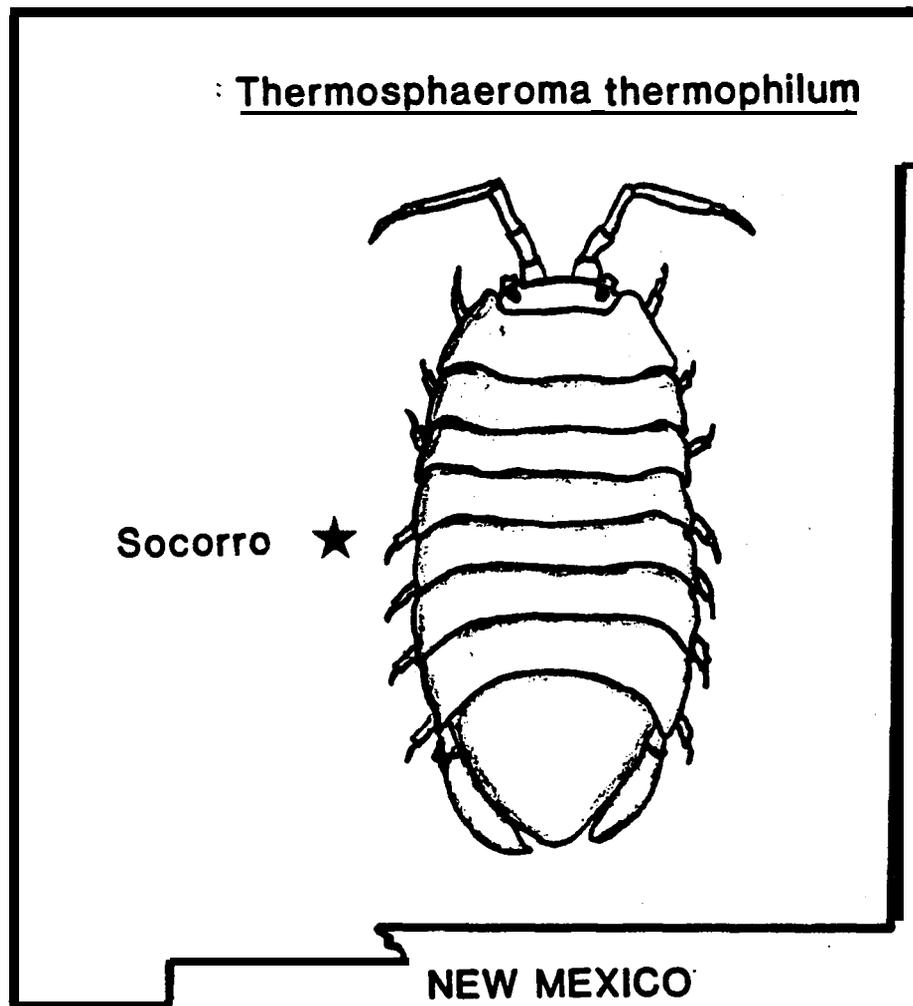


SOCORRO ISOPOD RECOVERY PLAN



1982

RECOVERY PLAN FOR THE
SOCORRO ISOPOD
(Thermosphaeroma thermophilum)

Developed by

New Mexico Game and Fish Department

Under Contract to

U.S. Fish and Wildlife Service

Approved: Robert A. Yontz
Director, U.S. Fish and Wildlife Service

Date: 2/16/82

PREFACE

The Socorro Isopod Recovery Plan was developed by the New Mexico Game and Fish Department under contract to the Albuquerque Regional Director of the U.S. Fish and Wildlife Service.

The recovery plan is based upon the belief that State and Federal conservation agencies and knowledgeable, interested individuals should endeavor to preserve the Socorro isopod and its habitat and to restore them, as much as possible, to their historic status. The objective of the plan is to make this belief a reality.

The best information available was used to produce this recovery plan. It is hoped the plan will be utilized by all agencies, institutions and individuals concerned with the Socorro isopod and its ecosystem to coordinate conservation activities. Periodically, and as the plan is implemented, revisions will be necessary. Revisions will be the responsibility the task of the U.S. Fish and Wildlife Service in cooperation with the New Mexico Game and Fish Department and implementation is the task of the managing agencies, especially the New Mexico Game and Fish Department.

