

CONSERVATION AGREEMENT AND STRATEGY

FOR

SPOTTED FROG

(Rana pretiosa)



Photo by P. Dotson

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CONSERVATION STRATEGY

FOR

SPOTTED FROG

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INTRODUCTION

In 1989, the U. S. Fish and Wildlife Service (FWS) was petitioned to list the spotted frog (referred to as *Rana pretiosa*) under the Endangered Species Act (Federal Register 54[1989]:42529). The FWS ruled on 23 April 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). The major impetus 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 FWS maintained the same status for spotted frog, however, they updated the common and scientific name of the Utah populations. The FWS now refers to the spotted frog in Utah as the Columbia spotted frog (*Rana luteiventris*).

The purpose of this document is to describe specific actions and strategies required to expedite implementation of conservation measures for spotted frog as a cooperative effort among resource agencies in Utah. The goal of these actions is to ensure the long-term conservation of this species within its historic range in Utah. Though the primary focus of this Strategy is conservation and enhancement of spotted frog, it may also reduce or eliminate threats and improve habitat for other associated species that would require the need for Federal protection pursuant to the Endangered Species Act of 1973, as amended (ESA).

DEFINITIONS

Geographic Management Unit (GMU) - A distinct area within Utah defined by the historic spotted frog range and geographic boundaries.

Historic Range - The area that spotted frog is perceived to have inhabited at the time of modern exploration and settlement of Utah (Approximately 1850) through 1989.

Introduction - Release of wild or cultured spotted frog into historically unoccupied sites for aiding conservation.

Nonnative - A species that historically did not occur in a specific area or habitat and that now inhabits as a result of human actions.

Reintroduction - Release of wild or cultured spotted frog into historically occupied sites for the purpose of reestablishing populations.

Threat - Any action or activity, past or present, that currently or in the future may prevent the continued existence of spotted frog.

Transplant/Translocate - Removal of spotted frog individuals from a naturally occurring population and subsequent release of these individuals into other waters.

Effective Population Size - N_e = The size of an ideal population that has the same rate of increase in homozygosity or gene-frequency drift as the actual population under consideration (Wright 1931, Crow and Denniston 1988). As a result of genetic drift, isolated populations lose variation at a rate of $1/2N_e$ per generation (Wright 1931). In an applied sense, effective population size is the number of breeding individuals that contribute genes to the next generation.

Population - A population is defined as an area of spotted frog occurrence that is geographically or hydrologically isolated from other areas of spotted frog.

SPECIES DESCRIPTION

Spotted frog belong to the anuran family of “true frogs”, Ranidae. Twenty-three species of ranids occur in the United States of which only four are native to Utah. The northern leopard frog, *Rana pipiens*, the relict leopard frog, *Rana onca*, the lowland leopard frog, *Rana yavapaiensis*, and the spotted frog. The green frog (*Rana clamitans*), and the bull frog, (*Rana catesbeiana*) also occur in Utah, however, these species do not naturally occur west of the Rockies and have successfully been introduced into many areas throughout the West.

Ranids are typically characterized as slim-wasted, long-legged, smooth-skinned jumpers with webbed hind feet with a pair of dorsolateral folds (glandular folds) that extend from behind the eyes to the lower back. In Utah, adult spotted frogs range from 40 mm to 100 mm (Tanner 1931, UDWR in prep) and average between 45 mm and 80 mm (Ross et al. 1993, 1994, Keleher, unpubl.) in snout vent length (SVL). Color and pattern descriptions of individuals from Utah include a brownish-black dorsal coloration with little or no spotting pattern. They differ from spotted frogs in the Pacific Northwest which possess numerous dorsal spots (Nussbaum et al. 1983, Stebbins 1985). Spotted frogs along the Wasatch Front generally possess a salmon color ventrally and yellow to yellow-orange coloration ventrally in the West Desert and Sanpete County, however coloration can be quite variable between populations in Utah. The throat and the ventral region are sometimes mottled. The head has a dark mask with a light stripe on the upper jaw and the eyes are turned slightly upward. The dorsolateral fold is usually present in spotted frogs, however may be absent in some individuals. Male frogs have swollen thumbs with darkened bases.

Spotted frog is similar to and often mistaken for the leopard frog. Specific characteristics which distinguish the spotted frog from the sympatric leopard frog include: rougher skin, shorter limbs (the heel of the hind limb when adpressed seldom reaches the nostrils), larger webs between the toes, smaller tympanum, and the smooth round eyes which are turned slightly upward. Other distinguishing characteristics of the leopard frog are very large conspicuous spots and a mostly white ventral surface compared to the pigmented ventral surfaces of the spotted frog.

SYSTEMATICS AND TAXONOMY

The systematic and taxonomic relationship of spotted frog occurring in Utah to other spotted frog has been described in several manners. Originally, two subspecies of *Rana pretiosa* were described for populations occurring within Utah (Thompson 1913, Wright and Wright 1949). These two subspecies, *R. p. pretiosa* and *R. p. luteiventris*, were described based on pigmentation characteristics of frogs collected from the Wasatch Front and the West Desert populations. As additional specimens were examined, variability of characteristics within and between populations was described (Morris and Tanner 1969). Recent studies have provided additional information on the taxonomic relationships of the Utah populations to other populations in the Intermountain west (Green et al. 1996 and Green et al. 1997). Green et al. (1997) speculated, based on biochemical and morphological data, that spotted frog should be taxonomically described as two groups at the species level: Oregon Spotted Frog (*Rana pretiosa*), and Columbia Spotted Frog (*Rana luteiventris*). They suggested that all spotted frog populations occurring within Utah were *Rana luteiventris*. The FWS refers to Utah populations as the Columbia spotted frog. No standardized designation, however, has been accepted.

Population Genetic Analysis of Spotted Frog in Utah

To best manage populations of spotted frog it is necessary to have a good understanding of within and among-population genetic structure. Quantification of within-population genetic variation will determine whether or not the populations have undergone severe reductions in population size (historically or recently) and may therefore be prone to the effects of inbreeding depression. Due to the large geographic distance between the West Desert and the Wasatch Front it is obviously unlikely that any gene flow is occurring between them currently. Therefore, quantification of among-population genetic variation will lend insight into what level of migration (gene flow) might be occurring among populations within a region (e.g. the West Desert) but among-regions, interpretation of genetic variation will be more appropriately applied to determining whether or not there has been sufficient time for divergence and/or if these regions were potentially founded by different dispersal routes. Both within and among-population genetic analysis will help to 1) determine appropriate management units for spotted frog and 2) aid in the determination of potential sources for broodstock should the need arise.

ECOLOGY AND LIFE HISTORY

The spotted frog tends to be 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 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 (Morris and Tanner 1969, Stebbins 1985). In Utah, it is usually found in locations with cool, clear spring-fed water and organic substrates (Dumas 1966, Morris and Tanner 1969). 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 (Ross et al. 1994). 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.*) (Ross et al., 1994). Morris and Tanner (1969) suggest that deep silt or muck bottoms are required for hibernation and torpor. 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 (Hovingh 1993).

Spotted frogs emerge from hibernation in the spring and tend to utilize different habitats depending on their needs. For example, in Yellowstone National Park, sexually immature individuals tended to inhabit aquatic habitats away from breeding adults until the summer when first, second, and third year male and female age-classes and females in the fourth year move back to or near the area from which they emerged from hibernation (Turner 1958). Breeding adults use areas in the absence of the other age-classes and move to sites near the younger frogs as the water begins receding from the breeding area (Turner 1958). Often, adult frogs disappear after breeding, perhaps burrowing into the substrate. Studies conducted along the Provo River in 1997 support this hypothesis (UDWR in prep.). Some researchers have suggested that spotted frogs travel great distances from water after breeding (Stebbins 1985). Turner (1960) suggested that spotted frogs utilize small home ranges. In Yellowstone National Park, frogs were recaptured at or near the same location used for breeding. Turner (1960) also indicated that emigration and immigration between populations may be closely balanced over the long term, although this aspect was not well documented or studied. It is unclear what spotted frogs do and where they are outside of the breeding season in Utah. Habitat use and movement studies were initiated in 1997. Preliminary results indicate that spotted frog in Utah do not move great distances and remain in or near the breeding areas (UDWR, unpubl.) Intensive mark-recapture and/or radiotelemetry studies are required in order to determine actual movement patterns in the Utah populations.

Breeding occurs early with the spring thaw and although spotted frog are known to use temporary bodies of water for breeding in more mesic parts of their range (Turner 1960, Licht 1971), in Utah, breeding sites are predominantly associated with a spring or some other permanent water source (Morris and Tanner 1969, Hovingh 1993, Ross et al. 1993, Ross et al. 1994, UDWR in prep).

In the West Desert, spotted frog begin breeding in early-March and continue to the middle of April (Hovingh 1993, UDWR, unpubl.). Wasatch Front populations begin breeding in early-March as well; however, breeding populations at higher elevations tend to begin breeding toward the end of March and continue through the end of April (Keleher, unpubl.). This has also been noted in other populations of spotted frog in British Columbia (Licht 1975) and Wyoming (Yellowstone National Park) (Turner 1958) and is attributed to temperature differences. One male usually begins vocalizing, stimulating the other males to call simultaneously. The

vocalization is described as a “clicking” noise (Morris and Tanner 1969), but may also be described as a soft “bubbling” sound. Calls consist of 4-50 clicks per call and last about 1-10 seconds (Stebbins 1985).

Egg deposition is stimulated by a single pair of frogs followed by other spotted frogs depositing eggs in the same area. It has been reported that they will also deposit eggs in the same area annually (Morris and Tanner 1969, Nussbaum et al. 1983). Individual females may oviposit more than one clutch of eggs annually (Morris and Tanner 1969); however, this has not been confirmed in Utah populations. Sex ratios have not been quantified in Utah. For population estimates derived from monitoring information for the 1991-1993 surveys; however, UDWR used estimates of 1:1 sex ratios (Ross et al. 1993, Ross et al. 1994).

Egg masses tend to be deposited in open, shallow (<20 cm) areas and within 2 m of the shoreline with water temperatures ranging between 11°C and 20°C (Ross et al., 1993, 1994).

Egg masses are weakly adhesive and form an irregular mass or globular cluster approximately 7.5 to 20 cm in diameter. They may become weakly attached to vegetation (*Chara* spp.) for a short period of time then the mass floats to the surface, exposing the top layer of eggs. Wind and water currents often move masses around and they may begin to break up. Eventually the egg masses may become separated and covered with debris. Number of eggs per egg mass are quite variable, ranging from 147 to 1160 eggs (Toone 1991). Individual eggs are typically larger than other ranids and can have one or two envelopes. Hatching rate varies directly with water temperature (Toone 1991).

DISTRIBUTION

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 (Tanner 1931, Tanner 1978, Linsdale 1940, Banta 1965, Turner and Dumas 1972, Hovingh 1993, Ross et al. 1993, Ross et al. 1994). Post-glacial climatic shifts naturally distributed spotted frog populations amongst drainage areas in Utah. These populations represent the southern extent of the species (Stebbins 1985).

The Bonneville Basin within Utah encompasses the area that was covered by ancient Lake Bonneville and which, today, lies within the Great Basin province. The entire Great Basin province is distinguished geologically by its characteristically parallel north-south mountain ranges that are separated by broad, alluviated desert basins (Christiansen 1951) and valleys. The steep, gravelly slopes of these ranges are prominently marked by benches and other shore features of Lake Bonneville. Numerous springs are present at the base of the mountains (Bick 1966) and in the valley floors. Several aquatic species have maintained an existence as relict populations in these springs, including spotted frog, least chub, and several species of mollusks (Ecosearch, Inc. 1991, 1992). Populations of these species are, however, rare and in some areas declining. The rapid deterioration of these aquatic environments, primarily from agricultural

practices, has caused other unique Bonneville Basin species, such as *Rhinichthys osculus relictus* (Hubbs and Miller) a subspecies of dace, to become extinct (Hubbs et al. 1974).

The historic and current distribution of spotted frog has been separated into three geographic management units (GMU's) that are based on hydrologic subregions (USGS 1974). These units are the Sevier River GMU, Wasatch Front GMU, and the West Desert GMU (Figure 1). These GMUs have been further divided into subunits consistent with the United States Geological Survey hydrological description of Utah (USGS 1974) to assist in further defining distribution, describing threats, and prioritizing conservation measures to be implemented. These subunits have been assigned a name by UDWR with corresponding USGS accounting codes as shown in Table 1.

Very little information is available, particularly, quantitative information, on the historic occurrence of spotted frog in Utah. Information that is available is limited to spotty museum collection records and anecdotal information (Toone 1991), and surveys conducted in the mid 1900's (Tanner 1931, Turner 1960). Based on this information, spotted frog along the Wasatch Front are thought to have historically occurred in the San Pitch River, Spanish Fork River, Utah Lake, Provo River, Jordan River, and Upper Weber River Drainages (Table 1 and Figure 1). During 1991 and 1992, all historically known locations, as well as other suitable wetlands within its historic range, were surveyed for the occurrence of spotted frog (Ross et. al, 1993). Results of this survey indicated that the distribution of spotted frog along the Wasatch Front had declined (Figure 2). Spotted frog were not found in the Jordan River or the Lower Weber River drainages. Populations were still found in the San Pitch River (Sanpete Valley), Spanish Fork River (Holladay Springs), Utah Lake (near Mona), Provo River (Heber Valley), and in the Upper Weber River (Francis) drainages. Only seven egg masses; however, were observed at one location near Francis in the Upper Weber River (Figure 2). A subsequent survey of this site by UDWR has not been conducted so the population status remains unclear. Though the 1991 and 1992 surveys do not show a significant range reduction, they did indicate that the size of the populations had declined significantly and had become more fragmented because of habitat loss and degradation due to water and urban development. In 1996, a single adult spotted frog was collected by UDWR in the Lower Weber River drainage (Farmington Canyon); however, subsequent surveys have not found any additional spotted frog at this site (Figure 2). Therefore, the status of a population in the Lower Weber River Drainage remains unclear. A survey conducted by UDWR near the town of Springville, found an additional breeding site with significant numbers (n = 65 egg masses) of spotted frog in 1997.

Spotted frogs have been recorded to occur historically in the West Desert in the Tule Valley, Snake Valley, and Iapah Valley drainages (Table 1 and Figure 1). Specific areas where spotted frog were recorded included Bishop Springs (Foote Reservoir) and Gandy Salt Marsh in Snake Valley, and spring systems in the valley floor in Iapah Valley. Recent surveys indicate that spotted frog distribution has probably remained relatively stable (Toone 1991, Cuellar 1992, Hovingh 1993, Ross et al. 1994). Toone (1991) conducted an inventory in Snake Valley and

Tule Valley, Cuellar (1992) completed a population study in Gandy Salt Marsh, and Hovingh (1993) studied spotted frog life history in Tule Valley. In 1993, UDWR conducted a comprehensive survey during the breeding season of all known and potential spotted frog habitat to assess spotted frog distribution, population, and habitat characteristics in the West Desert (Ross et al 1994). Areas surveyed consisted of saline mud flats, terminal lakes, and springs in the Tule, Snake, and Iapah Valley drainages. Spotted frog were found to occur in all historic localities in abundant numbers (Table 1, Figure 1). Specific areas where populations of spotted frog were found included: North and South Tule Spring, Willow Spring, Coyote Spring and the Tule turnoff in Tule Valley, the Leland Harris/Miller spring complex, Gandy Salt Marsh, and the Bishop Spring complex in Snake Valley, and throughout the spring complexes in the valley floor of Iapah Valley.

