

Painted Snake Coiled Forest Snail



RECOVERY PLAN

RECOVERY PLAN
FOR
PAINTED SNAKE COILED FOREST SNAIL

PREPARED BY
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FOR

REGION 4
OF THE
U.S. FISH AND WILDLIFE SERVICE

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LITERATURE CITATIONS SHOULD READ AS FOLLOWS:

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I. INTRODUCTION

The Painted Snake Coiled Forest Snail, Anguispira picta (Clapp, 1920), is a geographically restricted species of a widespread and quite successful land snail genus. It is known only from Buck Creek Cove, southwest of Sherwood, Franklin County, Tennessee. Discovered in 1906 (Clapp, 1920), it apparently has not been reported from any other locality though competent malacologists over the years have sought for it specifically.

The snail is considered threatened because the population is restricted to this one small area. Lumbering, forest fires, or quarrying could easily destroy the entire known habitat.

Information on the snail's ecology and natural history is almost completely lacking. Solem (report on OES contract, 1974) believes it lives only on limestone outcrops (often within crevices) in those areas of the cove that have sufficient forest cover to maintain high moisture conditions. It seems to feed on lichens growing on the rock faces. He reported that it was restricted to areas of the cove between 750-800 feet in elevation.

Description: Anguispira picta is a strongly depressed, dome-shaped snail with a sharp, perfectly smooth, white carina (Fig. 1a). Adults range from 17-21 mm in width and 9-10 mm in height, and have six whorls. The shell's broad umbilicus (Fig. 1b) is about 1/4 the shell diameter

and shows all the whorls. Ribbing is indistinct, especially on the body whorl. The shell is opaque in adults (juveniles translucent and very colorful), off-white to cream in ground color with chocolate brown blotches (Fig. 1c) on the upper surface. On the lower surface there is a row of large dark blotches (Fig. 1b) along the carina with a second row of narrow, very faint, flame-like markings extending into the umbilicus. Clapp (1920) considered it the most distinctly marked and richest in coloring of all Anguispira species.

Distinguishing Characters: This snail is similar to Anguispira cumberlandiana which occurs on the Cumberland Plateau almost all around Buck Creek Cove. In fact, Pilsbry (1948) considered it a subspecies of A. cumberlandiana. Further work by Solem (1976) confirmed its species status. The snails themselves distinguish like and non-like species by chemical means (unknown) or by anatomical differences (especially those of the reproductive system whose details are well documented by Solem, 1976). A. picta can be distinguished from A. cumberlandiana by its carina, sculpture, color pattern, and habitat. The other species of Anguispira are rounded or only slightly angular at the periphery: A. picta and some forms of A. cumberlandiana are acutely carinate (and strongly depressed). The carina in A. picta is white and smooth while in A. cumberlandiana it is often serrate. In A. picta the ribbing is weak and almost obsolete on the body whorl while in A. cumberlandiana it is quite strong. A. picta is much more colorfully marked than A. cumberlandiana and usually carries the indistinct flame-like markings on the bottom of the shell. A. picta prefers limestone crevices while A. cumberlandiana is known to live either on rocks or under logs.

