CANDIDATE ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

SCIENTIFIC NAME: *Tryonia adamantina*

COMMON NAME: Diamond Y Spring snail

LEAD REGION: Region 2

INFORMATION CURRENT AS OF: February 2003

STATUS/ACTION (Check all that apply):
__ New candidate
_X_ Continuing candidate
    _X_ Non-petitioned
    ___ Petitioned - Date petition received: ___
        ___ 90-day positive - FR date: ___
        ___ 12-month warranted but precluded - FR date: ___
        ____ Is the petition requesting a reclassification of a listed species?
    ___ Listing priority change
        Former LP:___
        New LP:___
Latest date species first became a Candidate: _____
___ Candidate removal: Former LP: ___ (Check only one reason)
    ___ A - Taxon more abundant or widespread than previously believed or not subject to a degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status.
    ___ F - Range is no longer a U.S. territory.
    ___ M - Taxon mistakenly included in past notice of review.
    ___ N - Taxon may not meet the Act=s definition of Aspecies.@
    ___ X - Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY: Snails: Hydrobiidae

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE: Texas

CURRENT STATES/COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE: Texas

LEAD REGION CONTACT (Name, phone number): Susan Jacobsen, 505/248-6641

LEAD FIELD OFFICE CONTACT (Office, name, phone number):
    Austin, Texas Field Office, Nathan Allan, 512/490-0057

BIOLOGICAL INFORMATION (Describe habitat, historic vs. current range, historic vs. current population estimates (# populations, #individuals/population), etc.):

In the desert Southwest, aquatic snails are distributed in isolated geographically-separate wetland populations (Hershler et al. 1999). They likely evolved into distinct species during recent dry periods from parent species that once enjoyed a wide distribution during wetter, cooler climates of the Pleistocene. Such divergence has been well-documented for aquatic and terrestrial macroinvertebrate groups within arid ecosystems of western North America (e.g., Taylor 1987, Metcalf and Smartt 1997, Bowman 1981).

The Diamond Y Spring snail is an aquatic snail occurring only in the Diamond Y Spring system and associated outflows in Pecos County, Texas (Taylor 1987). There is no available information that the species= historic distribution was larger than the present distribution. However, other area springs may have contained the same species, but because these springs have been dry for more than four decades, there is no opportunity to determine the potential historic distribution.

Another endemic hydrobiid aquatic snail, Gonzales springsnail (*Tryonia circumstriata = stocktonesis*), also occurs in the Diamond Y Spring system. A recent study (Hershler et al. 1999) investigated phylogenetic relationships among the 23 recognized species of the genus *Tryonia* in the southwestern United States, using mitochondrial DNA sequences. This analysis supported the taxonomic status of both snails and suggested that there were differences within the genus that may warrant reclassification. Gonzales springsnail was assigned to a clade of Atrue Tryonia@made up of 16 species. Diamond Y Spring snail was assigned to a separate clade of four species. This study confirms these two snails from the Diamond Y Spring system are indeed distinct, monotypic groups warranting species status.

Diamond Y Spring snail is a very small snail, measuring only 2.9 to 3.6 millimeters (.11 to .14 inches) in length. The shell is narrowly conical, with obtuse apex and broadly rounded anterior end (Taylor 1987). Whorls 4.75 to 5.75 in larger females, regularly convex and swollen to weakly shouldered, separated by a deeply incised suture (Taylor 1987). Habitat of the species is mud substrates on the margins of small springs, seeps, and marshes in flowing water associated with sedges and cattails (Taylor 1987). These snails likely have life spans of 9-15 months and reproduce several times during the spring to fall breeding season (Taylor 1987, Pennak 1989, Brown 1991). Snails of the family Hydrobiidae are sexually dimorphic with females being characteristically larger and longer-lived than males. The snails are ovoviviparous, producing live young serially (as opposed to broods) (Taylor 1985). They are presumably fine-particle feeders on detritus and periphyton associated with the substrates (mud and vegetation).