Table 1: Summary of GMU subunits and spotted frog subunit occurrence and populations

GMU	SUBUNIT	SUBUNIT CODE (USGS 1974)	HISTORIC OCCURRENCE	KNOWN OCCURRENCE	# OF KNOWN POPULATIONS
Wasatch Front	Spanish Fork River	16020202	X	X	2
	Utah Lake	16020201	X	X	1
	Provo River	16020203	X	X	2
	Jordan River	16020204	X	?	0
	Upper Weber River	16020101	X	X ¹	0
	Lower Weber River	16020102	?	X ²	0
Sevier River	San Pitch River	16030004	X	X	1
	Middle Sevier River	16030003	?	?	0
	Lower Sevier River	16030005	?	?	0
West Desert	Tule Valley	16020303	X	X	4
	Snake Valley	16020301	X	X	3
	Iapah Valley	16020306	X	X	1
	West Great Salt Lake	16020308	?	?	0
	North Great Salt Lake	16020309	?	?	0
	Skull Valley	16020305	?	?	0
	Tooele Valley	16020304	?	?	0
Bear River	Upper Bear River	16010101	?	?	0
	Middle Bear River	16010202	?	?	0
	Lower Bear River	16010204	?	?	0
	Logan River	16010203	?	?	0
	Bear Lake	16010201	?	?	0
TOTAL			9	9	14

¹ Based on observations of only seven egg masses in one location near Francis in the 1992 survey.

² Based on the collection of a single adult in Farmington Canyon in 1996

Figure 1: Historic Locality Information and Subunits that Historically Contained Populations of Spotted Frog in Utah.

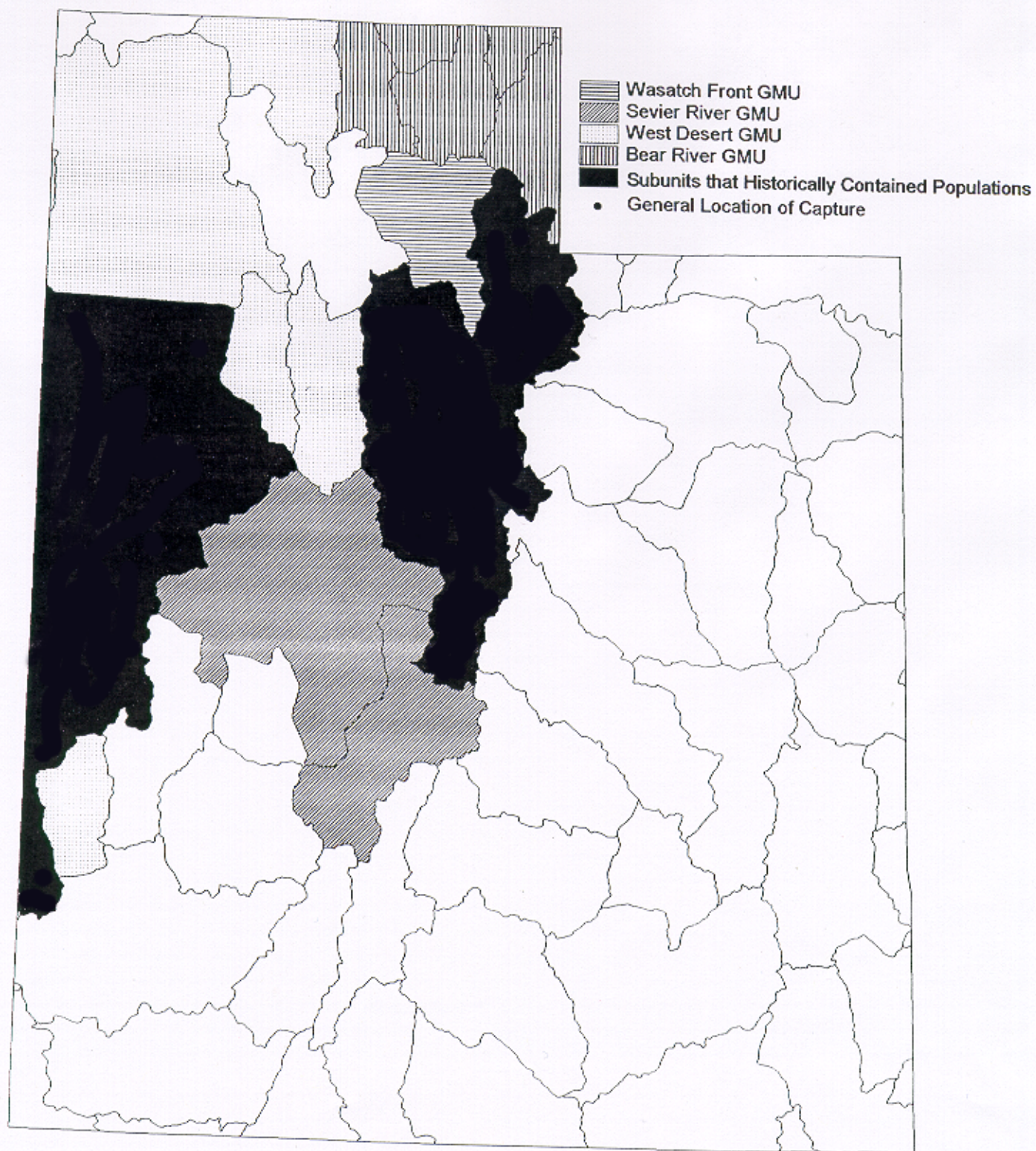
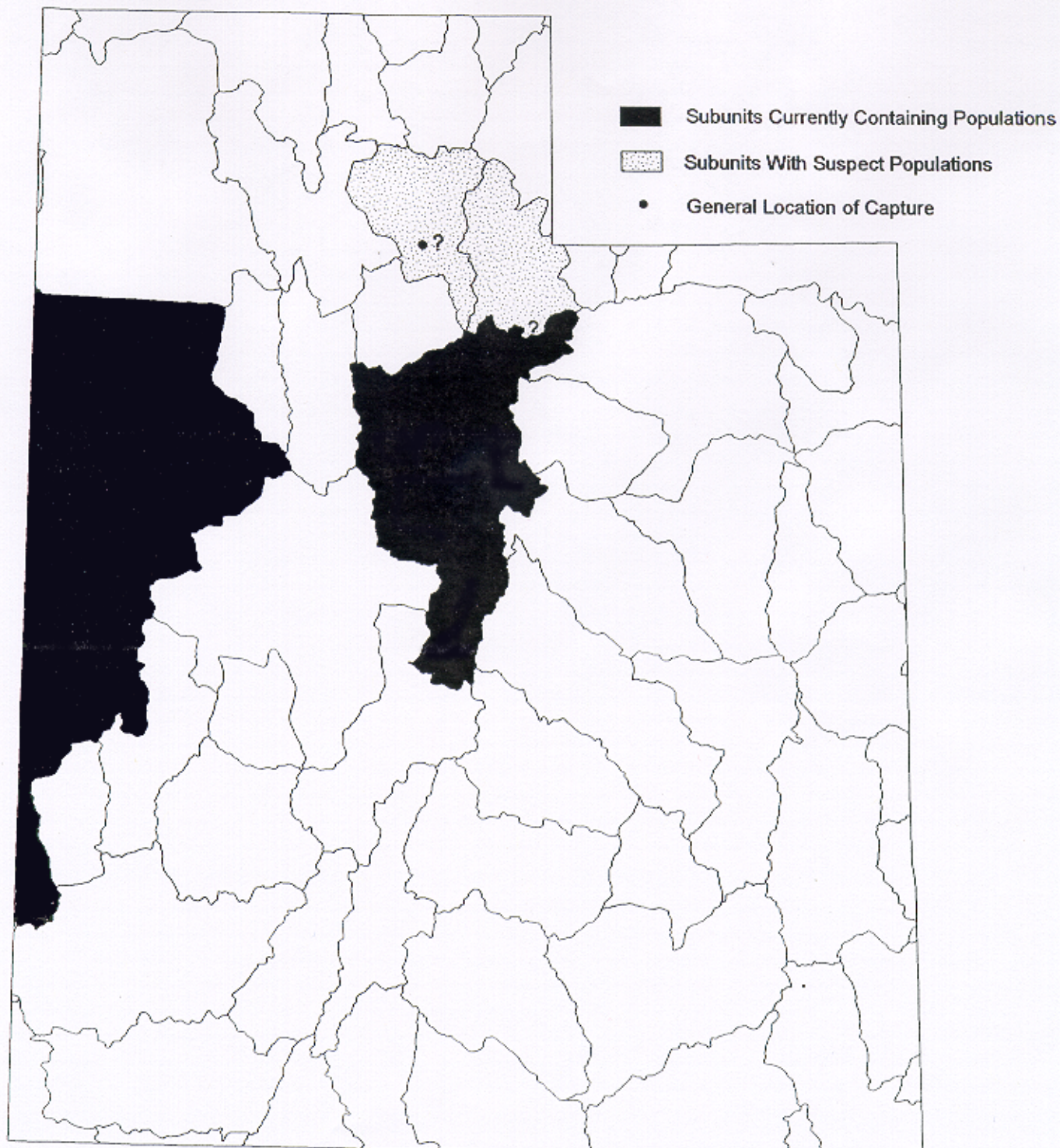


Figure 2: Subunits Currently Containing Populations of Spotted Frog in Utah.



STATE-WIDE CONSERVATION AND MANAGEMENT

The historic and current distribution of spotted frog covers three GMUs: the Sevier River, Wasatch Front, and the West Desert (Figure 1 and Figure 2). A fourth GMU, the Bear River, includes suitable habitat for spotted frog; however, the species has not been sampled in this region (Figure 1). The purpose of this section is to describe the overall conservation and management goals, objectives, general threats facing spotted frog, and conservation actions that are being undertaken. In order to facilitate prioritization and implementation of necessary actions for the conservation of spotted frog, details of threats and actions have been described in the Action Plan for each of the four GMU's. The Action Plan also outlines actions to be implemented at the statewide level.

STATE-WIDE GOAL AND OBJECTIVES

The state-wide goal for spotted frog in Utah is to ensure the long-term viability of this species within its historic range.

The following two objectives will be required to attain the goal.

Objective 1: To eliminate or significantly reduce threats to spotted frog and its habitat to the extent necessary to prevent the danger that the Utah populations will become extinct throughout or a part of their range, or the likelihood that these spotted frog populations will become an endangered species within the foreseeable future throughout all or a part of their range.

Objective 2: To restore and maintain a sufficient number of populations of spotted frog and the habitat to support these populations throughout its historic range in Utah that will ensure the continued existence of the species.

The specific number of populations and the associated population sizes required to ensure the long-term viability of spotted frog in Utah is described in the management objectives for each GMU (see below). These objectives are based on maintaining genetic variability within populations such that they can respond to changing environmental pressures while reducing the chance loss of genetic variability through drift. Maintenance of a sufficient effective population size is critical to meeting these objectives. Where, effective population size is the size of an ideal population that has the same rate of increase in homozygosity or gene-frequency drift as the actual population under consideration (Wright 1931, Crow and Denniston 1988). As a result of genetic drift, isolated populations lose variation at a rate of $1/2N_e$ per generation (Wright 1931). In an applied sense, effective population size is the number of breeding individuals that contribute genes to the next generation.

Natural populations are exposed to both temporal and spatial variation in the environment. Genetic diversity is necessary for adaptive evolutionary change of the population to these variable selection pressures and the ability to respond is proportional to the genetic variance

(Falconer 1989). This ability to respond may be particularly important for threatened and endangered species exposed to selection pressures that are much greater than they have experienced in their evolutionary history due to, for example, introduction of non-native species and habitat destruction (Lynch 1996).

Populations with an effective population size of N_e are expected to lose a fraction $1/(2 N_e)$ of their genetic variation each generation through drift (Falconer 1989). For example, if $N_e = 50$ then the population will lose 1% of its genetic variation each generation or 10% after ten generations. This is a substantial loss in terms of fitness where it has been shown that in historically outbreeding populations a 10% loss of genetic variability can translate to a 10% loss in fitness (Falconer 1989, Ralls and Ballou 1983). Franklin (1980) suggested that when $N_e = 50$ the population would experience short-term inbreeding depression whereas an N_e of 500, as a lower limit, provides long-term maintenance of genetic diversity. This estimate of 500 was derived by Franklin (1980) and Soulé (1980) by assuming a balance between mutation and random genetic drift. However, this number ($N_e = 500$) is (somewhat arbitrarily) based upon the maintenance of 90% of the genetic variability for 200 years (Franklin 1980, Soulé 1980, Soulé et al. 1986, Lande 1995). However, additional evidence on the mutation rate of quantitative traits (López and López-Fanjul 1993a, 1993b) suggest a rate much lower (10% of the original) than that incorporated into Franklin (1980) and Soulé's (1980) estimate. Indeed, if the López (1993) and López-Fanjul (1993) results are taken into consideration then N_e should be increased by a factor of ten to $N_e = 5000$ (Lande 1995). For the maintenance of adaptive variation of quantitative traits, Lynch (1996) argued that for long-term planning, an acceptable N_e is on the order of 1000. This value of N_e is more likely to prevent loss of adaptive traits, especially those associated with life-history characters whereas a number greater than 1000 is not expected to enhance the amount of genetic variance maintained in a population. The effective population size (N_e) will deviate from the census population size due to fluctuations in population size, variation in reproductive success and deviation from a 1:1 sex ratio (Wright 1931).

UDWR's long-term monitoring program of spotted frog includes counts of egg masses. These counts are being used to estimate the number of breeding adults in the populations. Although the mating system of spotted frog is not completely understood, the assumption is being made that every egg mass is the product of a single male and a single female. The egg masses therefore represent one-half the number of breeding adults. That is, every egg mass counts as two adults.

PROBLEMS FACING THE SPECIES

The success of any conservation or recovery program depends on eliminating or reducing the impact of activities that threaten the species existence. Several problems and threats have been identified and described for spotted frog by federal and state agencies as well as the public. These threats were identified based on the criteria for Federal listing as required by Section 4(a)(1) of the ESA. The following discussion summarizes the significant threats to spotted frog that will be addressed by conservation actions described in this Strategy.