This completed **Socorro** Isopod Recovery Plan has been approved by the U.S. Fish and Wildlife Service. The plan does not necessarily represent official positions or approvals of cooperating agencies and does not necessarily represent the views of the New Mexico Game and Fish Department. This plan is subject to modification as dictated by new findings and changes in species status and completion of tasks assigned in the plan. Goals and objectives will be attained and funds expended contingent upon appropriations, priorities, and other budgetary constraints.

Literature citations should read **as** follows:

U.S. Fish and Wildlife Service. 1982. Socorro Isopod (Thermosphaeroma thermophilum) Recovery Plan. U.S. Fish and Wildlife Service, Albuquerque New Mexico. 16 pp.

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PART I

SOCORRO ISOPOD RECOVERY PLAN

Isopods are members of the Phylum Arthropoda and the Class **Crustacea**. **Most** non-marine species of isopods are terrestrial, but of the North American aquatic genera, one is notable. This genus is Thermosphaeroma, which contains at least four highly restricted species, all occurring in warm springs. Among these is the Socorro isopod, Thermosphaeroma thermophilum, an endemic to three neighboring springs in Socorro County, New Mexico. Because of its small numbers, limited distribution, and limited habitat, T. thermophilum was listed as Endangered by the State of New Mexico on February 10, 1978, and as **Endangered** by the U. S. Fish and Wildlife Service on March 27, 1978. In view of its precarious status and **instability** of its habitat, immediate steps should be taken to guarantee perpetuation of T. thermophilum. Such steps are incorporated in this recovery plan, **along** with appropriate background information on the species, its biology, and related matters.

The Socorro isopod originally was placed in the genus Sphaeroma by Richardson (1898), based on specimens collected by Theodore D. A. Cockerell prior **to** February 6, 1897. The species **was** later transferred to the genus Exosphaeroma by Richardson (1905) and remained there for 73 **years**. Then Cole and Bane (1978) placed the species in the new genus Thermosphaeroma along with another species they described as T. subequalum (**type** locality: Big Bend, Texas) and the previously described-E. dugesi (Dollfus)(**type** locality: Aguascalientes, Mexico). Cole and **Bane** (1978) also indicated that a fourth undescribed species occurs in Chihuahua, Mexico.

T. thermophilum received little attention from conservationists until 1976, when **the** New Mexico Department of Game and Fish began to investigate its status. Studies by Hatch (1976), Shuster (1977, 1978) and others associated with the Department gathered significant information on the biology of the species. Captive populations were established in Albuquerque at **the** University of New Mexico and at the Rio Grande Zoo, and at Dexter National Fish Hatchery to insure the genome against possible catastrophic extinction and to assure diversity among captive populations. While more biological work is still needed, the major goal at present is to ensure the survival of this species, possibly a relict of the marine biota that inhabited New Mexico millions of **years** ago.

General Description

The Socorro isopod has a flattened body with seven pairs of legs, antennae on **the** head, and oar-like extensions (uropods) on the last segment (Hatch 1979). The average length is 7.8 mm (range 4-13 mm) in males and 5.1 mm (range 4.5-6.0 mm) in females.