The Diamond Y Spring system is a tributary drainage to the Pecos River and is composed of disjunct upper and lower watercourses, separated by about a 1 kilometer (km) (.62 mile (mi)) stretch of dry stream channel. The upper watercourse starts with the Diamond Y Spring head pool and is augmented by numerous small seeps, some of which drain into the spring outflow channel. This outflow channel converges with the Leon Creek drainage and flows through a marsh-meadow, where it is then referred to as Diamond Y Draw. The total upper watercourse is about 1.5 km (.93 mi) in length. The lower watercourse has a smaller head pool spring (Euphrasia Spring) and outflow stream and also has several isolated pools, for example,

Mansanto Pool. The total lower watercourse is about 1 km (.62 mi) in length and may extend below the State Highway 18 bridge, during wetter seasons or years.

Taylor (1985) documented the distribution and abundance of aquatic snails in the Diamond Y Spring system. At the time of this work, Fall 1984, he found Diamond Y Spring snail distribution limited to the upper watercourse. It was found present at 12 of the 14 sites sampled, with density estimates ranging from 0.5 to 108 individuals per 0.1 square meter, with very low densities in the upstream areas, near the headspring. Taylor (1985) indicates the low density areas were in definite contrast to unpublished data collected by the author in 1968, where the upstream areas of the upper watercourse had very high abundance of Diamond Y Spring snails. This study also found that Gonzales springsnail was limited to only the lower watercourse in the first 30 meters (98.4 feet) of outflow from Euphrasia Spring. These findings were confirmed by Fullington (1991).

More recent surveys have found that Diamond Y Spring snail is currently found in the isolated spring seeps near the Diamond Y Spring head pool, in side seeps at the downstream end of the upper watercourse and at the immediate outflow of Euphrasia Spring in the lower watercourse (Echelle 2001). Meanwhile, Gonzales springsnail is now found only in the outflow stream of the Diamond Y head pool in the upper watercourse. This distribution is supported by recent observations of Dr. Robert Hershler=s (pers. comm. in Echelle 1991). The reason for the apparent reversal in distributional patterns of the two species within the Diamond Y Spring system since the surveys by Taylor (1985) is unknown.

Although the two snail species both occur in the Diamond Y Spring system, they have never been taken together at any sample locations (Taylor 1985, 1987; Echelle 1999), with the reported exception by Fullington (1991) where both were collected from a small seep to the side of the Diamond Y Spring head pool. Taylor (1985, 1987) reports the reason for this mutually exclusive distribution is likely a function of competition rather than habitat differences, because the two species appear to occupy the same microhabitats, but are spatially segregated.

THREATS (Describe threats in terms of the five factors in section 4 of the ESA providing specific, substantive information. If this is a removal of a species from candidate status or a change in listing priority, explain reasons for change):

A. <u>The present or threatened destruction, modification, or curtailment of its habitat or range.</u>

The primary threat to this species is the potential failure of spring flow due to excessive groundwater pumping and/or drought which would result in total habitat loss for the species. Diamond Y Spring is the last major spring still flowing in Pecos County, Texas. Over pumping of the regional aquifer system for agricultural production of crops has resulted in the drying of most other springs in this region (Brune 1981). Other springs that have already failed include Comanche Springs, which was once a large surface spring in Fort Stockton, Texas, about 8 miles from Diamond Y. This spring flowed at more than 1200 liters per second (lps) (Brune 1981) and undoubtably provided habitat for rare species of fishes and invertebrates, including spring snails. The spring ceased flowing by 1962 (Brune 1981). Leon Springs, located upstream of Diamond Y in the Leon Creek watershed, was measured at 500 lps in the 1930s and was also known to contain rare fish, but ceased flowing in the 1950's following significant irrigation pumping (Brune 1981). There have been no continuous records of spring flow discharge at

Diamond Y Spring by which to determine any trends in spring flow.