(1) *Present or Threatened Destruction, Modification, or Curtailment of its Habitat or Range (Habitat Loss)*

Habitat loss and degradation have been indicated as major causes of the declines in spotted frog populations and distribution (Hovingh 1993, Ross et al, 1993). Loss of habitat due to water and urban development and agricultural practices has resulted in many small isolated populations. This increase in fragmentation has caused a loss in population connectivity that maintains the genetic integrity of spotted frog. This threat is particularly present along the Wasatch Front. Habitat degradation due to agricultural practices is also a major threat facing all populations in Utah. Although no studies have been conducted on the springs occupied by spotted frog, numerous other reports link livestock trampling and grazing with frog habitat degradation (water quality, vegetation type, habitat morphology etc.). The majority of occupied and unoccupied habitats are currently not protected against grazing practices, and those that are have only recently been protected with cattle exclosures. Potential habitat loss and degradation due to short term future projects and activities such as the 2002 Winter Olympics also present a threat to spotted frog.

Other habitat alterations also threaten spotted frog populations such as water development activities (e.g. irrigation practices). Water levels have been identified as important in the life history of spotted frog (Hovingh 1993). Many springs along the Wasatch Front have been depleted through diversions or capped and pumped. Similarly, the conversion from flood irrigation to sprinkler irrigation systems may eliminate currently occupied habitats. Interest has also been expressed in water development and mining activities within Snake valley. These activities could significantly lower the water table, possibly drying up or lowering the water level in springs and marshes populated by spotted frog.

(2) *Predation, Competition, and Disease (Nonnative Interactions)*

Surveys of spring complexes indicate that where nonnative aquatic species have been introduced, spotted frog breeding populations have typically declined (Ross et al 1994). Introduced sport fish, including largemouth bass (*Micropterus salmoides*), rainbow trout (*Oncorhynchus mykiss*), and brook trout (*Salvelinus fontinalis*) are probably predators on spotted frog. In addition to sport fish, other nonnative aquatic species such as common carp (*Cyprinus carpio*), mosquitofish (*Gambusia affinis*), rainwater killifish (*Lucania parva*), and the bullfrog (*Rana catesbeiana*) also have been released into spotted frog habitat. The mosquitofish poses a direct threat to the spotted frog because of its known aggressive predation on eggs and young of other fishes and amphibians (Meffe, 1985; Sigler and Sigler, 1987).

Other species that present possible negative interactions with spotted frog include reptiles (snakes), amphibians (salamanders, frogs) ducks, gulls, herons, and egrets (Ross et al, 1993, UDWR in prep). Under normal situations, predation or competition from these sources normally would not injure healthy populations of spotted frog. However, the effects of the interactions with the above combined sources could result in further depletions of already fragile populations.

Disease or incidence of parasitism has not been studied. Based on monitoring and surveying activities and observations, these do not appear to be major threats affecting spotted frog.

(3) *Over utilization for Commercial, Recreational, Scientific, or Educational Purposes (Over utilization)*

Over utilization for commercial, scientific or educational purposes does not currently pose a threat to spotted frog. Historically, however, many educators and researchers did collect spotted frog from many populations which may have negatively impacted the population in conjunction with other threats that were facing the species.

(4) *Inadequacy of Existing Regulatory Mechanisms (Regulations)*

The inadequacy or lack of regulatory mechanisms to protect spotted frog populations and habitat has been a significant threat historically, however, several regulatory mechanisms have been established to assist in the protection and conservation of spotted frog. Additional mechanisms are still required, particularly those that will assist in the protection and conservation on private property.

(5) *Other Natural or Human Induced Factors Affecting the Continued Existence of spotted frog (Other Factors)*

Other factors such as natural succession or limited available habitat may pose potential threats to spotted frog. For example, some areas, such as the San Pitch River area have limited available habitat and have probably never supported large populations of spotted frog (UDWR in prep). Stochastic events could eliminate these types of populations. Re-colonization would probably be very slow if it ever occurred.

Other human induced factors that potentially threaten spotted frog include a proposed mosquito abatement program for Juab County. The Bureau of Land Management has rejected the County's request to implement a mosquito control spraying program in marsh and spring areas on BLM administered lands. The rejection does not prevent the county from spraying on privately owned lands. The effect of a mosquito control spraying program on spotted frog is uncertain. Past studies (Turner 1959, Whitaker et al. 1978, Licht 1986) indicate that much of the spotted frog diet is composed of insects, including mosquito larvae. To date, no studies have been undertaken to determine the effects of chemical toxins on the spotted frog or its environment.

SUMMARY OF CONSERVATION AND MANAGEMENT ACTIVITIES SINCE 1989

Since the petition to list spotted frog as a threatened species was received in 1989, several conservation and recovery activities have been conducted in order to address the threats facing spotted frog. These actions include surveys (9 total), studies (4 total), genetic analyses (2 years), habitat enhancement (6 projects), completed, in progress, or planned land acquisition (1,125 acres), increased regulatory mechanisms and statewide monitoring efforts (4 years). Actions that are indicated with an asterisk (*) were conducted since the FWS warranted spotted frog for listing under ESA in 1993. For clarity, activities are described below by the major threat they address.

THREAT: Present or Threatened Destruction, Modification, or Curtailment of its Habitat or Range (Habitat Loss)

a) Action: Determine baseline spotted frog distribution and available habitat (Surveys)

Activities:

- ▶ Several surveys have been conducted in order to determine spotted frog distribution and identify additional populations. Toone (1991) conducted an inventory of suitable habitat in Snake Valley and Tule Valley. In 1991 and 1992, all historic and currently occupied areas, as well as areas that potentially may be suitable habitat for spotted frog were surveyed by UDWR along the Wasatch Front (Ross et al. 1993). These surveys included areas in San Pitch River, Spanish Fork River, Utah Lake, Provo River, Jordan River, Upper Weber River, and Lower Weber River Drainages. Cuellar conducted a population survey of the Gandy Salt Marsh in 1992 and in *1993.

*In 1993, UDWR conducted an extensive survey during the breeding season of all known and potential spotted frog habitat to assess spotted frog distribution, population, and habitat characteristics in the West Desert (Ross et al 1994). These activities were conducted using standard protocols for sampling and monitoring amphibians (Heyer et al. 1994).

*Additional surveys were conducted in Tule and Ibapah Valley drainages in 1997 (UDWR, in prep). *Along the Wasatch Front, additional surveys were also conducted in 1997 in Mills Valley, Utah Lake (near the town of Springville) and in Sanpete (near the town of Manti) drainages (UDWR, in prep). These activities were conducted using standard protocols for sampling and monitoring amphibians (Heyer et al. 1994).

- ▶ *Aerial photography was acquired for most historic and currently occupied spotted frog locations in Utah in 1997. Photographs will be digitized into an electronic format. This information will assist in identifying potential spotted frog

habitat for the purposes of surveying and/or reintroduction projects. This information will also assist in determining and monitoring spotted frog distribution/range trends.

- ▶ *UDWR is currently in the process of developing statewide inventory plans for amphibians. Sensitive habitats and species such as spotted frog and boreal toad, as well as community types are being prioritized in these plans. These plans will use standard protocols for sampling and monitoring amphibians (Heyer et al. 1994).

b) Action: Determine baseline spotted frog population, life history, and habitat requirement data (Studies)

Activities:

- ▶ *Hovingh conducted a life history study of the Tule Valley populations in 1993. Information collected for this study included: aquatic habitats, life history observations, and zoogeographic considerations.
- ▶ *Baseline breeding information such as timing of breeding, approximate number of breeding adults, egg mass numbers, egg development, breeding habitat parameters etc. has been collected by UDWR and BLM. in 1994, 1995, 1996, and 1997 as part of the annual statewide spotted frog monitoring program (UDWR in prep). Breeding habitat parameters included distance from shoreline, water depths, temperatures, dominant vegetation types, pool lengths and widths etc. Biological and physical data were collected using standard protocols for sampling and monitoring amphibians (Heyer et al., 1994).
- ▶ *A habitat use study was implemented in 1997 along the Provo River between Jordanelle Dam and Deer Creek Reservoir (UDWR in prep). The purpose of this study was to obtain basic life history and habitat requirement information. The first objective of this study was to conduct field surveys for the purposes of identifying suitable habitat for all age classes and determining distribution of spotted frog in the study area. The second objective was to conduct field observations for the purposes of determining movement patterns and migratory corridors and for identifying micro habitat utilization. This study used standard methods and protocols to obtain this information (Heyer et al. 1994). Visual encounter surveys were used for faunal surveys and mark-recapture and some telemetry was used for movement analysis, and complete habitat descriptions of all suitable and potentially suitable habitat were conducted to determine habitat use.
- ▶ Another study was conducted at the Leland Harris/Miller Spring site in the West Desert (UDWR in prep). The purpose of this study was also to obtain basic life

history and habitat requirement information. The primary objective of this study, however, was to conduct field observations for the purposes of determining spotted frog movement patterns and migratory corridors. Frogs were found using visual encounter surveys and movement data was collected using standard mark-recapture and telemetry methods (Heyer et al. 1994). Additional information was collected on micro habitat use where frogs were located.

- ▶ *A population study based on morphometrics and age structure was conducted by Utah State University (Seitz and Toline, in prep) in 1997.

c) Action: Determine and maintain genetic composition and integrity (Genetic Analysis)

Activities:

- ▶ *Spotted frog eggs and tadpoles were collected from all known populations in 1996 and 1997 for genetic analysis. Samples collected were of sufficient size so that results will be statistically sound. Both nuclear and mitochondrial DNA (mtDNA) analysis are being used to quantify population genetic variation. Quantification of nuclear DNA variation is being obtained by PCR (polymerase chain reaction) amplification of RAPD markers and mtDNA variation is being assessed by RFLP analysis of amplified products. These PCR-based molecular techniques allow for non-destructive sampling of adults. Indeed, DNA for this study is being isolated from individual frog eggs. The goal was to sample enough eggs from each site to obtain a sample size of 30 for each. However, due to limited mass numbers in several sites, some population analysis will include fewer than 30.

Sites Sampled:

West Desert:

Coyote Springs

Bishop/Foote Reservoir (if necessary, samples are somewhat low from this site)

Gandy

Ibapah

Leland Harris/Miller Springs

Tule

Wasatch Front:

Jordanelle mitigation ponds/ Heber Valley

Mona/Burraston

Springville hatchery

Sevier

San Pete

- ▶ *Genetic analyses are currently being conducted on all samples collected in 1996

and 1997. A preliminary report has been completed (Seitz and Toline, in prep) Information obtained from the genetic analyses will assist in developing conservation and management decisions relating to speciation, broodstock development, translocations and reintroductions etc. Both nuclear and mitochondrial DNA (mtDNA) analysis are being used to quantify population genetic variation. Quantification of nuclear DNA variation is being obtained by PCR (polymerase chain reaction) amplification of RAPD markers and mtDNA variation is being assessed by RFLP analysis of amplified products.

MITOCHONDRIAL DNA RFLP ANALYSIS: Restriction fragment length polymorphism (RFLP) analysis is a method of indirectly assaying DNA sequence variation. Variation is due to point mutations and is observed when DNA from different individuals is digested with restriction enzymes. Fragments varying in size and number are produced by individuals with different recognition sites. RFLP analysis of mitochondrial DNA (mtDNA) is particularly useful because it provides information about the population structuring not always obtained by quantification of nuclear variation. Unlike nuclear DNA, mtDNA is haploid and maternally inherited. Thus, it has a smaller effective population size than nuclear DNA and is more sensitive to population bottlenecks (Moritz et al. 1987). **RAPD analysis:** Randomly amplified polymorphic DNA (RAPD) analysis is a highly efficient technique that uses synthetic randomly-generated ten-base-long chains as primers in the PCR-based amplification of anonymous portions of the nuclear DNA. This is an appropriate method to examine variation among several populations using a large number of individuals in a relatively short period of time (Williams et. al 1990). In addition, the almost limitless number of 10-base primers available potentially provides a great many polymorphic characters relative to other nuclear markers.

d) Action: Augment and expand spotted frog populations and distribution through introduction or reintroduction from either transplanted or spotted frog raised in a designated hatchery facility (Range Expansion)

Activities:

- ▶ *Development and implementation of the State of Utah Policy on Fish Stocking and Transfer Procedures. These procedures provide a general outline for stocking of native species. It also requires that all stocking activities be consistent with ongoing recovery and conservation activities for sensitive species.
- ▶ *Development of the Draft Fish Hatchery Production Plan by the UDWR and URMCC. This plan includes facilities for propagation and rearing of spotted frog.

e) Action: Enhance and maintain habitat (Habitat Enhancement)

Activities:

- ▶ In 1990 and *1995, enclosures were constructed around two spring areas in the Gandy Salt Marsh Spring complex in conjunction with least chub activities. The

purpose of these exclosures were to protect the riparian vegetation and shoreline of the spring habitat occupied by least chub and spotted frog.

- ▶ *Currently, the Utah Lake Wetland Preserve (ULWP) project is being developed. It is anticipated that this project will both enhance and develop wetlands around Utah Lake. It is being developed for the protection of migratory birds, wildlife habitat, and wetland values. The Central Utah Project Completion Act authorizes URMCC and UDWR to establish and manage the ULWP. This project could result in a preserve totaling approximately 21,000 acres. Development of this preserve provides future opportunities for management and conservation actions for sensitive species such as the spotted frog by creating and/or enhancing habitat within its historic range. Subsequent actions may include reintroduction or natural recolonization.
- ▶ *Currently, the Timpanogos Special Services District project is being developed. It is anticipated that this project will both enhance and develop the wetlands in and around this area. There has been some discussion regarding the inclusion of sensitive species introductions such as June sucker, least chub, and spotted frog as part of this project. Preliminary feasibility studies and discussion have been ongoing by UDWR.
- ▶ *Currently, UDWR is in the process of developing the Jordan River Wetland Project. It is anticipated that this project will both enhance and develop aquatic habitats along the Jordan River. Development of this project provides future opportunities for management and conservation actions for sensitive species such as the spotted frog.
- ▶ *Recently, URMCC and USBR have been conducting an analysis of the Jordanelle wetland mitigation ponds for potential management and habitat enhancements for spotted frog. Actions such as year round water and construction of additional habitat for hibernation has been proposed.

f) Action: Protect and provide habitat for spotted frog (Habitat Acquisition)

- ▶ In 1989, USBR acquired 134 acres as mitigation for loss of wetland habitat resulting in the construction of Jordanelle Reservoir. This property has been developed into mitigation wetland ponds for the purpose of providing habitat for wetland species. Spotted frog are currently using these wetlands for breeding. One of the largest breeding sites known on the Wasatch Front occurs in these mitigation ponds.
- ▶ *In 1995, URMCC acquired 64.7 acres of riverine/riparian habitat along the Provo River between Jordanelle Dam and Deer Creek Reservoir. This property was acquired in order to protect and enhance habitat along this reach of river. It also is habitat that contains one of the largest spotted frog populations (Heber Valley)

along the Wasatch Front. Enhancement of this habitat will benefit many species of birds, fish, reptiles, amphibians, plants and other wildlife. Acquisition of this property provides future opportunities for management and conservation actions for sensitive species such as the spotted frog.