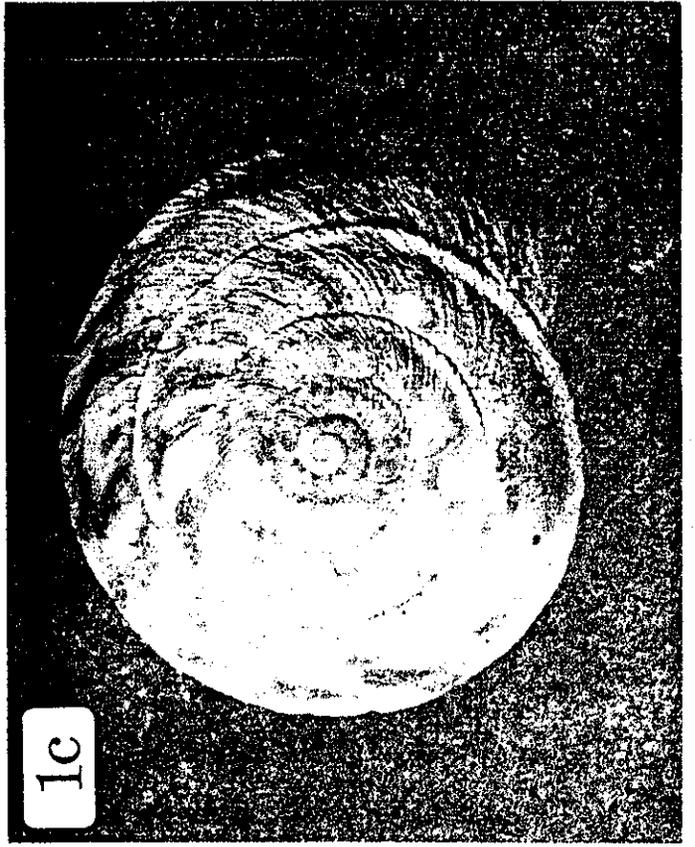
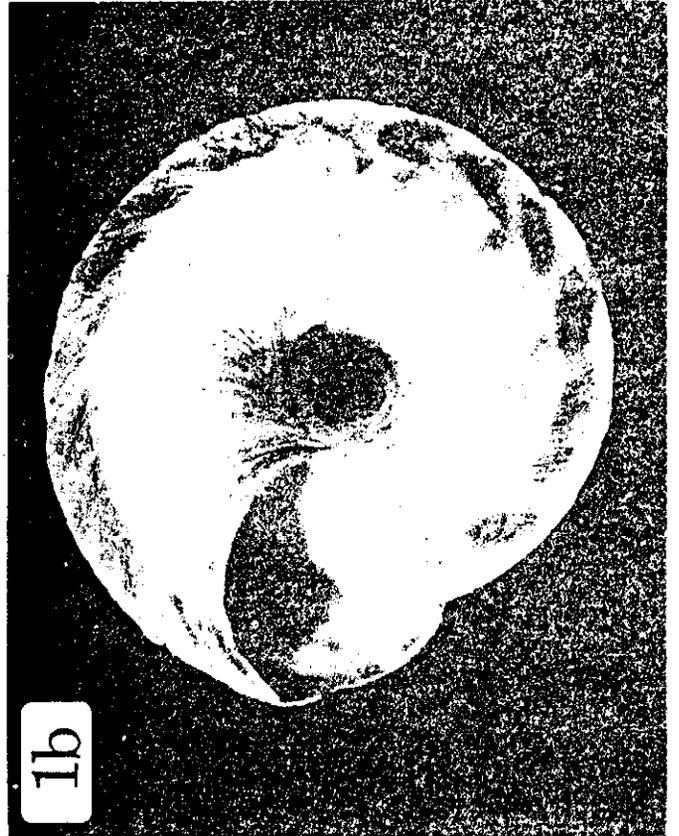
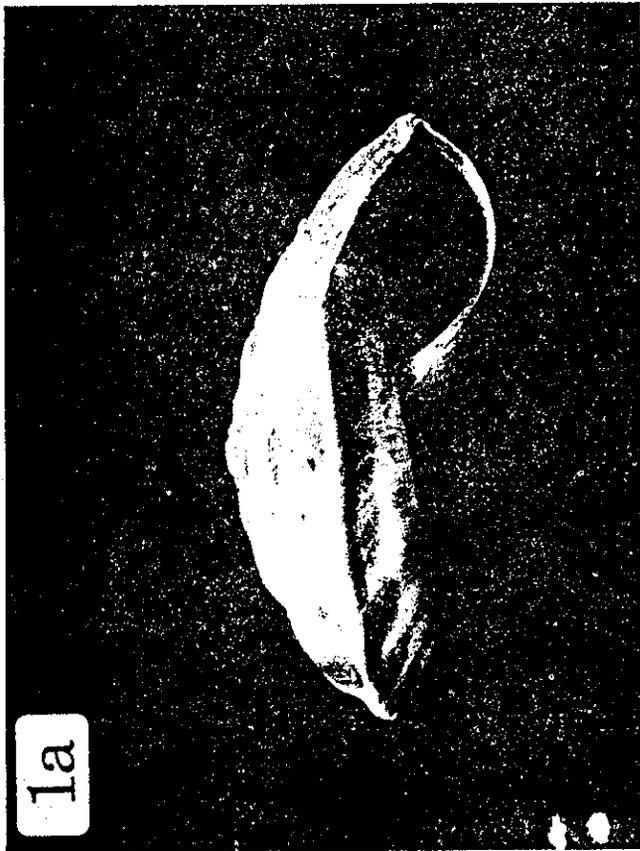