Studies by Veni (1991) and Boghici (1997) indicate that the spring flow at Diamond Y Spring comes from the Rustler aquifers located west of the spring outlets. One significant factor that influences flows at the spring is the large groundwater withdrawals for agricultural irrigation of farms to the southwest in the Belding-Fort Stockton areas. Although The Nature Conservancy of Texas owns and manages the property surrounding the Diamond Y Spring system, it has no control over groundwater use that affects spring flow. The Supreme Court of Texas has upheld the rule of capture for groundwater use in Texas. This means that property owners have the right to withdraw as much groundwater as they desire, without considering impacts to other resources or nearby landowners.

Oil and gas activities threaten this springsnail because of the potential groundwater or surface water contamination of pollutants (Veni 1991, Fullington 1991). The Diamond Y Spring system is within an active oil and gas extraction field. At this time there are still many active wells located within a hundred meters of surface waters. In addition a natural gas refinery is located within 0.8 km (0.5 mi) upstream of Diamond Y Spring. There are also old brine pits associated with previous drilling within feet of surface waters. Oil and gas pipelines cross the spring outflow channels and marshes where the species occurs, creating a constant potential for contamination from pollutants from leaks or spills. These activities are a threat to contaminate the habitat of the springsnail by allowing foreign pollutants to enter underground aquifers that may contribute to spring flow or through point sources from spills and leaks of petroleum products.

B. Overutilization for commercial, recreational, scientific, or educational purposes.

None known.

C. Disease or predation.

None known. However, the presence of introduced species (*Melanoides* snail) increases the potential for foreign diseases to be introduced to the species.

D. The inadequacy of existing regulatory mechanisms.

Texas State law provides no protection for these invertebrate species. There are no existing Federal, State or local regulatory mechanisms providing protection for these species. The snails are afforded some protection indirectly due to the presence of two fishes (Leon Springs pupfish and Pecos gambusia) listed as endangered by State and Federal governments that occupy similar habitats. However, the snail may be more sensitive to changes in water quality than the fish and are likely more directly threatened by the presence of the exotic *Melanoides* snail, than the endangered fish.

E. Other natural or manmade factors affecting its continued existence.

Within the last 10 years, an exotic snail, *Melanoides* sp., has become established in Diamond Y Spring (Echelle 2001, McDermott 2000). The species is by far the most abundant snail in the upper watercourse of the Diamond Y Spring system. So far it has not been detected in the lower

water course (Echelle 2001). In many locations, this exotic snail is so numerous that it essentially is the substrate in the small stream channel. The effects of this introduction are not yet known. However, this exotic snail is likely competing with the native snails for space and resources. Other changes to the ecosystem from the dominance of this species are likely to occur and could have detrimental effects to the native invertebrate community.

BRIEF SUMMARY OF REASONS FOR REMOVAL OR LISTING PRIORITY CHANGE:

No change.

FOR RECYCLED PETITIONS: N/A

a. Is listing still warranted? ___
b. To date, has publication of a proposal to list been precluded by other higher priority listing actions? ___
c. Is a proposal to list the species as threatened or endangered in preparation? ___
d. If the answer to c. above is no, provide an explanation of why the action is still precluded.

LAND OWNERSHIP (Estimate proportion Federal/state/local government/private, identify non-private owners):

The land on which the snail occurs is owned and managed by The Nature Conservancy of Texas. The surrounding watershed and surface area over contributing aquifers is all privately owned.

PRELISTING (Describe status of conservation agreements or other conservation activities):
None

REFERENCES (Identify primary sources of information (e.g., status reports, petitions, journal publications, unpublished data from species experts) using formal citation format):

Boghici, R. 1997. Hydrogeological investigations at Diamond Y Springs and surrounding area, Pecos County, Texas. Unpublished Master=s Thesis, University of Texas at Austin. 120 pp.

Bowman, T.E. 1981. *Thermosphaeroma milleri* and *T. smithi*, new sphaeromatid isopod crustaceans from hot springs in Chihuahua, Mexico, with a review of the genus. Journal of Crustacean Biology. 1:105-122.