- ▶ *In 1997, URMCC acquired an additional 61.4 acres of riverine/riparian habitat along the Provo River between Jordanelle Dam and Deer Creek Reservoir. This property was also acquired to protect and enhance habitat along this reach of river. Enhancement of this habitat will benefit many species of birds, fish, reptiles, amphibians, plants and other wildlife. Acquisition of this property provides future opportunities for management and conservation actions for sensitive species such as the spotted frog. Currently, one of the largest spotted frog populations (Heber Valley) along the Wasatch Front occur in this area.
- ▶ *Acquisition of 184 acres by URMCC is currently in progress for river corridor (+/- 50ft on each side) along the Provo River from Jordanelle Dam to Deer Creek Reservoir as a environmental mitigation measure of the M&I System of the Central Utah Project. An additional 681 acres of riparian corridor (between 500ft and 1300ft in width) will be pursued for acquisition as part of the Provo River Restoration Project between Jordanelle Dam to Deer Creek Reservoir. If the Proposed Action in the 1997 Final EIS is selected for implementation, a Record of Decision on the project is anticipated in February 1998. Acquisition of these acres would create a 10 mile reach of Federally owned fish and wildlife corridor that would be protected. Currently, one of the largest spotted frog populations (Heber Valley) along the Wasatch Front occur in this area.
- ▶ *URMCC has acquired also approximately 1500 acres as part of ULWP. It is anticipated that an additional 650 acres will be acquired in 1998 as part of ULWP by URMCC. As previously mentioned, development of this preserve provides future opportunities for management and conservation actions for sensitive species such as the spotted frog.
- ▶ *A minimum of 125 cfs is and will be maintained in the Provo River between Jordanelle Dam and Deer Creek Reservoir as an environmental commitment of the Central Utah Project. Minimum flows were maintained at 50 cfs in this reach from 1993 through July 1996 under an interim agreement. Beginning in July of 1996, flows have been maintained at 125 cfs. Providing flows in this reach of river assists in maintaining riverine and riparian habitat. Currently, one of the largest spotted frog populations (Heber Valley) along the Wasatch Front occur in this area.
- ▶ *A Cooperative Agreement has been executed by URMCC, UDWR, and USBR for the acquisition of approximately 100 acres associated with the American Dream Spring property near the town of Mona. This spring complex is currently

occupied by spotted frog, least chub, and the California floater. It represents one of the few areas where these species still occur sympatrically.

g) Action: Monitor populations and habitat

Activities:

- ▶ *A statewide monitoring program was established in 1994. It was based on the surveys that were conducted in 1991, 1992, and 1993 by UDWR. A total of 14 sites in the San Pitch River subunit, and 30 sites in the Wasatch Front subunit were monitored in 1994, 1995, 1996, and 1997 (UDWR in prep). Monitoring has also occurred in all of the spring complexes associated with the Leland Harris/Miller Spring, Gandy Salt Marsh, and Bishop Spring populations in the Snake Valley subunit in 1994 through 1997 as well (UDWR in prep). Information collected included number of eggs masses, number and lengths of all juvenile and adult frogs captured as well as several habitat parameters. Parts of Tule Valley were monitored by BLM and UDWR in 1994, 1995, and 1996. The same information was collected during these monitoring efforts as well.
- ▶ In 1997, UDWR revised their statewide monitoring program for the West Desert. Long-term monitoring sites were established in the Leland Harris/Miller Spring complex and Gandy Salt Marsh area in Snake Valley and a north and south long-term site was established in Ibapah Valley. One site was established in Tule Valley. All of these sites were monitored in 1997. Data collected was expanded to include complete macro-habitat descriptions consistent with standard protocols for sampling and monitoring amphibians (Heyer et al., 1994).

THREAT: Predation, Competition, and Disease (Nonnative Interactions)

a) Action: Selectively control nonnative species

Activities:

- ▶ *Development and implementation of the State of Utah Policy on Fish Stocking and Transfer Procedures. These procedures provide additional protection for spotted frog and habitat by requiring that an impact assessment to the current species community be conducted prior to any new nonnative fish introductions. It also requires that any stocking be consistent with ongoing recovery and conservation efforts.
- ▶ *UDWR has initiated communications with the entities associated with the mosquito abatement program. Preliminary discussions have been conducted on developing abatement management strategies that will reduce the impact of nonnative fish species on spotted frog.
- ▶ *Selective removal of nonnative species has been ongoing as part of the annual

statewide monitoring and sampling efforts for spotted frog and least chub along the Wasatch Front.

THREAT: Over utilization for Commercial, Recreational, Scientific, or Educational Purposes (Over utilization)

a) Action: Prohibit over utilization of spotted frog

Activities:

- ▶ Currently, utilization of spotted frog for commercial, recreational, scientific or educational purposes is prohibited in the State of Utah under the Natural Resources Proclamation for the Collection, Importation, Transportation or Possession of Zoological Animals (R657-3) without a permit.

THREAT: Inadequacy of Existing Regulatory Mechanisms (Regulations)

a) Action: Eliminate and/or reduce detrimental nonnative species interactions

Activities:

- ▶ Regulatory mechanisms regarding the stocking of nonnative species, collection of spotted frog, or protection of habitat have recently been established in the State of Utah.

ACTION PLAN

The purpose of the action plan is to describe the actions that will eliminate or reduce threats to spotted frog. Because the potential for restoration varies between spotted frog populations, most actions will be prioritized and implemented within the GMUs. Site specific actions are currently being developed and identified and will be incorporated into the Action Plan upon completion.

STATE-WIDE ACTIONS

(1) *Determine baseline spotted frog distribution and available habitat (Surveys)*

a) Locate and assess additional spotted frog populations and/or available habitat and confirm status. These activities will be conducted using standard protocols for sampling and monitoring amphibians (Heyer et al., 1994).

Specific Actions

- ▶ Complete development and implement statewide inventory plans for amphibians
- ▶ Identify potential habitat of spotted frog using aerial videography

b) Analyze habitat fragmentation to determine the degree of connectivity required for metapopulation persistence.

(2) *Determine baseline spotted frog population, life history, and habitat requirement data (Studies)*

a) Identify additional habitat and life-history requirements and conditions through studies of habitat use and types, and hydrologic, hydraulic, biological and watershed features as listed below. These activities will be conducted using standard protocols for sampling and monitoring amphibians (Heyer et al., 1994).

- * year round and life stage habitat use
- * wetland/spring condition and water quality requirements
- * flow quantity, flow timing, flow duration, water level requirements
- * sympatry and macro invertebrate/micro invertebrate community composition and ecology
- * affects of chemical toxins released in the environment (e.g. for mosquito abatement)

Specific Actions:

- ▶ Conduct habitat use and movement study on Snake Valley spotted frog populations.
- ▶ Analyze data collected during Heber Valley Spotted Frog Habitat Use Study.

b) Determine the number of individuals needed to maintain a viable population. These activities were conducted using standard protocols for sampling and monitoring amphibians (Heyer et al., 1994).

Specific Actions:

- ▶ Conduct population studies.

(3) *Determine and maintain genetic composition and integrity (Genetic Analysis)*

a) Conduct genetic analyses of all known spotted frog populations.

Specific Actions:

- ▶ Complete genetic analyses of all samples collected to determine relatedness within and between spotted frog populations.
- b) Establish introduction, reintroduction, and transplant protocols based on criteria of maintaining genetic integrity and maximizing genetic variability.

(4) *Augment and/or expand current spotted frog populations and distribution within historic range through introduction or reintroduction from either transplanted or spotted frog raised in a designated hatchery facility (Range Expansion)*

- a) Determine feasibility and methodologies for augmentation and reintroduction.
- b) Develop protocols for the captive propagation and rearing of spotted frog.
- c) Develop protocols for the translocation, introduction and re-introduction for spotted frog.
- d) Identify and develop broodstock sources including identification and taking of wild sources, and potential rearing facilities.

Specific Actions

- ▶ Assist in finalizing plans to develop a hatching/rearing facility
- e) Augment populations through stocking that have become small enough that genetic viability may be threatened. Specific actions will be identified within individual GMU's on an annual basis.
- f) Establish additional populations through reintroduction and introductions as per protocols established under 3b . Specific actions will be identified within individual GMU's

- g) Maintain consistency with the State of Utah Policy on Fish Stocking and Transfer Procedures and with the Least Chub Conservancy Agreement and Strategy.
- (5) *Enhance and maintain habitat (Habitat Enhancement)*
- a) Enhance and/or restore habitat conditions in designated areas throughout the historic range of spotted frog. Actions may include bank stabilization, riparian/spring fencing and sustainable grazing practices. Specific actions will be identified within individual GMU's on an annual basis.
 - b) Maintain and restore where possible the natural hydrologic characteristics and water quality. Specific actions will be identified within individual GMU's on an annual basis.
- (6) *Selectively control nonnative species (Nonnative Control)*
- a) Determine where detrimental interactions, such as predation, competition, hybridization, or disease occur or could occur. This action will be conducted in conjunction with additional surveys outlined in 1a.
 - b) Control or modify stocking, introductions, and spread of nonnative aquatic species where appropriate. This action will be consistent with the State of Utah Policy on Fish Stocking and Transfer Procedures.
 - c) Establish protocols for eradication of nonnative aquatic species. These protocols should be developed that will minimize impacts of eradication on the native species community.
 - d) Eradicate or control detrimental nonnative fish where feasible. Targeted species may include mosquitofish, some species of trout, carp, and other piscivorous warmwater fish species. Specific actions will be identified within individual GMU's on an annual basis.
- (7) *Protect and provide habitat for spotted frog (Habitat Acquisition)*
- a) Protect sensitive habitat for spotted frog through land and water acquisition, and development of conservation easements, or cooperative agreements. Specific actions will be identified within individual GMU's on an annual basis.

Specific Actions

- ▶ Develop management plans and cooperative agreements that will protect sensitive spotted frog habitat on public lands.
- ▶ Develop memorandums of understanding or conservation easements that will

- ▶ protect sensitive spotted frog habitat on private lands.
 - ▶ Acquire land and water rights for areas that are vital to spotted frog.
- b) Provide additional habitat for spotted frog by changing land use and management practices in areas that have been protected under 7a.

Specific Actions

- ▶ Once 7a has been accomplished, actions will focus on changing land and water use practices that are consistent with county and other regulatory entities. In some cases, habitat enhancement activities will be required.

(8) *Monitor populations and habitat (Monitoring).*

- a) Implement, evaluate and revise population and habitat monitoring program as appropriate to determine effectiveness. This activity will be conducted using standard protocols for sampling and monitoring amphibians (Heyer et al., 1994).

Specific Actions

- ▶ Evaluate and revise current monitoring protocols.
 - ▶ Develop long-term monitoring plan
- b) Evaluate status and trends of populations and habitat using monitoring data and baseline data obtained under 1 and 2.
- c) Maintain spotted frog database.

(9) *Develop and implement mitigation protocols for proposed water development and future habitat alteration, where needed (Mitigation)*

- a) Impacts from existing and proposed watershed development that affects spotted frog habitat will be assessed and mitigation will be determined on a case-by case basis. In some areas, habitat restoration will offset negative affects of grazing, road construction and water development projects.

Specific Actions

- ▶ Develop mitigation protocols

(10) *Protect spotted frog populations through the use of regulatory mechanisms (Regulations)*

- a) Maintain and enforce current regulations that prohibit the collection, possession, transportation, and importation of spotted frog. These regulations should eliminate the threat of over utilization for commercial, scientific, recreational, or education purposes.

- b) Maintain consistency with the State of Utah Policy on Fish Stocking and Transfer Procedures.

WASATCH FRONT GEOGRAPHIC MANAGEMENT UNIT

Subunits where historic records of spotted frog and in some cases where empirical evidence suggests that spotted frog were thought to historically occur include Utah Lake, Spanish Fork, Provo River, Jordan River, Upper Weber River, and in the Lower Weber River. Currently a total of five populations are known to occur in this GMU (Table 2). They occur in the Utah Lake, Spanish Fork, Provo River, and Lower Weber River subunits. The collection sites, breeding sites, and monitoring sites that have typically been described in the literature and are part of the five identified populations for this GMU are summarized in Table 2. Current effective population size estimates are based on egg mass counts in the 1991/1992, and 1997 surveys (Table 3). Based on this information, the largest population in this subunit is the Heber Valley population.

Table 2: Summary of subunits containing spotted frog populations, and population descriptions for Wasatch Front GMU.

Subunit	Population	Description
<i>Spanish Fork River</i>	North Spanish Fork	Includes Springville and T-bone bottom breeding sites and surrounding areas
	South Spanish Fork	Includes Holladay Spring breeding sites and surrounding areas
<i>Utah Lake</i>	South Utah Lake	Includes the Burraston Pond and Mona breeding sites and surrounding areas
<i>Provo River</i>	Heber Valley	Includes all breeding sites and surrounding areas between Jordanelle Dam and Deer Creek Reservoir
	Hailstone	Includes all breeding sites and surrounding areas above Jordanelle Dam but within the Provo River subunit
<i>Upper Weber River</i>	Kamas	Includes all breeding sites and surrounding areas above Jordanelle Reservoir but within the Upper Weber River subunit

Table 3: Estimated breeding population sizes (Ne) for Wasatch Front GMU

Subunit	Population Name	# of Egg Masses		Estimated Ne	
		1991/1992	1997	1991/1992	1997
<i>Spanish Fork River</i>	North Spanish Fork	12	65	24	130
	South Spanish Fork	36	64	72	128
<i>Utah Lake</i>	South Utah Lake	15	147	30	294
<i>Provo River</i>	Heber Valley	272	483	544	966
	Hailstone	70	21	140	42
<i>Jordan River</i>	none known	0	0	0	0
<i>Upper Weber River</i>	Kamas	7	0	14	0
<i>Lower Weber River</i>	none known	0	0	0	0

Conservation Objective:

To restore, maintain, and protect populations in five of the six subunits within the historic range. A minimum of three of the five subunits must have at least one population with an effective population size of 1000 individuals in three out of every five years. The remaining existing populations must be maintained with a minimum effective population size of 50 individuals each.

Threats:

The major threat in this GMU is loss of habitat due to human growth and water development for municipal and agricultural purposes. Agricultural areas and mountain foothills have been converted into neighborhoods and wetland areas in the valleys have been drained and diked. Utah Valley, in particular, has experienced rapid growth and residential development over the past few decades. Water development projects have caused a reduction in habitat due to decreased water levels, inundation by reservoirs, alteration of natural flows, and water diversions. The Provo River flows through Heber Valley as part of the Utah Lake Drainage. Efforts have been made to control seasonal flooding of the Provo River in Heber Valley through channelization and diking. The Heber Valley is bounded to the south by Deer Creek Reservoir and to the north by Jordanelle Reservoir. Like Utah Valley, Heber Valley has a history of agricultural use but is experiencing rapid growth and residential development. These alterations have resulted in small and isolated breeding populations, most occurring on private property.

