goal of the Agreement is to ensure the long-term persistence of least chub within its historic range and support development of statewide conservation efforts.

### **Least Chub Distribution**

Least chub currently occur in two major geographically isolated areas of the Bonneville Basin: in the West Desert and in two isolated spring complexes along the Wasatch Front (Workman et al. 1979, Osmundson 1985, Perkins et al. 1998, Bailey et al. 2005). Least chub persist in relict wetlands pockets left by the receding Lake Bonneville and Lake Provo. There are 6 populations in 4 general locations: Mona Springs, Mills Valley, Snake Valley, and Clear Lake. The current distribution of least chub in the West Desert includes three populations in the Snake Valley: Gandy Salt Marsh, Bishop Springs, Leland Harris Springs, and Miller Spring and one population at Clear Lake. The Leland Harris and Miller Spring sites are two distinct wetland marsh complexes but are connected seasonally. Genetic analyses indicate they are one population (Mock and Miller 2005). During 2003 the Division found a previously undocumented population of least chub at the Clear Lake Waterfowl Management Area, south of Delta, Utah, in the Sevier subbasin (Wheeler et al 2004, Mock and Bjerregaard 2005). In the West Desert least chub have been extirpated from Callao Springs and Redden Springs near the town of Callao (Crist 1990). Least chub were reported in Snake Creek, south of Gandy Salt Marsh; however, surveys conducted in 2000 determined that currently least chub do not occupy Snake Creek (Hudson and Hogrefe 2000). Additional surveys were conducted in Tule Valley, southeast of Snake Valley, to look for additional extant populations of least chub. Thirteen spring complexes were surveyed. No fish were observed at any of the thirteen sites (Hogrefe and Fridell 2000).

### **Least Chub Ecology and Habitat Requirements**

The least chub is a small cyprinid less than 6.35 cm in length and becomes sexually mature within one year. The least chub was believed to be short lived, until recent studies indicate least chub live up to 7 years of age (Mills et al. 2004). This species swims in rather dense, well-ordered schools but is very adept at diving into the bottom vegetation or retreating rapidly into rushes when

disturbed. The least chub spawns in the spring when water temperatures reach 16°C. Least chub are polyandrous broadcast spawners over vegetation, primarily algae. The eggs are demersal and adhere to vegetation. Fertilized eggs hatch in approximately two days at water temperature of 22°C (Crawford 1979). The presence of submerged vegetation provides an important habitat for eggs and young larvae by furnishing needed oxygen and food (Crist and Holden 1980). Spawning has not been observed in the springhead, least chub move back into the deeper springhead after the spawning period. Least chub reproduce in shallow marshes on the periphery of the wetland complex when temperature, alkalinity, pH, and conductivity are at a maximum. These unique reproductive strategies (movement, spawning over an extended period, broad tolerances to water quality extremes, and the ability to mature in one year) allow the least chub to thrive in the fluctuating environment of the spring/marsh complexes of the West Desert (Hickman 1989 in Perkins et al. 1998).

The least chub is of value as a natural predator of mosquito larvae although mosquito larvae appear to be a seasonal food item (Wagner et al. 2005).

Least chub is a generalist and exhibits broad tolerance limits to many water quality parameters, which allow it to exist in the severe environment of the springs and marshes in Snake Valley (in Perkins et al. 1998). In general, the springs least chub occupy exhibit cool stable temperatures, relatively low, stable dissolved oxygen values, and low conductivities. The marshes display higher temperatures, conductivity, pH, and dissolved oxygen than the spring areas (Hickman 1989 in Perkins et al. 1998). The marshes also exhibit wide diurnal fluctuations in dissolved oxygen due to higher daytime primary productivity. The daily temperatures in the marshes can fluctuate between 15 and 32°C. Seasonal water quality changes in the marshes and stream segments result in fish movement back and forth between different habitat types, especially between springs and marshes. The presence of vegetation is an important habitat component for least chub, while substrate type appears to be insignificant (Crist and Holden 1980).

Habitat usually consists of a small spring, pond or slough with a variety of herbaceous emergent, floating, and submergent vegetation. Vegetation most commonly associated with least chub includes: bullrush (*Scirpus* sp.), sedges (*Carex* spp.), cattails (*Typha* sp.), duckweed (Lemnaceae), rushes (*Juncus* spp.), watercress (*Nasturtium officinale*), grasses (Graminae) and algae. Additional species of vegetation found associated with the Snake Valley populations include saltgrass (*Distichlis spicata*), Elodea (*Elodia* sp.), pondweed (*Xanthium spinosum* and *X. strumarium*), giant reed (*Phragmites*) and sandbar willow (*Salix* sp.) (Perkins et al. 1998, Bailey et al 2005). The occurrence of least chub populations in Snake Valley is ecologically intriguing because it has evolved life history traits that enable them to survive in isolated springs of high salinity and temperature.