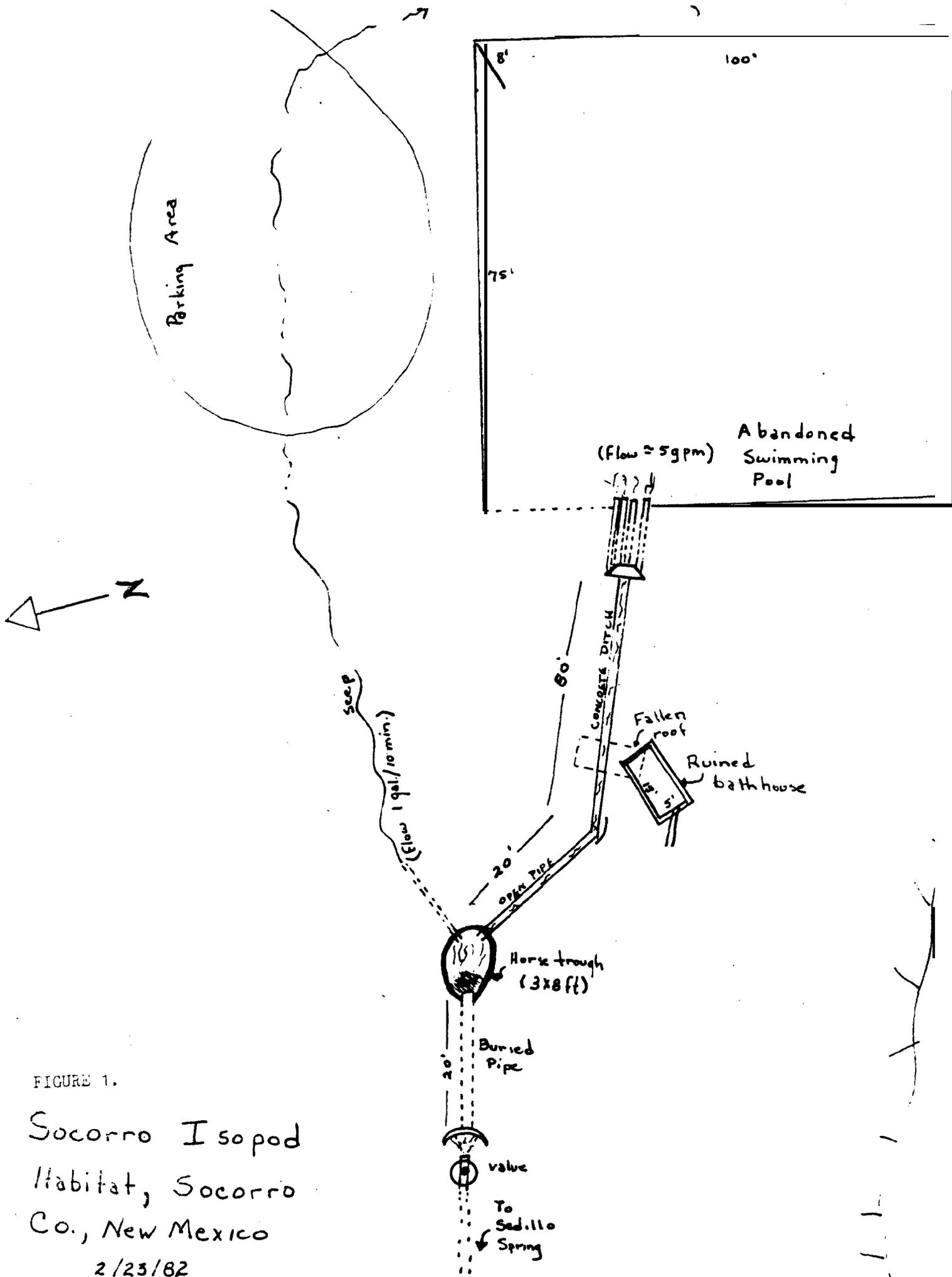


FIGURE 1.

Socorro Isopod
 Habitat, Socorro
 Co., New Mexico
 2/23/82

Richardson's (1898) complete description is as follows:

"Head nearly three times as long, **with its** anterior margin widely rounded. Eyes round and post-laterally situated. The first pair of antennae, with a flagellum of eight articles, extend to the middle of the first thoracic segment. The second pair of antennae reach the posterior margin of the first thoracic segment; the flagellum contains eleven articles. The thoracic segments are all similar with the exception of the first, which extends laterally around the head, almost touching the peduncle of the first pair of antennae with its anterior angle. The ephimeral parts are continuous with the segments with no indication of a separation from them. The abdomen is formed of **two** distinct segments, the first of which is partly covered by the last thoracic segment, the second is sub-triangular, rounded posteriorly. The internal **lamella** of the uropods is moderately broad, **well** rounded, and extends to the posterior edge of the last abdominal segment. The external **lamella** is half as long and half as broad as the internal one, and is more **pointed at** its extremity. The body is oblong-ovate with almost parallel sides. Its surface is entirely smooth. The grayish-brown color of the body is everywhere marked with small black **spots** and lines, which run together, forming a broad, black band in the center of each one of the thoracic segments. All **the** exposed edges of the body are tinged with a bright orange."

Distribution and Status

The Socorro isopod is confined to a thermal outflow approximately 3 kilometers west of **the** City of Socorro in the Socorro Mountains in south-central Socorro County (Fig. 1). The isopod population occurs within the water system of an abandoned bathhouse referred to as "The Evergreen" (Stanley 1950), which is supplied with water from Setiillo Spring. The water **system** now consists of a small (1m x 2m x 0.3m) cement-lined animal watering tank, a smaller pool, and approximately 40 meters of open irrigation **pipe**.