Brown, K. M. 1991. Mollusca: gastropoda. Pages 285-314 in J.H. Thorp and A.P. Covich, Eds. Ecology and Classification of North American Freshwater Invertebrates. Academic Press, Inc. San Diego, California. 940pp.

Brune, G. 1981. Springs of Texas. Branch-Smith, Inc. Fort Worth, Texas.

Echelle, A.A. 2001. Monitoring effects of a renovation project on endangered fish and invertebrates in Diamond Y Draw. Final Report, Endangered Species Program, Texas Parks and Wildlife Department, Austin, Texas. Project No. E-1-13; Code WER38. 66 pp.

Fullington, R.W. 1991. Mollusca survey of Texas Nature Conservancy Preserves: Diamond Y

Springs and Independence Creek. Final Report, The Nature Conservancy of Texas, San Antonio, Texas. 7 pp.

Henry, B. 1992. The macroinvertebrate community of Diamond Y Cienega, a saline spring system in Trans-Pecos, Texas. Final Report, The Texas Nature Conservancy, San Antonio, Texas. 13 pp.

Hershler, R., Hsiu-Ping Liu, and M. Mulvey. 1999. Phylogenetic relationships within the aquatic snail genus Tryonia: implications for biogeography of the North American Southwest. Molecular Phylogenetics and Evolution 13:377-391.

Metcalf, A.L. and R.A. Smartt. 1997. Land snails of New Mexico. New Mexico Museum of Natural History and Science. Bulletin No. 10. 145 pp.

McDermott, K. 2000. Distribution and infection relationships of an undescribed digenetic Trematode, its exotic intermediate host, and endangered fishes in springs of west Texas. Unpublished Master=s Thesis, Southwest Texas State University, San Marcos, Texas. 26+ pp.

Pennak, R. W. 1989. Fresh-water invertebrates of the United States: Protozoa to Mollusca. John Wiley & Sons, Inc.

Taylor, D. W. 1985. Status survey of aquatic molluscs in Diamond Y Draw in Pecos County, Texas. Unpublished report. 27 pp.

Taylor, D. W. 1987. Fresh-water molluscs from New Mexico and vicinity. New Mexico Bureau of Mines and Mineral Resources Bulletin 116:1-50.

Veni, G. 1991. Delineation and preliminary hydrologic investigation of the Diamond Y Spring, Pecos County, Texas. Final Report, The Nature Conservancy, San Antonio, Texas. 111 pp.

LISTING PRIORITY (place * after number)

THREAT

Magnitude	Immediacy	Taxonomy	Priority
High	Imminent	Monotypic genus	1
		Species	2 *
		Subspecies/population	3
	Non-imminent	Monotypic genus	4
		Species	5
		Subspecies/population	6
Moderate to Low	Imminent	Monotypic genus	7
		Species	8
		Subspecies/population	9
	Non-imminent	Monotypic genus	10
		Species	11
		Subspecies/population	12

Rationale for listing priority number:

Magnitude: Limited distribution of species makes any impact from increasing threats (loss of springflow, contaminants, nonnative species) likely result in extinction of species.

Imminence: The species occurs in an arid region with drought and aquifer withdrawals making loss of springflow an imminent threat of total habitat loss. The species habitat is in an active oil and gas field with constant threats from contamination. Nonnative *Melanoides* snail recent invaded in last decade.

APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes to the candidate list, including listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all additions of species to the candidate list, removal of candidates, and listing priority changes.

Approve: Tom Bauer March 14, 2003
Acting Regional Director, Fish and Wildlife Service Date

Concur: _____ _____
Director, Fish and Wildlife Service Date

Do not concur: _____ _____
Director, Fish and Wildlife Service Date

Director's Remarks: _____
_____
_____

Date of annual review: Feb. 2003

Conducted by: Nathan Allan, Austin FWS office

Comments: _____
_____
_____

(rev. 7/02)