#### **Utah's Role in Conservation of Spotted Frog and Least Chub**

The Conservation Agreement and Strategy for Spotted Frog (*Rana luteiventris*) in the State of Utah (Perkins and Lentsch 1998, amended Bailey et al. 2006) and the Conservation Agreement and Strategy for Least Chub (*Iotichthys phlegethontis*) in the State of Utah (Perkins et al. 1998, amended Bailey et al. 2005) were developed to expedite implementation of conservation measures for spotted frog and least chub in Utah as a collaborative and cooperative effort among resource

agencies. Signatories to the Agreements and participants on the Conservation Teams include Utah Department of Natural Resources, Division Wildlife Resources, U.S. Bureau of Reclamation, U.S. Forest Service, U. S. Bureau of Land Management, Utah Reclamation Mitigation Conservation Commission, U.S. Fish and Wildlife Service, Confederated Tribes of Goshute Nation, and Central Utah Water Conservancy District. Threats that warrant spotted frog and least chub listing as a sensitive species by state and federal agencies and as threatened or endangered under the Endangered Species Act of 1973, as amended (ESA), should be significantly reduced or eliminated through implementation of the Agreements and Strategies.

The **goals** of the spotted frog and least chub Agreements are to ensure the long-term persistence of spotted frog and least chub within their historic range and support development of statewide conservation efforts.

**Objectives of the spotted frog Agreement are:**

- Objective 1 – Eliminate or significantly reduce threats to spotted frog and its habitat.
- Objective 2 – Maintain existing self – sustaining populations and their habitat.
- Objective 3 – Restore populations at selected localities within the historic range.
- Objective 4 – Increase the size of selected populations.
- Objective 5 – Maintain genetic diversity.
- Objective 6 – Develop and implement an adaptive management framework by incorporating new information annually into conservation planning efforts.
- Objective 7 – Implement and incorporate provisions of the conservation strategy into signatory planning documents and budgets to ensure the conservation goal and objectives are achieved.

**Objectives of the least chub Agreement are:**

- Objective 1 – Eliminate or significantly reduce threats to least chub and its habitat to the greatest extent possible.
- Objective 2 – To restore and maintain self-sustaining populations throughout its historic range that will ensure the continued existence of least chub.

Since the areas of concern covered by the spotted frog and least chub Agreements are located in Utah, the State of Utah has primary jurisdiction over these species within the State. The designated lead agency for the spotted frog and least chub Conservation Teams is the Division of Wildlife Resources. Conservation Teams consist of a designated representative from each signatory agency to the Agreements.

As leader of the Conservation Teams, the Division coordinates conservation activities and monitors implemented conservation actions conducted by participants of the Agreements to determine if all actions are in accordance with the Agreements. Authority of the Conservation Teams is limited to making recommendations for the conservation of spotted frog and least chub. The recommendations implemented by Conservation Team members are subject to review by the Division Director for ecosystem conflict and/or opportunities for ecosystem-level or multi-species collaborative conservation. The Conservation Teams meet at least semiannually to review conservation schedules, budgets, develop funding as necessary, and receive reports on progress and effectiveness of the Strategy implementation (Bailey et al. 2005, Bailey et al 2006).

The Division conducts annual standardized monitoring of all known spotted frog populations and has consecutively monitored since 1994. The purpose of monitoring is to document population trends, determine distribution, and identify potential habitat. Known breeding sites are surveyed weekly during the breeding season to collect information on the number of egg masses deposited and the development and metamorphosis of tadpoles. The estimated size of a spotted frog population is based on the number of egg masses counted during the breeding season. The number of egg masses observed during the breeding season is doubled; this number represents the effective population size of spotted frog ( $N_e$  = the number of breeding individuals that contribute to the reproductive effort for the year). The estimates are then used to evaluate population trends based on annual fluctuations. At each egg mass deposition site, the depth from the center of the egg mass cluster to the top of the water column and the distance from the center of the cluster to the shore are recorded. Water temperatures, pH, and dissolved oxygen levels are also recorded. Habitat inventories are conducted at all sites in conjunction with least chub monitoring to assess physical parameters and to determine abundance of aquatic flora. Water depth, substrate depth, pool size, bank condition, water temperature, pH, dissolved oxygen, aquatic flora presence, and ungulate damage are recorded on standardized data sheets (Wilson et al. 1999, Wilson 2000, Fridell et al. 2000, Fridell et al. 2001, Wilson and Olsen 2001, Wheeler et al. 2002, Wilson and Olsen 2002, Wheeler et al. 2003, Wilson and Davidson 2003, Fridell et al. 2004, Mills et al. 2004, Wheeler et al. 2005).

The Division also conducts annual standardized monitoring of all known least chub populations. The standardized monitoring protocol consists of a variable number of mesh minnow traps set at the same location each year. Minnow traps are set for 2-4 hours at a minimum depth of 12 cm. Trap location, trap depth, and total trapping time are recorded for each trap. All trapped fish are measured to the nearest millimeter and classified by species. Trends in distribution and abundance are evaluated annually based on the presence or absence of least chub at each sampling site. Habitat inventories are conducted at all sites to assess physical parameters and to determine abundance of aquatic flora. Water depth, substrate depth, pool size, bank condition, water temperature, pH, dissolved oxygen, aquatic flora presence, and ungulate damage are recorded on standardized data sheets (Fridell et al. 1999, Wilson et al. 1999, Fridell and Marr 2000, Wilson 2001, Fridell and Malecki 2001, Wilson and Whiting 2001, Fridell et al. 2002, Wilson and Whiting 2002, Wilson and Davidson 2003, Wheeler et al. 2004, Wilson and Mills 2004, Thompson 2004, Wheeler and Fridell 2005).