The water flow is controlled **by** an unprotected valve just above the tank and averages about 10 gallons a minute. This system comprises the total present habitat of the isopod. The majority of the water from **Sedillo** Spring is diverted to the City of Socorro for municipal use. Cook and Socorro Springs also exist within the immediate area. During late Pleistocene and early Holocene time these springs fed a marsh extending one-half mile east of Cook Spring (**Weber**, in Hatch 1977). Whether **T. thermophilum** inhabited Cook, Socorro, or other springs in **this** area is unknown, but seems **likely**. Both Cook and Socorro Springs are capped now and all of the water is diverted to **the City** of Socorro.

Although population sizes probably vary seasonally and perhaps annually, the only two published counts of Socorro isopods made at the Sedillo . Spring outflow were similar. Hatch (1976) reported the population to be about 2,400 in 1976, and Shuster (1977) estimated it as 2,449 in 1977.

Habitat Requirements

T. thermophilum presently occupies waters with a temperature range of 88" to 90" F. The currently occupied habitat consists of two small pools and two runs characterized by relatively stable temperature and physical factors. Algae covering most surfaces serve as the primary food source for the isopod, but detritus and dragonfly nymphs are also consumed (Shuster 1977); even though cannibalistic behavior is not often documented in isopods, except in serolids (Richardson 1905), T. thermophilum has been observed consuming its own kind.

Reproductive Status

Shuster (1977) reported a positive correlation between female size and fecundity in a captive population of the isopod. Although fecundity under laboratory conditions may be unnaturally high because of increased availability of food, brood sizes ranged from 3 to 57 individuals (mean = 15.8 + 11.4). The gestation period was about 30 days, and the recovery time between the release of a brood and appearance of fully mature ovarioles was about 30 days. Provided sufficient quantities of food and proper temperatures are available, females may be able to produce broods every two months during their reproductive life (longevity records are unavailable). The number of gravid females peaked in April and steadily declined to zero in August. This timing may have been a response to changing day length, although increased food availability from increased photoperiod also could have been a factor.

Threats to Future Existence

The major threat facing the **Socorro** isopod is loss of habitat. Municipal and private water developments have completely altered the natural habitat of this species by capping the original spring source and by piping the water to alternate areas (Hatch 1979). The amount of water diverted to "The Evergreen" water system is limited, and a readily accessible cut-off valve can stop even this flow. Present conditions place the species in a very precarious situation; because continuous flows have not been secured. In addition, protection of habitat from harmful contaminants and other negative impacts cannot be guaranteed because the habitat is on private land.

Required Action to Ensure Lone-Term Existence of Socorro Isopod

Man's activities have drastically altered Socorro isopod habitat. Even though no adverse biological factors are known to be operating, events such as introduction of predatory or competitive species could change the present situation. With these factors and **the** precariousness of **the** water supply in mind, **recovery** of the species clearly will require concerted conservation efforts--albeit these efforts generally should not involve elaborate or complicated actions.

PART II - THE ACTION PLAN

RECOVERY PLAN STEPDOWN OUTLINE

Prime Objective: Prevent extinction of the Socorro isopod (Thermosphaeroma thermophilum) by **stabilizing** and enhancing existing precarious aquatic habitat derived from Sedillo Spring and ^{initiate} recovery by establishing and maintaining at least two additional populations.

1. Maintain and Enhance the Existing Socorro Isopod Population and Habitat at Sedillo Spring.
 11. Continue Gathering Data on the Sedillo Spring and Captive Populations to Provide Additional Management Data.
 12. Protect Habitat at Sedillo Spring.
 121. Provide for Permanent Flow of Water.
 122. Enter into an Agreement with the Existing Private Landowner for Beneficial Land Management Practices in Order to Prevent Detrimental Alteration of the Habitat.
 1221. Prevent Contamination.
 1222. Prevent Loss of Cover and Soil.
 1223. Prevent Introduction of Predatory or Competitive Species.
 1224. Fence the Area Around the Existing Pools.
 1225. Monitor Status of Existing Population and Habitat.
 13. Enhance Habitat at Sedillo Spring.
 131. Expand Habitat by Acquiring Additional Flow of Water.
 132. Develop Additional Habitat.
 1321. Expand "The Evergreen" Water System.
 1322. Determine Feasibility of and Initiate Expansion in Nearby Non-Flushing Arroyos if Possible.
2. Expand the Area Occupied by the Species.
 21. Investigate the Possibility of Redeveloping Aquatic Areas Near Socorro and Cook Springs.
 22. Investigate the Possibility of Releasing Isopods into Ft. Harmony Sorinn.
 221. Negotiate Easement and Closure.
 222. Protect and Enhance Habitat.
 223. Introduce the Socorro Isopod.