Several nonnative fish species have been introduced into these areas for purposes of mosquito abatement and sportfishing. Competition and predation by nonnative species have significantly impacted spotted frog populations and will continue to present a threat. Plains killifish (*Fundulus zebrinus*) and/or mosquitofish (*Gambusia affinis*) introduced for mosquito abatement purposes are present in the three major breeding sites and have been observed feeding on newly hatched spotted frog tadpoles (Keleher, pers. comm.).

Actions Taken Since 1989 To Address Threats:

Since the petition to list spotted frog as a threatened species was received in 1989, several conservation and recovery activities have occurred in this GMU that have reduced threats to spotted frog in Utah. These activities include surveys (3 total), studies (3 total), genetic analyses (2 years), habitat enhancement (2 projects), completed and planned land acquisition (1,125 acres). Details on these accomplishments are summarized in Table 4 and described in the Statewide Conservation Section of the Strategy. This summary does not include actions that were conducted at the statewide level.

Table 4: Summary of major actions taken in the Wasatch Front GMU to reduce threats to spotted frog since 1989

ACTION	TIME PERIOD	
	1989 - 1992 (Since petition to list)	1993 - 1997 (Since warranted by FWS)
Surveys	<ul style="list-style-type: none"> - 1991, UDWR surveyed all known and potential spotted frog habitat on Wasatch Front - 1992, UDWR continued surveying all known and potential spotted frog habitat on Wasatch Front 	<ul style="list-style-type: none"> - 1996, UDWR surveyed 15 sites in the Lower Weber River subunit as part of amphibian inventory activities. - 1997, UDWR surveyed 3 sites in the Lower Weber River subunit as part of amphibian inventory activities. - 1997, UDWR surveyed 3 sites in the Upper Weber River subunit as part of amphibian inventory activities. - 1997, UDWR surveyed wetlands at the UDWR Springville Hatchery Facility - 1997, UDWR surveyed spring complexes in Mills Valley - UDWR and BLM completed aerial photography of all known and potential spotted frog habitat.
Studies		<ul style="list-style-type: none"> - 1994, 1995, 1996, 1997, UDWR obtained baseline breeding biology and habitat use data as part of annual monitoring program - 1997, USU obtained morphometrics on all populations in this GMU - 1997, UDWR conducted habitat use study on Heber Valley population
Genetic Analysis		<ul style="list-style-type: none"> - 1996, Green conducted a genetic analysis of Heber Valley spotted frog population - 1996/1997, USU and UDWR collected samples from all known spotted frog populations for genetic analysis studies in this GMU - 1997, USU conducted genetic analyses of samples collected in this GMU
Expansion		<ul style="list-style-type: none"> - 1996, UDWR and URMCC conducted feasibility study on Goshen Warm Springs for a native aquatic/warm water species hatchery - 1997, UDWR and URMCC initiated plans for a native aquatic species hatchery facility at Goshen Warm Springs.
Habitat Enhancement	<ul style="list-style-type: none"> - 1992, Congress signed Central Utah Project Completion Act that authorized the Utah Lake Wetland Preserve and other measures. 	<ul style="list-style-type: none"> - UDWR and URMCC began development of the Utah Lake Wetland Preserve. - UDWR initiated the Jordan River Wetland Project

<p>Habitat Acquisition</p>	<p>- 1989, Bureau of Reclamation acquired 134 acres of wetland habitat as part of mitigation for Jordanelle Reservoir.</p>	<ul style="list-style-type: none"> - 1995, URMCC acquired 64.7 acres of riverine/riparian habitat along the Provo River between Jordanelle Dam and Deer Creek Reservoir - 1996 to 1997, URMCC acquired 1500 acres of wetland habitat for the Utah Lake Wetland Preserve. - 1997, URMCC acquired 61.4 acres of riverine/riparian habitat along the Provo River between Jordanelle Dam and Deer Creek Reservoir - URMCC is currently in the process of acquiring an additional 184 acres of riverine/riparian habitat along the Provo River between Jordanelle Dam and Deer Creek Reservoir - URMCC is in the process and will be acquiring an additional 681 acres of riparian corridor as part of the Provo River Restoration Project. - 1996, a minimum of 125 cfs has been maintained in the Provo River between Jordanelle Dam and Deer Creek Reservoir. - 1997, a Cooperative Agreement was executed for the acquisition of approximately 100 acres of wetland habitat associated with the American Dream Spring Complex (near Mona population).
<p>Monitoring</p>		<p>- 1994, 1995, 1996, 1997, UDWR monitored all known Wasatch Front populations</p>

Required Future Actions:

The following general actions have been identified as required in order to meet the objectives of this GMU. Specific actions will be developed on an annual basis and incorporated into this Strategy. These actions are summarized by threat in Table 5.

(1) *Surveys:*

Actions will include identification of areas with available spotted frog habitat. Areas with suitable habitat will be surveyed for the presence or absence of spotted frog. If spotted frog are not present, areas will be identified for range expansion and reintroduction activities. In addition, areas where historic localities have been recorded will be re-surveyed. These actions have been identified for all subunits within this GMU

(2) *Genetic Analysis:*

Actions will include determining the relatedness of the Wasatch Front populations with other populations in Utah. Once this determination has been made, actions will focus on maintaining the genetic integrity of these populations. This action has been identified for all of the subunits.

(3) *Range Expansion:*

In order to obtain the goal for this GMU, five of the six subunits must have spotted frog occupation and at least three of the five subunits must have a minimum effective population size of 1000 individuals in three out of every five years. Only four of the six subunits are currently occupied by spotted frog and it is suspected that only the Provo River subunit has at least 1000 breeding adult individuals. It is anticipated that once additional habitat is available and enhanced, populations naturally expand, however, some brood stock development and subsequent population augmentation will be required. Specific brood stock and augmentation needs need to be identified. This action has been identified for all of the subunits.

(4) *Habitat Enhancement:*

Actions will include identification of areas that have been degraded and require enhancement. Enhancement projects will include wetland improvements (e.g. revegetation), water restoration, and water quality improvements and bank stabilization. Areas where exclosures can be constructed to protect vital areas of habitat will be identified and implemented. This action has been identified for all subunits.

(5) *Nonnative Control:*

The first action will be to determine where detrimental nonnative species interactions occur. Once identified, eradication of detrimental nonnative fish will be implemented where feasible and controlled to the maximum extent possible where eradication is not possible. Several species have already been targeted for control and/or eradication including mosquitofish, killifish and in some cases nonnative sportfish and forage fish. Future stocking of nonnative aquatic species will be consistent with the State of Utah

Policy on Fish Stocking and Transfer Procedures. Public education on the benefits of ecosystem integrity and detrimental effects of nonnative introductions and disease transmission may reduce these threats. This action has been identified for all of the subunits.

(6) *Habitat Acquisition:*

Actions will include identification of areas of public and private lands available for land or water acquisition or conservation easements. Once areas have been identified, areas will be prioritized and either acquired or protected through easements where feasible. This action has been identified for all of the subunits.

(7) *Monitoring:*

Monitoring protocols are currently being evaluated and revised for spotted frog. As habitat and population enhancement activities are implemented, they will be incorporated into the state-wide monitoring program. This action has been identified for all of the subunits.

(8) *Mitigation:*

Impacts from existing and proposed watershed development that affect spotted frog habitat will be assessed and mitigation will be determined on a case-by-case basis. In some areas, habitat restoration will offset negative affects of grazing, road construction and water development projects. This action has been identified for all of the subunits.

(9) *Regulations:*

Existing regulatory mechanisms will be maintained. As new habitat becomes available it is anticipated that additional regulatory mechanisms will be established to limit access to sensitive spotted frog habitat areas. This action has been identified for all of the subunits

Table 5: Summary of required actions listed by threat for Wasatch Front GMU

CURRENT ESA THREAT	DETRIMENTAL FACTORS	ACTIONS
<i>Habitat Loss</i>	Urbanization	Surveys, Studies, Habitat Enhancement, Habitat Acquisition, Monitoring, Mitigation
	Water Development	Surveys, Studies, Habitat Enhancement, Habitat Acquisition, Monitoring, Mitigation
	Agricultural Practices	Habitat Enhancement, Habitat Acquisition, Monitoring, Mitigation, Protection
	Fragmentation	Habitat Enhancement, Habitat Acquisition, Monitoring, Mitigation
	Small Populations	Habitat Enhancement, Studies, Genetic Analysis, Range Expansion, Monitoring, Mitigation
<i>Nonnative Interactions</i>	Nonnative Introductions/Stocking	Surveys, Nonnative Control, Protection
	Mosquito Abatement	Surveys, Nonnative Control, Protection
<i>Other Factors</i>	Mosquito Abatement (Spraying/Chemicals)	Nonnative Control, Protection

SEVIER RIVER GEOGRAPHIC MANAGEMENT UNIT

Water in the Sevier River Basin historically flowed into pluvial Sevier Lake, but for the most part is currently diverted for agricultural purposes. It is thought that spotted frog in this GMU became separated from the remaining spotted frog populations on the Wasatch Front following the decline of ancient Lake Bonneville. Areas where spotted frog occur average about 1785 meters in elevation and are only known to occur in the San Pitch River subunit where the primary land use is agricultural. One population has been identified for this GMU near the town of Fairview. The current estimated effective population size (N_e) is shown in Table 6.

No spotted frog occurrences are known to currently or historically occur within the Middle Sevier River or Lower Sevier River subunits. The actions for these subunits are associated with determining if spotted frog historically or currently occurred in them. Since the distribution and occurrence of spotted frog in these subunits remain unclear, threats and conservation goals can not be described.

Table 6: Estimated Breeding Populations Sizes (N_e) for Sevier River GMU

Subunit	Population Name	# of Egg Masses		Estimated N_e	
		1991/1992	1997	1991/1992	1997
<i>San Pitch River</i>	Fairview	54	24	108	48
<i>Middle Sevier River</i>	none known	0	0	0	0
<i>Lower Sevier River</i>	none known	0	0	0	0

Conservation Objective:

To restore, maintain, and protect a population with an effective population size of 1000 individuals in the San Pitch subunit.

Threats:

The major obstacle facing conservation and management in the Sevier River GMU unit is the lack of suitable habitat. This has resulted in small isolated populations with little to no hydrologic connectivity between populations. If a population is extirpated from an isolated site, there is little chance of that site being reoccupied.

The major threat in this area is loss of habitat due to agricultural practices and water development for municipal and agricultural purposes. Livestock grazing specifically impacts the habitat by trampling, reducing vegetation, and decreasing water quality. Other agricultural practices such as cropland development have also significantly impacted spotted frog populations and habitat. Water development projects have caused a reduction in habitat due to decreased water levels and capping and drying of spring complexes.

In addition to habitat loss, nonnative species introduction poses a significant threat to spotted frog. Several nonnative fish species have been introduced into these areas for purposes ranging from mosquito abatement to sportfishing. Competition and predation by nonnative species has significantly impacted spotted frog populations and continues to present a threat in this unit.

Actions Taken Since 1989 To Address Threats:

Since the petition to list spotted frog as a threatened species was received in 1989, several conservation and recovery activities have occurred in this GMU that have reduced threats to spotted frog in Utah. These activities include surveys (3 total), studies (2 total), genetic analyses (2 years, 1 study). Details on these accomplishments are summarized in Table 7 and described in the Statewide Conservation Section of the Strategy. This summary does not include actions that were conducted at the statewide level.

Table 7: Summary of major actions taken in the San Pitch River GMU to reduce threats to spotted frog since 1989

ACTION	TIME PERIOD	
	1989 - 1992 (Since petition to list)	1993 - 1997 (Since warranted by FWS)
Surveys	<ul style="list-style-type: none"> - 1991, Utah Division of Wildlife Resources (UDWR) surveyed all known and potential spotted frog habitat in this GMU - 1992, UDWR surveyed all known and potential spotted frog habitat in this GMU 	<ul style="list-style-type: none"> - 1997 UDWR surveyed spring complex at Manti Meadows - UDWR and BLM completed aerial photography of all known and potential spotted frog habitat in this GMU.
Studies		<ul style="list-style-type: none"> - 1994, 1995 1996, 1997, UDWR obtained baseline breeding biology and habitat use data as part of annual monitoring program in this GMU - 1997, Utah State University (USU) obtained morphometrics on the population in this GMU
Genetic Analysis		<ul style="list-style-type: none"> - 1996, Green conducted a genetic analysis of the population in this GMU - 1996/1997, USU and UDWR collected samples from the population in this GMU - 1997, USU conducted genetic analyses of samples collected in this GMU
Monitoring		<ul style="list-style-type: none"> - 1994, 1995, 1996, 1997, UDWR monitored the population in this GMU

Required Future Actions:

The following general actions have been identified as required in order to meet the objective of this GMU. Specific actions will be developed on an annual basis and incorporated into this Strategy. These actions are summarized by threat in Table 8. It is anticipated that the most significant action is this GMU will be to provide additional suitable habitat.

(1) *Surveys:*

Actions will include identification of areas with available spotted frog habitat. Areas with suitable habitat will be surveyed for the presence or absence of spotted frog. If spotted frog are not present, areas will be identified for range expansion and reintroduction activities. This action has been identified for all subunits within this GMU

(2) *Genetic Analysis:*

Actions will include determining the relatedness of the San Pitch population with other populations in Utah. Once this determination has been made, actions will focus on maintaining the genetic integrity of this population. This action has been identified for the San Pitch subunit.

(3) *Range Expansion:*

In order to obtain the goal for this GMU, the San Pitch population needs to have a minimum effective population of 1000 individuals. Once habitat enhancement and protection actions have been determined, the actions that will be required to meet the goal will be identified. It is anticipated that once additional habitat is available, the population will naturally expand, however, some brood stock development and subsequent population augmentation may be required. This action has been identified for the San Pitch subunit.

(4) *Habitat Enhancement:*

Actions will include identification of areas that have been degraded and require enhancement. Enhancement projects will include wetland improvements (e.g. revegetation), water restoration, and water quality improvements and bank stabilization. Areas where exclosures can be constructed to protect vital areas of habitat will be identified and implemented. This action has been identified for the San Pitch subunit.

(5) *Nonnative Control:*

The first action will be to determine where detrimental nonnative species interactions occur. Once identified, eradication of detrimental nonnative fish will be implemented where feasible and controlled to the maximum extent possible where eradication is not possible. Several species have already been targeted for control and/or eradication including mosquitofish, killifish and in some cases nonnative sportfish and forage fish. Future stocking of nonnative aquatic species will be consistent with the State of Utah Policy on Fish Stocking and Transfer Procedures. Public education on the benefits of

ecosystem integrity and detrimental effects of nonnative introductions and disease transmission may reduce these threats. This action has been identified for all subunits.