Figure 1. *Anguispira picta*

a. Lateral view

b. Ventral view

c. Dorsal view

Range: Anguispira picta is currently found only within one cove along the southwest boundary of the Cumberland Plateau. While the Plateau in this region is overlain with sandstone or conglomerate rock, limestone outcrops abound in valleys or coves dissecting the uplands (Braun, 1967). This is the case within Buck Creek Cove, southwest of Sherwood, Franklin County, Tennessee (USDA, 1958). This cove, about 1.2 miles long and 0.4 miles wide, faces southwest, is completely forested, and has a large permanent creek running through it. The study and work by Tom Smith for The Nature Conservancy (TNC), Tennessee Field Office, show that the snail is not nearly so restricted in elevation as previously thought. I found it alive on both sides of the creek (much more common to the south in more moist woods) from 750 feet up to at least 930 feet. Tom Smith found it at least once in a well-watered, protected spot on the north-facing slope at 1500 feet. The appropriate habitat within the cove covers about 325 acres.

Population Numbers and Trends: Solem roughly estimated the snail population at 2000 individuals but based this number on his idea of limited elevational variance. Suitable habitat occurs throughout the cove (and in nearby coves) so the actual population may be 10 or more times that numerous. Live snails seem to occur only on limestone outcrops in well-watered areas shaded by large canopy trees. Drought has been a problem in the Sherwood area for several years, which may explain why some snails were found on large

rocks within the stream itself. Areas of young, cut-over forest on the the south-facing slope of Buck Creek Cove and in the small side cove to the south produced no living individuals. Parts of the cut-over areas did contain limestone outcrops but were consistently drier than other slopes, and the small side cove had been grazed by livestock. In contrast, a survey of undisturbed areas revealed several size classes of snails (from 20 mm down to 4 mm) indicating that reproduction has been occurring and the present existence of a viable population.

Reasons for Current Status: The snail is limited to Buck Creek Cove. Some obvious habitat loss has occurred due to human activity, but the amount of loss has not been quantified. It is evident, however, that extensive lumbering, limestone quarrying or even a forest fire in the cove could extirpate the species. At present, the owners of land at the mouth of the cove have refused to sell timber and mineral (high quality limestone) rights to commercial interests, but much of the upper reaches of the cove is owned by an estate currently being probated. The mineral rights for the latter property have already been purchased by an outsider (Smith, 1980). A recovery plan is essential to identify the necessary actions that will lead to the species' recovery.

Habitat: A. picta was found only on limestone outcrops (Fig. 2a,b) in parts of the cove with good cover. The slopes of the cove are very steep with rock outcrops and sheer cliffs at intervals along both sides of the creek. Much of this rock is limestone, as is much of the creek bed itself. Several smaller streams (containing numerous waterfalls 10 to 20 feet high) feed Buck Creek. The cove forest of the north-facing slope has not been

- a. *Anguispira pieta* (juvenile) on limestone overhang



- b. Detail of (a)