23. Monitor Transplanted Isopod Populations and Habitat and Manage Them Accordingly.
3. Maintain Captive Populations.
4. Establish or Maintain Control as Appropriate.
 41. Maintain as State and Federal Endangered Species as Long as Appropriate.
 42. Enforce Laws Protecting Species
 43. Establish Closures as Necessary.
5. Disseminate Information about Socorro Isopod.
 51. Public Information.
 52. Professional.Information.
6. Review Status of Socorro Isopod.
 - 6.1 Recommend Reclassification if Appropriate.

RECOVERY PLAN NARRATIVE

Prime Objective: Prevent the extinction of the Socorro isopod (Thermosphaeroma thermophilum) by stabilizing and enhancing the existing precarious aquatic habitat derived from Sedillo Spring and initiate recovery by establishing and maintaining at least two additional populations.

1. Maintain and Enhance the Existing Socorro Isopod Population and Habitat at Sedillo Spring.

Maintain and enhance Socorro isopod historic habitat, including agreements with the city and with the private landowner. At present, lack of landowner cooperation is the major factor limiting management at this site. This situation conceivably could improve with further negotiations.

11. Continue Data Gathering on the Sedillo Spring and **Captive** Populations to Provide Additional Management Data.

Study the population of Socorro isopods at Sedillo Spring to gather information on numbers, age structure, food habits, reproductive information, habitat requirements including water chemistry and other pertinent information necessary to attain goals stated in the prime objective.

Also study the captive populations at the University of New Mexico and **the** Rio Grande Zoo in Albuquerque and at Dexter NFH give special effort to maintenance of the genetic variation and habitat-specific adaptation of these captive populations.

12. Protect Habitat **at** Sedillo Spring.

Critically examine any proposed activity within the Sedillo Spring watershed for potential impacts affecting isopod habitat. Examples might **be** construction that would cause soil erosion and/or **removal** of vegetation adjacent to Sedillo Spring, additional grazing or other uses of the waters of Sedillo Spring, including, but not limited to, municipal water consumption, irrigation or recreational uses. Use of chemical agents and introductions of any exotic species into the area should be avoided. Federal or State protection of portions of the land and water by fee simple purchase or easement should be considered in order to preserve Sedillo Spring.

121. Provide for Permanent Flow of Water.

Obtain a continuous and assured long-term flow of water at Sedillo Spring. This could be **done** through an agreement (contract, lease, easement or purchase) **with the** City of Socorro and the present landowner, with the understanding that use of the water for isopod habitat will **be** continuous and nonconsumptive.

122. Enter into an Agreement with the Existing Private landowner for Beneficial Land Management Practices in Order to Prevent Detrimental Alteration of the Habitat.

Prevent reduction of water flow, loss of area presently covered with waters from Sedillo Spring or any other activities that would adversely alter isopod habitat. This management will likely necessitate some type of agreement (contract, lease, easement, purchase) with the private landowner.

1221. Prevent Contamination.

Critically review all activities that could cause chemical contamination of the water issuing from Sedillo Spring. Examples include any form of insect control, chemical treatment of water or surrounding vegetation or any other uses of chemicals within the watershed of Sedillo Spring, such as treatment of water for domestic, consumption upstream of isopod habitat.

1222. Prevent Loss of Vegetative Cover and Soil Cover.

Prevent removal of vegetation and/or soil within the watershed of Sedillo Spring. Any activities involving soil removal adjacent to Sedillo Spring, including removal of fill soil, gravel and sand for construction and mining, should be carefully examined for adverse impacts. Restrictions should be particularly stringent for any activity within the watershed of Sedillo Spring.