(6) *Habitat Acquisition:*

Actions will include identification of areas of public and private lands available for land or water acquisition or conservation easements. Once areas have been identified, areas will be prioritized and either acquired or protected through easements where feasible.

(7) *Monitoring:*

Monitoring protocols are currently being evaluated and revised for spotted frog. As habitat and population enhancement activities are implemented, they will be incorporated into the state-wide monitoring program. This action has been identified for the San Pitch subunit.

(8) *Mitigation:*

Impacts from existing and proposed watershed development that affect spotted frog habitat will be assessed and mitigation will be determined on a case-by-case basis. In some areas, habitat restoration will offset negative affects of grazing, road construction and water development projects. This action has been identified for the San Pitch subunit.

(9) *Regulations:*

Existing regulatory mechanisms will be maintained. As new habitat becomes available it is anticipated that additional regulatory mechanisms will be established to limit access to sensitive spotted frog habitat areas.

Table 8: Summary of required actions listed by threat for the Sevier River GMU

SUBUNIT	CURRENT ESA THREAT	DETRIMENTAL FACTORS	ACTIONS
San Pitch	<i>Habitat Loss</i>	Urbanization	Surveys, Studies, Habitat Enhancement, Habitat Acquisition, Mitigation
		Water Development	Surveys, Studies, Habitat Enhancement, Habitat Acquisition, Mitigation
		Agricultural Practices	Habitat Enhancement, Habitat Acquisition, Mitigation, Protection
		Small Populations	Habitat Enhancement, Studies, Range Expansion, Habitat Acquisition
		Fragmentation	Habitat Enhancement, Habitat Acquisition, Monitoring, Mitigation
	<i>Nonnative Interactions</i>	Nonnative Introductions/Stocking	Surveys, Nonnative Control, Protection
		Mosquito Abatement	Surveys, Nonnative Control, Protection
	<i>Other Factors</i>	Limited Habitat	Surveys, Habitat enhancement, Habitat acquisition
Middle Sevier	unknown	unknown	Surveys, Nonnative Control
Lower Sevier	unknown	unknown	Surveys, Nonnative Control

WEST DESERT GEOGRAPHIC MANAGEMENT UNIT

Populations of spotted frog are currently known to exist in Tule Valley, Snake Valley, and Ibapah Valley subunits. The Tule Valley subunit is located between the House Range and the Confusion Range in Juab County. Tule Valley consists of several spring complexes that have been designated as high priority areas (Table 9). Snake Valley subunit is located between the Deep Creek Mountains and the Confusion Range. Currently occupied areas within Snake Valley include Bishop Spring Complex, Gandy Salt Marsh spring complex, Leland Harris spring complex, and Miller Spring (Table 10), all of which spotted frog currently occur. Historic records have also been recorded in the Calleo Spring and the Redden Spring Complexes. In the Ibapah Valley subunit, spotted frog are only known to occur in the valley floor of Ibapah Valley which is located northwest of the Deep Creek Mountains in Tooele County and extends into Nevada. This area consists of the Ibapah Spring complex and springs in the vicinity of Blue Lake. Ibapah Valley is also associated with several stream reaches including Deep Creek, West Creek, East Creek, and Middle Creek of the Deep Creek Mountains. Blue Lake springs include East Spring, West Spring, North Radio Tower Spring, and South Radio Tower Spring. Estimated effective population sizes appear to be stable and at levels that are currently meeting the objectives for this GMU (Table 10).

No spotted frog occurrences are known to currently or historically occur within the W. Great Salt Lake, N. Great Salt Lake, Skull Valley, or Tooele Valley subunit. The actions for these subunits are limited to determining if spotted frog historically or currently occurred in them. Since the distribution and occurrence of spotted frog in these subunits remain unclear, threats and conservation goals can not be described.

Table 9: Summary of subunits containing populations, and population descriptions for West Desert GMU.

Subunit	Population	Description of Inclusive Sites/Location
Tule Valley	Coyote Springs	Coyote Spring is one large complex north of Willow Spring
	Willow Springs	Willow Spring consist of 3 springs between Coyote Spring and North Tule Springs
	North Tule	North Tule consists of North Tule Spring, Tule Spring and a spring located at the turn off road, all south of Willow Spring.
	South Tule	Single spring located South of North Tule Population
Snake Valley	Leland Harris/Miller	Located north of the Gandy Salt Marsh in Juab County and consists of Miller Spring and all of the Leland Harris spring complex.
	Gandy Salt Marsh	Located just south of the Leland Harris spring complex in Millard County.
	Bishop Springs	Bishop Springs is located South of the Gandy Salt Marsh population and includes Foote Reservoir, Twin Springs, and surrounding areas.

Table 10: Estimated breeding population sizes (Ne) for West Desert GMU

Subunit	Population	# of Egg Masses		Estimated Ne	
		1993	1997	1993	1997
Tule Valley	Coyote Springs	480	938+	960	1876
	Willow Springs	129	129	258	258
	North Tule	876	288	1752	576
	South Tule	82	18	164	36
Snake Valley	Leland Harris/Miller	836	877+	1672	1754
	Gandy Salt Marsh	398	406+	756	812
	Bishop Springs ¹	1892 ²		3784	na
Ibapah Valley	Ibapah	2195	2321	4390	4642
West Great Salt Lake	none known	0	0	0	0
North Great Salt Lake	none known	0	0	0	0
Skull Valley	none known	0	0	0	0
Tooele Valley	none known	0	0	0	0

¹ A complete survey was not conducted at Bishop Spring in 1997 and is anticipated for 1998.

² Bishop Springs total also includes Foote Reservoir, Twin Springs, and surrounding areas.

Conservation Objective:

The objective of this GMU is to restore, maintain, and protect populations within the historic range. Subunits within historic range must have at least one population with an effective population size of 1000 individuals in three out of every five years. The remaining existing populations must be maintained with a minimum effective population size of 50 individuals each.

Threats:

The major threat in this Unit is loss of habitat due to livestock grazing and the threat of oil and gas exploration, and accelerated succession of spring complexes. Livestock grazing specifically impacts the habitat by trampling shorelines, reducing vegetation, and decreasing water quality. Proposed oil and gas exploration has the potential for impacting ground water sources and the integrity of spring complexes. Other threats include potential water development projects from agricultural and municipal purposes.

Several nonnative fish species have been introduced into some of the subunits for purposes ranging from mosquito abatement to sportfishing. Competition and predation by nonnative

species such as the bullfrog has impacted spotted frog populations and continues to present a threat.

Actions Taken Since 1989 To Address Threats:

Since the petition to list spotted frog as a threatened species was received in 1989, several conservation and recovery activities have occurred in this GMU that have reduced threats to spotted frog in Utah. These activities include surveys (4 total), studies (5 total), genetic analyses (2 years, 1 study), range expansion (2 activities), habitat enhancement (2 projects), monitoring (4 years) Details on these accomplishments are summarized in Table 11 and described in the Statewide Conservation Section of the Strategy. This summary does not include actions that were conducted at the statewide level.

Required Future Actions:

The following general actions have been identified as required in order to meet the objectives of this GMU. Specific actions will be developed on an annual basis and incorporated into this Strategy. These actions are summarized by threat in Table 12.

(1) Surveys:

Actions will include identification of areas with available spotted frog habitat. Areas with suitable habitat will be surveyed for the presence or absence of spotted frog. If spotted frog are not present, areas will be identified for range expansion and reintroduction activities. In addition, areas where historic localities have been recorded will be re-surveyed. These actions have been identified for all subunits within this GMU

(2) Genetic Analysis:

Actions will include determining the relatedness of the West Desert populations with other populations in Utah. Once this determination has been made, actions will focus on maintaining the genetic integrity of these populations. This action has been identified for the Snake Valley, Tule Valley, and Ibapah Valley subunits.

(3) Range Expansion:

Currently, the goal for this GMU has been obtained. It is anticipated that once additional populations are located that some subsequent population augmentation may be required. Specific Brood stock and augmentation needs need to be identified. This action has been identified for the Snake Valley, Tule Valley, and Ibapah Valley subunits.

(4) Habitat Enhancement:

Actions will include identification of areas that have been degraded and require enhancement. Enhancement projections will include wetland improvements (e.g. re-vegetation), water restoration, and water quality improvements and bank stabilization. Areas where exclosures can be constructed to protect vital areas of habitat will be identified and implemented.

(6) *Habitat Acquisition:*

Actions will include identification of areas of public and private lands available for land or water acquisition or conservation easements. Once areas have been identified, areas will be prioritized and either acquired or protected through easements where feasible. This action has been identified for the Snake Valley, Tule Valley, and Ibapah Valley subunits.

(7) *Monitoring:*

Monitoring protocols are currently being evaluated and revised for spotted frog. As habitat and population enhancement activities are implemented, they will be incorporated into the state-wide monitoring program. This action has been identified for the Snake Valley, Tule Valley, and Ibapah Valley subunits.

(8) *Mitigation:*

Impacts from existing and proposed water shed development that affect spotted frog habitat will be assessed and mitigation will be determined on a case-by-case basis. In some areas, habitat restoration will offset negative affects of grazing, road construction and water development projects. This action has been identified for the Snake Valley, Tule Valley, and Ibapah Valley subunits.

(9) *Regulations:*

Existing regulatory mechanisms will be maintained. As new habitat becomes available it is anticipated that additional regulatory mechanisms will be established to limit access to sensitive spotted frog habitat areas. This action has been identified for the Snake Valley, Tule Valley, and Ibapah Valley subunits.

Table 11: Summary of major actions taken in the West Desert GMU to reduce threats to spotted frog since 1989

ACTION	TIME PERIOD	
	1989 - 1992 (Since petition to list)	1993 - 1997 (Since warranted by FWS)
Surveys	- 1991, Toone conducted general inventory of House Range Resource Area	<ul style="list-style-type: none"> - 1993, UDWR surveyed all known spring complexes in this GMU - 1996, UDWR surveyed 22 potential habitat sites in the West Great Salt Lake subunit as part of amphibian inventory activities.. - 1996, UDWR surveyed 7 potential habitat sites in the North Great Salt Lake subunit as part of amphibian inventory activities. - 1997, UDWR surveyed 15 potential habitat sites in the West Great Salt Lake subunit as part of amphibian inventory activities. - 1997, UDWR surveyed all known spring complexes in Tule Valley - UDWR, BLM completed aerial photography of all known and potential spotted frog habitat in this GMU.
Studies	- 1992, Cuellar conducted an ecological study during the breeding season in Gandy Salt Marsh	<ul style="list-style-type: none"> - 1993, Hovingh conducted a life history study on Tule Valley population - 1994, 1995 1996, 1997, UDWR obtained baseline breeding biology and habitat use data as part of annual monitoring program in Snake Valley - 1997, Utah State University (USU) obtained morphometrics on all populations in this GMU. - 1997, UDWR imitated spotted frog movement study on Snake Valley population
Genetic Analysis		<ul style="list-style-type: none"> - 1996, Green conducted a genetic analysis of three Utah spotted frog populations - 1996/1997 - USU and UDWR collected samples from all known spotted frog populations for genetic analysis studies - 1997, USU conducted genetic analyses of samples collected
Expansion		<ul style="list-style-type: none"> - 1996, UDWR and Utah Reclamation Mitigation and Conservation Commission (URMCC) conducted feasibility studies at Gandy Warm Springs and Goshen Warm Springs for a native aquatic/warm water species hatchery - 1997, UDWR and URMCC initiated plans for a native aquatic species hatchery facility at Gandy Warm Springs or Goshen Warm Springs.

Habitat Enhancement	- 1990, Bureau of Land Management (BLM) constructed cattle enclosure on part of the Gandy Spring in order to protect occupied springs.	- 1995, BLM constructed a second cattle enclosure on part of the Gandy Spring in order to protect occupied springs.
Monitoring		<ul style="list-style-type: none"> - 1994, 1995, 1996, UDWR monitored all Snake Valley populations - 1994, 1995, 1996 BLM monitored sections of Tule Valley population - 1995 - UDWR monitored all Snake Valley populations - 1997, UDWR monitored all populations in this GMU

Table 12: Summary of Threats/Actions for Snake Valley, Tule Valley, and Ibapah Valley Subunits

SUBUNIT	CURRENT ESA THREAT	DETRIMENTAL FACTORS	ACTIONS
Snake Valley Tule Valley Ibapah Valley	<i>Habitat Loss</i>	Water Development	Surveys, Studies, Habitat Enhancement, Habitat Acquisition, Monitoring, Mitigation
		Agricultural Practices	Habitat Enhancement, Habitat Acquisition, Monitoring, Mitigation, Protection
Snake Valley Tule Valley Ibapah Valley	<i>Nonnative Interactions</i>	Nonnative Introductions/Stocking	Surveys, Nonnative Control, Protection
		Mosquito Abatement	Surveys, Nonnative Control, Protection
SNAKE VALLEY Tule Valley Ibapah Valley	<i>Other Factors</i>	Mosquito Abatement (Spraying/Chemicals)	Nonnative Control, Protection
West Great Salt Lake	unknown	unknown	Surveys, Nonnative Control
North Great Salt Lake	unknown	unknown	Surveys, Nonnative Control
Skull Valley	unknown	unknown	Surveys, Nonnative Control
Tooele Valley	unknown	unknown	Surveys, Nonnative Control

BEAR RIVER GEOGRAPHIC MANAGEMENT UNIT

No spotted frog occurrences are known to currently or historically occur within this GMU. The priority actions are associated with determining if spotted frog historically or currently occur in this GMU. Since the distribution and occurrence of spotted frog in this GMU remains unclear, threats for this GMU can not be described. Required conservation actions, however, are described below.

Conservation Goal/Objective:

To conduct extensive habitat surveys and evaluation studies to determine if spotted frog historically or currently occur in any of the five subunits.

Actions Taken Since 1989 To Address Threats:

Since the petition to list spotted frog as a threatened species was received in 1989, some conservation and recovery activities have occurred in this GMU. These activities have included 23 surveys in 1996 and 17 surveys in 1997 of potential habitat throughout the Bear River GMU.

Actions:

(1) Surveys:

Actions will include identification of areas with available spotted frog habitat. Areas with suitable habitat will be surveyed for the presence or absence of spotted frog. These actions have been identified for all subunits within this GMU

(2) Nonnative Control:

Future stocking of nonnative aquatic species will be consistent with the procedures and protocols under the State of Utah Policy on Fish Stocking and Transfer Procedures. Public education on the benefits of ecosystem integrity and detrimental effects of nonnative introductions and disease transmission may reduce these threats. This action has been identified for all subunits within this GMU.

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CONSERVATION AGREEMENT
FOR
SPOTTED FROG

JANUARY 22, 1998

CONSERVATION AGREEMENT FOR SPOTTED FROG

This Conservation Agreement (Agreement) has been developed to expedite implementation of conservation measures for spotted frog in Utah as a collaborative and cooperative effort among resource agencies and private land owners. 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 this Agreement and the attached Conservation Strategy (Strategy). This Agreement will provide additional measures to enhance spotted frog populations that cannot be required under ESA (Table 1).