### **Potential Groundwater Withdrawal Impacts to Wetland Dependent Species**

The Bonneville Basin in Utah experienced a five-year period of drought beginning in 2000 and tentatively ending in 2005. Spotted frog reproductive effort decreased continuously, greater than 50% in most locations, for five years at those spotted frog sites heavily influenced by the effects of drought (Wilson et al. 1999, Wilson 2000, Fridell et al. 2000, Fridell et al. 2001, Wilson and Olsen 2001, Wheeler et al. 2002, Wilson and Olsen 2002, Wheeler et al. 2003, Wilson and Davidson 2003, Fridell et al. 2004, Mills et al. 2004, Wheeler et al. 2005). Drought conditions reduced the amount of available year round habitat, as well as other resources available to spotted frogs during the summer and fall, most likely leading to reduced egg formation in pre-hibernating females. It is

also likely that when conditions are unfavorable, adult frogs may forgo breeding (*in* Bailey et al. 2006).

Monitoring data in the West Desert for least chub from 1993-2005 suggest that least chub numbers may be declining in Snake Valley, particularly within the Gandy Salt Marsh (Fridell et al. 1999, Fridell and Marr 2000, Fridell and Malecki 2001, Fridell et al. 2002, Wheeler et al. 2004, Wheeler and Fridell 2005). The number of sites with the presence of least chub, within the Gandy Salt Marsh, has declined by approximately 50% since 1994. The number of sites with the presence of least chub has fluctuated between 83% and 66% at Leland Harris and 84% and 38% at Bishop Springs. The Leland Harris site has remained relatively stable and the Bishop Spring site has remained relatively stable since 1994.

~~Habitat loss and degradation have been indicated as major causes of the declines in least chub and spotted frog populations and distribution (Perkins and Lentsch 1998, Perkins et al. 1998, Bailey et al. 2005, Bailey et al. 2006). Although no specific studies have been conducted at the springs occupied by least chub and spotted frog, numerous other reports link livestock trampling and grazing with fish habitat degradation (water quality, vegetation type, habitat morphology, etc.) in streams and springs. The majority of occupied and unoccupied habitats in the West Desert are currently not protected against grazing practices, and those that are (Miller Spring) have only recently been fenced.~~

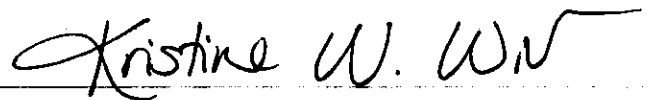
Many species that occupy the wetland/marsh complexes in the West Desert are “truly aquatic” which means they cannot survive outside of the water and/or lack the ability to disperse to adjacent suitable habitats. This includes native fishes, amphibians and mollusks such as least chub, Utah chub (*Gila atraria*), speckled dace (*Rhinichthys osculus*), mottled sculpin (*Cottus bairdi*), spotted frog, leopard frog (*Rana pipiens*), California floater (*Anodonta californiensis*) and numerous species of springsnails (spp. unknown).

Monitoring data for spotted frog during the drought period indicate the populations are extremely vulnerable to natural perturbations such as drought. The effective population size declined more than 50% over the five-year drought period. Spotted frogs are unable to disperse in search of suitable habitat due to the inhospitable habitat conditions between wetland complexes. Least chub populations have declined by more than 50% in the Gandy Salt Marsh area due to a reduction in available habitats. The reduction has occurred over the past thirteen years suggesting the Gandy Salt Marsh may be more at risk to potential groundwater withdrawals as it is already experiencing drying up of springs throughout the complex.

The proposed groundwater withdrawal project has the potential to significantly lower the water table, potentially drying up or lowering the water level in habitats occupied by least chub, spotted frog and other native species (listed above) that lack the ability to “move” to suitable habitats. The groundwater withdrawal project has the potential to mimic a permanent drought condition. If a permanent drought is artificially imposed on the wetland/marsh complexes within the West Desert, the wetlands will become more vulnerable to natural perturbations and fluctuations such as drought. Most likely the native fishes, amphibians, and mollusks that occupy the potentially impacted wetland complexes would be extirpated.



All conservation plans that have involvement by Utah Division Wildlife Resources are driven by efforts to not have the associated species listed under the Federal Endangered Species Act (1973). In fact, success of conservation plans is determined when species are delisted under the Act. Groundwater withdrawal, as proposed in Utah's West Desert, has high risk to reduce critical habitat for spotted frog, least chub, and other wetland dependent species. Thus, these species would be under increased scrutiny to move towards more protective listing status, rather than one of delisting.

A handwritten signature in black ink that reads "Kristine W. Wilson". The signature is written in a cursive style with a long horizontal flourish at the end.

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