1223. Prevent Introduction of Predatory or Competitive Species.

Prevent the introduction of predators or competitive species into isopod habitat and insure that introduction of the isopod into habitat outside Sedillo Spring does not jeopardize the existence of any State or federally listed species.

1224. Fence the Area Around the Existing Pools.

Present isopod habitat should be protected by fencing.

1225. Monitor Status of Existing Population and Habitat.

The present isopod population and habitat will be monitored to insure that the conditions specified in the easement agreement concerning tasks 1221., 1222., and 1223. are met.

13. Enhance Habitat at Sedillo Spring.

Expand the habitat at Sedillo **Spring** where feasible. Construction of pools and runs would expand present habitat.

I

131. Expand Habitat by Acquiring Additional Flows of Water.

Additional water will be necessary to significantly increase the amount of habitat at Sedillo Spring. Additional water rights could be obtained by one of several possible options, including purchase, leasing or easement from the private landowner or the City of Socorro.

132. Develop Additional Habitat.

Assuming approval from private landowners can be obtained:

1321. Expand the habitat afforded by "The Evergreen" water system by constructing new habitat adjacent to "The Evergreen" water system.

1322. Establish additional habitat in nearby nonfishing arroyos.

2. Expand the Area Occupied by the Species.

Establishment of T. thermophilum in other sites would reduce the likelihood of **catastrophic** elimination of the species. Therefore, locate and acquire other areas suitable for the species.

21. Determine the Feasibility of Redeveloping Aquatic Areas near Socorro and Cook Springs.

Systems similar to "The Evergreen" system at Sedillo Spring likely can be developed for a minimal cost at the adjacent **two** springs. Water rights from the City and an agreement with the landowner will have to be obtained.

22. Release Isopods into Ft. Harmony Spring.

Ft. Harmony Spring (Ojo Caliente), Socorro County, New Mexico, appears similar to Sedillo Spring and particularly suitable for the establishment of a population of Socorro isopods. However, Ft. Harmony Spring may contain another isopod species, **an** endangered gastropod or an endangered crustacean species; therefore, verify and resolve these possibilities **before** introduction of T. thermophilum. There is no previous record of T. thermophilum from **this** site.

221. Negotiate Easement and Closure.

Proceed with introductions of T. thermophilum as quickly as agreements with appropriate landowners and water users' can be made and any necessary habitat modifications are completed. A conservation easement is less expensive than fee simple purchase and allows the present owner to continue exercising ownership rights; therefore, an easement is preferable to purchase as a means of protecting isopod habitat.

222. Protect and Enhance Habitat.

Although the chemical and biological conditions in Ft. Harmony Spring are suitable for the introduction of Socorro isopods at this time, a few minor habitat modifications are needed, including construction of barriers to prevent upstream migration of predatory fish species into proposed isopod habitat. Eliminate fish presently occupying the habitat. Additional small scale habitat improvements also may be necessary, such as construction of small pools and runs at Ft. Harmony Spring and, perhaps, fencing the isopod habitat to exclude livestock.

The relatively isolated location of Ft. Harmony Spring and the lack of encouragement to the public from landowners restricts recreational activities at the spring. The cattle in the surrounding area do not threaten the habitat, so fencing the entire area to exclude them is not needed at present.

223. Introduce the Socorro Isopod.

Introduce the species upon completion of habitat expansion at Ft. Harmony Spring.

23. Monitor Transplanted Isopod Populations and Habitat and Manage Them.

Monitor and document establishment of new populations of isopods. Biological parameters such as reproductive success, growth rates, habitat usage, survival of young and other data should be gathered. If monitoring of these populations reveals sufficient increases in the populations and the likelihood of long-term habitat stability, additional introductions into new habitat may be unnecessary.

3. Maintain Captive Populations.

Maintain captive populations at the University of New Mexico and the Rio Grande Zoo. These populations will be the source for **trans-**planting purposes, for additional captive colonies and for research.

4. Establish or Maintain Controls as Appropriate.

Further protect the Socorro isopod from other detrimental impacts by establishment of appropriate controls governing human interference with the species.

41. Maintain as State and Federal Endangered Species as Long as Appropriate.

The Socorro isopod will be classified as Endangered at Federal and State levels until the Director of the **U. S.** Fish and Wildlife Service determines from information provided by biologists that the Socorro isopod is no longer endangered, the isopod could be reclassified or **delisted** (see item 61.).