GOAL:

Ensure the long-term conservation of spotted frog within its historic range and assist in the development of statewide conservation efforts.

OBJECTIVES:

The following two objectives will be required to attain the goal of this strategy:

Objective 1: To eliminate or significantly reduce threats to spotted frog and its habitat to the extent necessary to prevent the danger that populations will become extinct throughout or a part of their range in Utah, or the likelihood that these populations will become endangered within the foreseeable future throughout all or a part of their range in Utah.

Objective 2: To restore and maintain a sufficient number of populations of spotted frog and the habitat to support these populations throughout its historic range in Utah that will ensure the continued existence of the species.

Wasatch Front GMU - To restore, maintain, and protect populations in five of the six subunits within the historic range. A minimum of three of the five subunits must have at least one population with an effective population size of 1000 individuals in three out of every five years. Any and all additional populations must be maintained with a minimum effective population size of 50 individuals each.

Sevier River GMU - To restore, maintain, and protect a population with an effective population size of 1000 individuals in the San Pitch subunit.

West Desert GMU - To restore, maintain, and protect populations in three subunits within the historic range. Each of these subunits must have at least one population with an effective population size of 1000 individuals in three out of every five years. Any and all additional populations must be maintained with a minimum effective population of 50 individuals each.

Bear River GMU - To conduct extensive habitat surveys and evaluation studies to determine if spotted frog historically or currently occur in any of the five subunits.

These objectives will be reached through implementation of the specific measures set forth in Tables 3 through 7 of the Agreement and further discussed in the Strategy. However, the status of spotted frog will be evaluated annually to assess program progress. The parties to this Agreement understand that failure to implement the Spotted Frog Conservation Agreement and Strategy or the failure of such measures to remove threats to the species' continued existence will be considered by the U.S. Fish and Wildlife Service in making its determination or whether listing of populations in one or all of the GMU's is required under the ESA.

I. OTHER SPECIES INVOLVED

The primary focus of this agreement is the conservation and enhancement of spotted frog and the ecosystems upon which they depend; however, other species occurring within or adjacent to spotted frog habitat may also benefit. Some of these species include least chub (*Iotichthys phlegethontis*), California floater (*Anodota californiensis*), Utes ladies'-tresses (*Spiranthes diluvialis*), etc. By using an ecosystem approach, the accomplishment of actions identified in the Strategy should significantly reduce or eliminate threats for several of these species and the need for federal protection pursuant to the ESA.

II. INVOLVED PARTIES

Utah Department of Natural Resources
Division of Wildlife Resources
1594 West North Temple
Salt Lake City, Utah 84114-6301

United States Department of the Interior
Fish and Wildlife Service
P.O. Box 25486
Denver, Colorado 80225

Bureau of Land Management, Utah State Office
324 South State Street
Salt Lake City, Utah 84111

Bureau of Reclamation, Upper Colorado Regional Office
125 South State Street, RM 6107
Salt Lake City, Utah 84138-1102

Utah Reclamation Mitigation and Conservation Commission
102 W. 500 S., Suite 315
Salt Lake City, Utah 84101

Confederated Tribes of the Goshute Reservation
P.O. Box 6104
Ibapah, Utah 84034

Central Utah Water Conservancy District
355 West 1300 South
Orem, Utah 84058

Separate Memorandum (a) of Understanding and Cooperative Agreements will be developed with additional parties as necessary to ensure implementation of specific conservation measures.

While the Utah Field Office, Region 6 of the FWS maintains the Federal lead in the recovery efforts for the spotted frog in Utah, spotted frog distribution is not limited to Utah. Additional populations of spotted frog exist in Washington, Oregon, California, Idaho, Montana, Nevada, and Wyoming. The Bonneville Basin Conservation and Recovery Team (BBCRT) will cooperate and coordinate with these States in the implementation of this Agreement. Additionally, the FWS, Utah Field Office, in cooperation with appropriate states, will develop an umbrella document to coordinate management of spotted frog throughout its range.

III. AUTHORITY

* The signatory parties hereto enter into this Conservation Agreement and the attached Conservation Strategy under federal and state law, as applicable, including, but not limited to Section 2(c)(2) of the ESA, which states that "the policy of Congress is that Federal agencies shall cooperate with State and local agencies to resolve water resource issues in concert with conservation of endangered species."

* All parties to this Agreement recognize that they each have specific statutory responsibilities that cannot be delegated, particularly with respect to the management and conservation of wildlife, its habitat and the management, development and allocation of water resources. Nothing in this Agreement or the Strategy is intended to abrogate any of the parties' respective responsibilities.

* This Agreement is subject to and is intended to be consistent with all applicable Federal and State laws and interstate compacts.

IV. STATUS OF SPOTTED FROG

In 1989, the U. S. Fish and Wildlife Service (FWS) was petitioned to list the spotted frog (referred to as *Rana pretiosa*) under the Endangered Species Act (Federal Register 54[1989]:42529). The FWS ruled on 23 April 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). The major impetus behind the proposed listing 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 the FWS maintained the same status for spotted frog, however, they updated the common and scientific name of the Utah

populations (Federal Register 62{182}:49401. The FWS now refers to the spotted frog as the Columbia spotted frog (*Rana luteiventris*).

Since the petition to list spotted frog as a threatened species was received in 1989, several conservation and recovery activities have occurred that have reduced threats to spotted frog in Utah. These activities include surveys (9 total), studies (4 total), genetic analyses (2 years), habitat enhancement (6 projects), completed and planned land acquisition (1,125 acres), increased regulatory mechanisms and statewide monitoring efforts (4 years). Details on these accomplishments are summarized in Table 2 and described in the Strategy.

Commitments to carry out current and future actions identified in this Agreement and Strategy will primarily be funded by two sources. In 1992, Congress signed the Central Utah Project Completion Act. Under this act, funding was authorized for surveys of sensitive plant and animal species in Utah and other federal reclamation projects in Utah on fish, wildlife, and recreation resources. In 1997, the Utah State legislature passed a bill that established a multi-million dollar fund that allocates money for the endangered, threatened and sensitive species.

V. PROBLEMS FACING THE SPECIES

The success of any conservation or recovery program depends on eliminating or reducing the impact of activities that threaten the species existence. The following list is a compilation of threats as perceived by the researchers and managers of spotted frog populations. The Strategy provides a detailed review of the problems and threats to the species that signatories to this agreement will address with management actions. For consistency, the general format is based on the five criteria considered for federal listing of a species in Section 4(a)(1) of the ESA.

- A. The present or threatened destruction, modification, or curtailment of its habitat or range (Habitat Loss)
- B. Disease, predation, competition and hybridization (Nonnative Interactions)
- C. Over utilization for commercial, recreational, scientific, or educational purposes (Over utilization)
- D. The inadequacy of existing regulatory mechanisms (Regulations)
- E. Other natural (e.g. drought) or human induced (e.g. socio-political) factors affecting its continued existence (Other Factors)

VII. REQUIRED CONSERVATION ACTIONS

To meet the goal and objectives of this Agreement, the parties agree to undertake the specific measures set forth in Tables 3 through 7 of this Agreement. Where responsibility for undertaking a specific action has not been assigned in this Agreement, the parties agree to implement such measures through additional agreements as appropriate.

- A. Determine baseline spotted frog distribution and available habitat (Surveys)
- B. Determine baseline spotted frog population, life history and habitat needs (Studies)

- C. Determine and maintain genetic composition and integrity (Genetic Analysis)
- D. Augment or expand spotted frog populations and distribution within the historic range through introduction or reintroduction from either transplanted or spotted frog raised in a designated hatchery facility (Range Expansion)
- E. Enhance and maintain habitat (Habitat Enhancement)
- F. Selectively control nonnative species (Nonnative Control)
- G. Protect and provide habitat for spotted frog (Habitat Acquisition)
- H. Monitor populations and habitat (Monitoring)
- I. Develop mitigation protocols for proposed development projects and future habitat alteration, where needed (Mitigation)
- J. Protect Spotted frog populations through regulatory mechanisms (Regulations)

VIII. CONSERVATION SCHEDULE AND ASSESSMENT

In addition, four general administrative actions, as outlined below, will be implemented.

Coordinating Conservation Activities

* Administration of the Agreement will be conducted by the Bonneville Basin Conservation and Recovery Team (BBCRT) in coordination with other involved states. The BBCRT will consist of a designated representative from signatories to this Agreement and may include technical and legal advisors and other members as deemed necessary by the signatories.

* Because the areas of concern covered by this Agreement are located in Utah, and because the State of Utah presently has primary jurisdiction over spotted frog within the State, the designated BBCRT leader will be the Utah Department of Natural Resources, Division of Wildlife Resources (UDWR) representative.

* Authority of BBCRT shall be limited to making recommendations for the conservation of spotted frog to the Director of UDWR. The Director will provide copies of comments, recommendations, and actions to the signatories and to other interested parties upon request.

* The BBCRT will meet annually to develop yearly conservation schedules and review budgets.

* The BBCRT will meet on a semiannual basis to report on progress and effectiveness of the Strategy implementation.

* The BBCRT will revise the Strategy as needed.

* BBCRT meetings will be open to interested parties. Minutes of the meetings and progress reports will be distributed to the BBCRT, the technical advisors and to other interested parties, upon request, by the BBCRT leader.

Implementing Conservation Schedule

* A total of 10 years is anticipated for completion of all actions identified and specified in tables 3 through of this Agreement and in the Strategy. The timetable for completion of specific measures is set forth in Tables 3 through 7 of this Agreement. Where no time for completion is stated, the timing of such actions will be determined by the BBCRT.

* As leader of the BBCRT, the UDWR will coordinate conservation activities and monitor conservation actions conducted by participants of this Agreement to determine if all actions are in accordance with the Strategy and annual schedule.

* Conservation actions will be scheduled and reviewed on an annual basis by the signatories using recommendations from the team. Activities that are anticipated to be conducted over a 10 year period are listed in Tables 3 through 7. Although the Strategy is a flexible document and will be revised annually, the goal and objectives of this Agreement and the specific measures set forth in Tables 3 through 7 of this Agreement can only be amended through the assent of all parties.

Funding Conservation Actions

* Funding for the Agreement will be provided by a variety of sources. Federal, state and local sources will need to provide or secure funding to initiate procedures of the Agreement and Strategy.

- Federal sources include, but are not limited to, the United States Forest Service (USFS), FWS, Bureau of Land Management (BLM), Utah Reclamation Mitigation and Conservation Commission (URMCC), Bureau of Reclamation (BR), Central Utah Project Completion Act (CUPCA), Land and Water Conservation (LWC) funds and the Natural Resource Conservation Service (NRCS).

- State funding sources include, but are not limited to, direct appropriation of funds by the legislature (including the mitigation fund), Community Impact Boards, Water Resources Revolving funds, State Department of Agriculture (ARD), and State Resource Management Agencies.

- Local sources of funding will be provided by water districts, Native American affiliations, cities and towns, counties, local irrigation companies, and other supporting appropriations and may be limited due to factors beyond local control.

* In-kind contributions in the form of personnel, field equipment, supplies etc., will be provided by participating agencies (Table 8). In addition, each agency will have specific tasks, responsibilities, and proposed actions/commitments related to their in-kind contributions.

* It is projected that actions involved with the expansion of habitat and populations will require the greatest expense during the first five years of the agreement.

* It is understood that all funding commitments made under this Agreement are subject to approval by the appropriate local, state or federal appropriations.

Conservation Progress Assessment

* A semiannual assessment of progress towards implementing actions identified in this agreement will be provided to the Director, of UDWR by BBCRT. This assessment will be based on updates and evaluations by BBCRT members. The Director will provide copies of this assessment to the signatories of this document.

* An annual assessment of conservation activities and accomplishments identified in Tables 3 through 7 and subsequent yearly schedules will be made by the BBCRT. This assessment will determine the effectiveness of this agreement and whether revisions are warranted. It will be provided to the Director of UDWR by BBCRT. The Director will provide copies of this assessment to the signatories of this document.

* If threats to the survival of the spotted frog become known that are not or cannot be resolved through this or any Conservation Agreement, the UDWR immediately will notify all signatories. The FWS reserves the right to list the spotted frog if actions to remove threats are not proceeding according to the established schedules, notwithstanding funding limitations.

IX. DURATION OF AGREEMENT

The initial term of this Agreement shall be 5 years. Prior to the end of each 5 year period, a thorough analysis of actions implemented for the species will be conducted by the BBCRT. If all signatories agree that sufficient progress has been made towards the conservation and recovery of the spotted frog, this Agreement shall be extended for an additional five (5) years. Any party may withdraw from this Agreement on sixty (60) days written notice to the other parties.

X. NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) COMPLIANCE

The Agreement and Strategy are being developed for planning purposes. Before any on the ground actions can occur on BLM administered lands, a determination must be made whether or not the Agreement and Strategy are consistent with existing land use plans and whether or not additional NEPA analysis is required. If the Agreement and Strategy are not consistent with existing land use plans, then they must be incorporated into the plan through an amendment process. Actions on lands administered by the State of Utah are not subject to NEPA analysis.

XI. FEDERAL AGENCY COMPLIANCE

* During the performance of this agreement, the participants agree to abide by the terms of Executive Order 11246 on non-discrimination and will not discriminate against any person because of race, color, religion, sex or national origin.

USDI Bureau of Reclamation
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3/16/98

Charles Calhoun
Regional Director

Date

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Michael Weland
Executive Director

Date

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4/2/98

David Pete
Chairman

Date

Central Utah Water Conservancy District
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Orem, Utah 84058

3/16/98

Don A. Christiansen
General Manager

Date

Table 1: Comparison of benefits of Spotted Frog Conservation Agreements vs. ESA Listing and actions that can be accomplished under each.

ISSUE/ACTION	CONSERVATION AGREEMENT	ENDANGERED SPECIES ACT
Agency Cooperation	Provides multi-agency cooperation at Federal, state, and local levels. Provides for multi-agency commitments.	Section 6 - Limited to State Cooperative Agreements. Not collaborative or pragmatic and no multi-agency commitments.
Management Document	Strategic Conservation Plan (Strategy). This is a dynamic and flexible document that has already been developed and will be revised annually.	Recovery Plan
Funding	Multiple funding sources at federal, state, and local levels.	Section 6 - Limited to available funds
Federal Agency Actions and Consultations	Coordination as required in Agreement	Section 7 - Requires consultation. Does not apply to private property issues unless federal funds are involved.
“Take”	Under state law, collection, importation, transportation, or possession is prohibited.	Section 9 - Provides protection against take, importation, exportation, and transportation on federal lands, and violations only committed knowingly on private lands.
Permits	Collection, importation, transportation, or possession for any zoological use is prohibited in Utah.	Permits are available for certain activities as outlined in Section 10.
Implementation Schedules	Required. Revised yearly.	Required; however, no specific review is required.
Progress Assessment	Development of annual progress assessments	As needed basis
Species/Habitat Surveys	Required under Agreement. Will identify any additional populations and available habitat for subsequent conservation actions.	Not specifically required. Could be identified in Recovery Plan, but generally no commitment to implement.