42. Enforce Laws Protecting Species.

Until the Socorro isopod is reclassified or delisted, taking of isopods is prohibited except as outlined in 50 CFR 17. All other protection of isopod populations and critical habitat afforded under the Endangered Species Act of 1973 will be enforced.

43. Establish Closure as Necessary.

Closures will be invoked upon Socorro isopod habitat if necessary, but this will apply only to public properties.

5. Disseminate Information about Socorro Isopod.

Disseminate information concerning the Socorro isopod that provides an understanding of the species and its ecosystem and promotes general support of recovery efforts.

51. Public Information.

A program that encourages public support for the existing population and for expansion of the range of the Socorro isopod can be accomplished by disseminating general information to the largest and most varied audiences possible. Employ media such as newspapers, magazines, radio, and television. Place emphasis on basic information without disclosing information that could be a detriment to recovery efforts. Present public information programs in public schools.

52. Professional Information.

Publish technical information in appropriate media including scientific journals, agency reports and regulations.

6. Review Status of the Socorro Isopod.

After at least two additional isopod populations (total of three wild populations) are **established**, its status as an endangered species should be reevaluated.

61. Recommend Reclassification if Appropriate.

If three wild populations are found to be stable and protected, the isopod could be reclassified to threatened.

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IMPLEMENTATION SCHEDULE

GENERAL CATEGORY (1)	PLAN TASK (2)	TASK # (3)	PRIORITY # (4)	TASK DURATION (5)	RESPONSIBLE AGENCY			FISCAL YEAR COSTS (ES!!)			COMMENTS (9)
					FWS		OTHER (7)	FY82 (8)	FY83	FY84	
					REGION (6)	PROGRAM (6a)					
11 I2	Data collection on population and habitat	11.	2	ongoing	2	SE	NMG&F	5,000	5,000	5,000	
A2	Provide for permanent flow of water	121.	1	1 yr.	2	SE-RE	NMG&F	Appraisal necessary			Easement acquisition is preferred method--Fee title may be necessary.
A2	Prevent contamination	1221.	1	1 yr.	2	SE-RE	NMG&F	Partially covered by easement. Compliance checks included in monitoring (1225.) funds.			Easement acquisition necessary prior to implementatio
A2	Prevent loss of soil and vegetation	1222.	1	1 yr.	2	SE-RE	NMG&F	500	500	500	Same as A2-1221.
M4	Prevent introduction of predatory or competitive species	1223.	1	ongoing	2	SE-RE	NMG&F	Same as A2-1222.			
M3	Fence existing pool	1224.	1	1 yr.	2	SE		2,000	2,000		
11	Monitor existing pop- ulation	1225.	1	ongoing	2	SE	NMG&F	500	500	500	
A2	Acquire additional flows of water	131.	1	1 yr.	2	SE-RE	NMG&F	Appraisal necessary			

IMPLEMENTATION SCHEDULE

GENERAL CATEGORY (1)	PLAN TASK (2)	TASK # (3)	PRIORITY # (4)	TASK DURATION (5)	RESPONSIBLE A G E N C Y			FISCAL YEAR COSTS (EST.)			COMMENTS
					FWS		OTHER (7)	FY'82	FY'83 (8)	FY'84	
					EGIO (6)	PROGRAM (6a)					
M3	Expand "Evergreen" Water System	132.	3	1 yr.	2	SE	NMG&F		20,000		
113	Determine feasibility of expansion to near- by springs	221.	3	1 yr.	2		NMG&F	500			
A2	Easement acquisition on Ft. Harmony Spring	221.	3	1 yr.	2		NMG&F	Appraisal necessary			
M3	Enhance Ft. Harmony habitat	222.	3	1 yr.	2		NMG&F		5,000	2,500	
M2	Introduce Isopod	223.	3	1 yr.	2		NMG&F		500	500	
I1 I2	Monitor population and habitat of introduced population	23.	3	ongoing	2		NMG&F	500	500	500	
M1	Maintain captive populations	3.	1	ongoing	2	SE-IF		2,500	2,500	2,500	
02	Enforce laws protecting species	42.	1	ongoing	2	LE	NMG&F	500	500	500	
01	Disseminate information	5.	2	ongoing	2	PA	NMG&F	2,000	2,000	2,000	