Species/Habitat Studies	Required under Agreement. Will provide life history and ecology information for use in developing future/additional conservation actions.	Not specifically required. Could be identified in Recovery Plan, but generally no commitment to implement.
Genetic Analysis	Required under Agreement. Will provide guidance for implementation of conservation actions	Not specifically required. Could be identified in Recovery Plan, but generally no commitment to implement.
Range Expansion	Required under Agreement. Will assist in ensuring the long term survival of spotted frog by increasing number and size of populations within historic range.	Not specifically required. Could be identified in Recovery Plan, but generally no commitment to implement.
Habitat Enhancement	Required under Agreement. Will assist in ensuring the long term survival of spotted frog by providing better quality and/or additional habitat..	Not specifically required. Could be identified in Recovery Plan, but generally no commitment to implement.
Nonnative Interactions	Required under Agreement. Identified measures will assist in reducing threats to spotted frog.	Not required except as it relates to federal activities that require Section 7.
Habitat Acquisition	Required under Agreement. Will provide additional habitat and habitat protection as well as improve habitat by changing land use practices.	Not specifically required. Could be identified in Recovery Plan, but generally no commitment to implement.
Monitoring	Required under Agreement. Provides information on habitat and population status and trends. Will assist in developing continued conservation actions.	Not specifically required. Could be identified in Recovery Plan, but generally no commitment to implement.
Protection	Not provided by Agreement; however, separate state and federal regulations that are currently in place are identified in the Agreement and will be adhered to as part of conservation activities.	Required. Provides protection against harassment, harm, pursuit, hunting, shooting, wounding, killing, trapping, capturing, or collecting.

Table 2: Summary of major actions taken and in progress to reduce threats to spotted frog since 1989

ACTION	TIME PERIOD	
	1989 - 1992 (Since petition to list)	1993 - 1997 (Since warranted by FWS)
Surveys	<ul style="list-style-type: none"> - 1991, Toone conducted general inventory of House Range Resource Area - 1991, UDWR surveyed all known and potential spotted frog habitat on the Wasatch Front - 1992, UDWR continued surveying all known and potential spotted frog habitat on Wasatch Front 	<ul style="list-style-type: none"> - 1993, UDWR surveyed all known spotted frog populations in the West Desert - 1997, UDWR surveyed all known spring complexes in Tule Valley - 1997, UDWR surveyed wetlands at the UDWR Springville Hatchery Facility - 1997, UDWR surveyed spring complexes in Mills Valley - 1997, UDWR surveyed spring complex at Manti Meadows - UDWR and BLM completed aerial photography of all known and potential spotted frog habitat.
Studies	<ul style="list-style-type: none"> - 1992, Cuellar conducted an ecological study during the breeding season in Gandy Salt Marsh 	<ul style="list-style-type: none"> - 1993, Hovingh conducted a life history study on Tule Valley population - 1994, 1995 1996, 1997, UDWR obtained baseline breeding biology and habitat use data as part of annual monitoring program - 1997, USU initiated population study based on morphometrics - 1997, UDWR conducted habitat use study on Heber Valley population - 1997, UDWR initiated spotted frog movement study on Snake Valley population
Genetic Analysis		<ul style="list-style-type: none"> - 1996, Green conducted a genetic analysis of three Utah spotted frog populations - 1996/1997, USU and UDWR collected samples from all known spotted frog populations for genetic analysis studies - 1997, USU conducted genetic analysis of samples collected
Expansion		<ul style="list-style-type: none"> - 1996, UDWR, FWS, and URMCC conducted feasibility studies at Gandy Warm Springs and Goshen Warm Springs for a native aquatic/warm water species hatchery - 1997, UDWR and URMCC incorporated plans for a native aquatic species hatchery facility at Gandy Warm Springs or Goshen Warm Springs.
Habitat Enhancement	<ul style="list-style-type: none"> - 1990, BLM constructed cattle exclosure on part of the Gandy Spring in order to protect occupied springs. - 1992, Congress signed Central Utah Completion Act that included the Utah Lake Wetland Preserve. 	<ul style="list-style-type: none"> - 1995, BLM constructed a second cattle exclosure on part of the Gandy Salt Marsh Complex in order to protect occupied springs. - UDWR and URMCC began development of the Utah Lake Wetland Preserve. - UDWR initiated the Jordan River Wetland Project
Nonnative Interactions		<ul style="list-style-type: none"> - 1997, UDWR developed policy for Fish Stocking and Transfer Procedures

Habitat Acquisition	<p>- 1989, BR acquired 134 acres of wetland habitat as part of mitigation for Jordanelle Reservoir.</p>	<ul style="list-style-type: none"> - 1995, URMCC acquired 64.7 acres of riverine/riparian habitat along the Provo River between Jordanelle Dam and Deer Creek Reservoir - 1996/1997, URMCC acquired 1500 acres of wetland habitat for the Utah Lake Wetland Preserve. - 1997, URMCC acquired 61.4 acres of riverine/riparian habitat along the Provo River between Jordanelle Dam and Deer Creek Reservoir - URMCC is currently in the process of acquiring an additional 184 acres of riverine and riparian habitat along the Provo River between Jordanelle Dam and Deer Creek Reservoir - URMCC would acquire up to an additional 681 acres of riparian corridor as part of the Provo River Restoration Project Proposed Action. Actions to acquire this property are in progress - 1996, A minimum of 125 cfs has been maintained in the Provo River between Jordanelle Dam and Deer Creek Reservoir. - 1997, draft cooperative agreement has been developed for the acquisition of approximately 100 acres of wetland habitat associated with the American Dream Spring Complex (Mona population).
Monitoring		<ul style="list-style-type: none"> - 1994, UDWR monitored all Wasatch Front, Snake Valley, and Tule Valley populations - 1994, BLM monitored sections of Tule Valley population - 1995, UDWR monitored all Wasatch Front and Snake Valley populations - 1995, BLM monitored sections of Tule Valley population - 1996, UDWR monitored all Wasatch Front and Snake Valley populations - 1996, BLM monitored sections of Tule Valley population - 1997, UDWR monitored all Wasatch Front, Snake Valley, Tule Valley, and Ibapah Valley populations.
Protection	<p>- 1989, UDWR proclamation prohibited collection of spotted frog for zoological use Spotted frog was included on State Sensitive Species List</p>	<ul style="list-style-type: none"> - 1997, UDWR developed policy for Fish Stocking and Transfer Procedures

Table 3: Summary of required future statewide conservation actions that will address threats facing spotted frog.

THREATS	ACTIONS	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
<i>Habitat Loss</i>	Surveys	O	O	O	O	C					
	Studies	O	O	O	O	C					
	Genetic Analysis	C									
	Habitat Expansion	I ¹									
	Nonnative Control	O	O	O	O	O	O	O	O	O	O
	Habitat Acquisition	O	O	O	O	O	O	O	O	O	O
	Monitoring	I ¹									
	Mitigation	O	O	O	O	O	O	O	O	O	O
<i>Nonnative Interactions</i>	Surveys	O	O	O	O	C					
	Habitat Enhancement	O	O	O	O	O	O	O	O	O	C
	Nonnative Control	O	O	O	O	O	O	O	O	O	O
	Habitat Acquisition	O	O	O	O	O	O	O	O	O	O
	Monitoring	O	O	O	O	O	O	O	O	O	O
	Regulations	O	O	O	O	O	O	O	O	O	O
<i>Regulations</i>	Regulations	O	O	O	O	O	O	O	O	O	O
<i>Other Factors</i>	Nonnative Control	O	O	O	O	O	O	O	O	O	C
	Habitat Acquisition	O	O	O	O	O	O	O	O	O	O
	Mitigation	O	O	O	O	O	O	O	O	O	O
	Regulations	O	O	O	O	O	O	O	O	O	O

O = Ongoing actions

C = Anticipated year of completion

I = Anticipated year of implementation

¹ = Actions that refer to completion of new statewide plans necessary for the implementation of other activities within the GMU's

Table 4: Summary of required future conservation actions that will address threats facing spotted frog in the Wasatch Front GMU.

THREATS	ACTIONS	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
<i>Habitat Loss</i>	Surveys	O	O	O	O	C					
	Habitat Expansion				I	O	O	O	O	O	O
	Habitat Enhancement	O	O	O	O	O	O	O	O	O	C
	Nonnative Control	O	O	O	O	O	O	O	O	O	O
	Habitat Acquisition	O	O	O	O	O	O	O	O	O	O
	Monitoring	O	O	O	O	O	O	O	O	O	O
<i>Nonnative Interactions</i>	Surveys	O	O	O	O	C					
	Habitat Enhancement	O	O	O	O	O	O	O	O	O	C
	Nonnative Control	O	O	O	O	O	O	O	O	O	O
	Habitat Acquisition	O	O	O	O	O	O	O	O	O	O
	Monitoring	O	O	O	O	O	O	O	O	O	O
<i>Regulations</i>	Regulations	O	O	O	O	O	O	O	O	O	O
<i>Other Factors</i>	Nonnative Control	O	O	O	O	O	O	O	O	O	C
	Habitat Acquisition	O	O	O	O	O	O	O	O	O	O

O = Ongoing actions

C = Anticipated year of completion

I = Anticipated year of implementation

Table 5: Summary of required future conservation actions that will address threats facing spotted frog in the Sevier River GMU.

THREATS	ACTIONS	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
<i>Habitat Loss</i>	Surveys	O	O	O	O	C					
	Habitat Expansion				I	O	O	O	O	O	O
	Habitat Enhancement	O	O	O	O	O	O	O	O	O	C
	Nonnative Control	O	O	O	O	O	O	O	O	O	O
	Habitat Acquisition	O	O	O	O	O	O	O	O	O	O
	Monitoring	O	O	O	O	O	O	O	O	O	O
<i>Nonnative Interactions</i>	Surveys	O	O	O	O	C					
	Habitat Enhancement	O	O	O	O	O	O	O	O	O	C
	Nonnative Control	O	O	O	O	O	O	O	O	O	O
	Habitat Acquisition	O	O	O	O	O	O	O	O	O	O
	Monitoring	O	O	O	O	O	O	O	O	O	O
<i>Regulations</i>	Regulations	O	O	O	O	O	O	O	O	O	O
<i>Other Factors</i>	Nonnative Control	O	O	O	O	O	O	O	O	O	C
	Habitat Acquisition	O	O	O	O	O	O	O	O	O	O

O = Ongoing actions

C = Anticipated year of completion

I = Anticipated year of implementation

Table 6: Summary of required future conservation actions that will address threats facing spotted frog in the West Desert GMU.

THREATS	ACTIONS	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
<i>Habitat Loss</i>	Surveys	O	O	O	O	C					
	Habitat Enhancement	O	O	O	O	O	O	O	O	O	C
	Nonnative Control	O	O	O	O	O	O	O	O	O	O
	Habitat Acquisition	O	O	O	O	O	O	O	O	O	O
	Monitoring	O	O	O	O	O	O	O	O	O	O
<i>Nonnative Interactions</i>	Surveys	O	O	O	O	C					
	Habitat Enhancement	O	O	O	O	O	O	O	O	O	C
	Nonnative Control	O	O	O	O	O	O	O	O	O	O
	Habitat Acquisition	O	O	O	O	O	O	O	O	O	O
	Monitoring	O	O	O	O	O	O	O	O	O	O
<i>Regulations</i>	Regulations	O	O	O	O	O	O	O	O	O	O
<i>Other Factors</i>	Nonnative Control	O	O	O	O	O	O	O	O	O	O
	Habitat Acquisition	O	O	O	O	O	O	O	O	O	O

O = Ongoing actions

C = Anticipated year of completion

I = Anticipated year of implementation

Table 7: Summary of required future conservation actions that will address threats facing spotted frog in the Bear River GMU.

THREATS	ACTIONS	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
<i>Habitat Loss</i>	Surveys	O	O	O	O	C					
	Nonnative Control	O	O	O	O	O	O	O	O	O	O
<i>Nonnative Interactions</i>	Surveys	O	O	O	O	C					
	Nonnative Control	O	O	O	O	O	O	O	O	O	O
<i>Regulations</i>	Regulations	O	O	O	O	O	O	O	O	O	O
<i>Other Factors</i>	Nonnative Control	O	O	O	O	O	O	O	O	O	C

O = Ongoing actions

C = Anticipated year of completion

Table 8: Estimated agency in-kind contributions, actions, and responsibilities for implementation of the Spotted Frog Conservation Agreement.

Agency	Brief Description of Tasks and Responsibilities *
Utah Department of Natural Resources, Utah Division of Wildlife Resources	Serve as Bonneville Basin Conservation and Recovery Team leader and coordinator for spotted frog(eg: oversee administrative responsibilities of agencies, reports, meetings etc.). Consult on water protection issues. Assist in obtaining and/or securing water rights and land within spotted frog suitable and potential habitat. Assist in funding enhancement projects. Plan and implement eradication/control projects of non-indigenous species. Serve as lead agency for population, propagation and habitat enhancements, re-introductions and monitoring projects in Utah. Maintain data base.
U.S. Fish and Wildlife Service	Advise and assist implementation of conservation agreement in regard to existing laws (eg: ESA, NEPA regulations etc.). Cooperate and assist in eradication/control projects of non-indigenous species, cooperate and assist in habitat enhancement and population monitoring projects. Assist in funding conservation and recovery projects.
U.S. Bureau of Land Management	Cooperate and assist in habitat enhancement, population monitoring, and land management projects. Assist in funding conservation and recovery projects. Cooperate and assist in eradication/control projects of non-indigenous species.
Utah Reclamation Mitigation and Conservation Commission	Cooperate and assist in developing mitigation protocols and activities. Cooperate and assist in habitat enhancement and population monitoring projects. Assist in funding conservation and recovery projects. Cooperate and assist in eradication/control projects of non-indigenous species.
U.S. Bureau of Reclamation	Cooperate and assist in habitat enhancement and population monitoring projects. Assist in funding conservation and recovery projects. Cooperate and assist in eradication/control projects of non-indigenous species.
Confederated Tribes of Goshute Indian Reservation	Cooperate and assist in habitat enhancement and population monitoring projects. Assist in funding conservation and recovery projects. Cooperate and assist in eradication/control projects of non-indigenous species
Central Utah Water Conservancy District	Cooperate and assist in habitat enhancement and population monitoring projects. Assist in funding conservation and recovery projects. Cooperate and assist in eradication/control projects of non-indigenous species

* All agencies will participate in, and provide technical and administrative assistance to the Bonneville Basin Conservation and Recovery Team. Tasks and responsibilities will only apply to activities and locations where appropriate.