cut recently and approximates the Mixed Mesophytic Forest (Braun, 1967) that once covered the entire region. It is dominated (Smith, 1980) by large trees of the species Fagus grandifolia (American beech), Acer sacharum (sugar maple), Carya ovata (shagbark hickory), Liriodendron tulipifera (tulip poplar), Quercus alba (white oak), and Quercus muehlenbergii (chinkapin oak). The understory contains Ostrya virginiana (hophornbeam), Carpinus caroliniana (ironwood), Cornus florida (dogwood), Hamamelis virginiana (witch hazel), Platanus occidentalis (sycamore), and Magnolia acuminata (cucumber tree). Associated herbaceous species include Asplenium rhizophyllum (walking fern), Polypodium polypodioides (resurrection fern), Heucera villosa (alumroot), Lobelia siphilitica (great lobelia), Asarum canadense (wild ginger), Hepatica acutiloba (sharp leaf hepatica), and Sedum ternatum (three leaf stone crop). Animals closely associated with A. picta include other crevice specialists: Stenotrema spinosum (a carinate polygyrid snail) and Aneides aeneus, the green salamander. A. picta was found often within crevices or under ledges of the limestone, as often as not out in the open on the north-east face. They seemed to avoid places with heavy growth of mosses.

Food and Foraging Behavior: Little is known at present about the snails' food preferences or feeding behavior. Observation indicates that they feed on low growing lichens commonly found on limestone. No stomach analyses have been made to confirm this. Other species of Anguispira are

strongly diurnal (Ingram, 1940, as reported in La Rocque, 1970) but I could not confirm that trait for A. picta. Most of the juveniles found day or night were inactive and closely adherent to the rock. Some adults were moving about "foraging" both by day and at night. Nothing is known about whether they are more active during damp weather. Snails have been observed in the open on warm days well into November.

Shelter Requirements: A. picta aestivates on rock surfaces but numerous dead shells were found within crevices indicating that they may retreat to crevices in times of stress. No live snails were found in leaves or soil at the bases of the outcrops or in areas logged recently.

Reproductive Behavior: Unknown

Oviposition and Incubation Requirements: Other species of Anguispira are known to deposit eggs with a calcareous shell covered by a thin membrane in soil (Elwell and Ulmer, 1971; A. Tompa, pers. comm.); but no data are available for A. picta.

Predation: Numerous dead shells were found with the apex of the shell "chewed" off which is a sign of predation by small mammals (Elwell and Ulmer, 1971; Ingram, 1944 as reported in La Rocque). Carabid beetles and lampyrid beetle larvae are also potential predators. These are probably naturally occurring pressures that are unlikely to lead to the extinction of the species.

PART II.

RECOVERY

A. Recovery Objective

The purpose of this recovery plan is to identify those actions that should be undertaken to lead to the protection and recovery of Anguispira picta to the point that it can be delisted. The immediate dangers are those threats to its small, specialized habitat. Unless significant populations of Anguispira picta are found outside Buck Creek Cove and preclude the need for further protection of the species, it shall not be considered recovered until the following conditions are met:

1. A. picta and its habitat are protected from human-related threats and/or modifications that would endanger the species' existence;
2. No evident natural threats exist which would likely endanger the species' existence;
3. A population monitoring program is established and conducted for 4 to 5 years to establish "normal" distribution and abundance for the species and that no downward trend is evident;
4. A means is established to assure that population monitoring will be conducted periodically after delisting, and;
5. Collection of the species for scientific or other purposes is controlled or is proven not to threaten the species' continued existence.

B. Step-down Outline

1. Protect, evaluate, and manage the known population and habitat of Anguispira picta in Buck Creek Cove.

1.1 Protect the snail's essential habitat within Buck Creek Cove by acquisition, conservation easement, land donation, cooperative agreement, or other feasible means.

1.1.1 Support, and where necessary, assist TNC and the Tennessee Wildlife Resources Agency (TWRA) in their ongoing attempts to obtain a conservation agreement with the Robert A. Hoosier family, whose land provides the only reasonable access to Buck Creek Cove.

1.1.2 Contact all landowners in Buck Creek Cove to determine if anticipated land use changes might affect the species or its habitat.

1.1.3 Implement any necessary protection measures with landowners.

1.2 Assess and monitor population level and habitat quality.

1.2.1 Develop monitoring techniques.

1.2.2 Implement monitoring program.

1.3 Manage A. picta habitat if justified.

1.3.1 Conduct preliminary evaluations as to the necessity for management.

1.3.2 Study limiting factors and develop management techniques.

- 1.4 Determine present and foreseeable threats to the species.
 - 1.4.1 Evaluate potential for overcollection, and develop post-delisting control measures if needed.
 - 1.4.2 Assess other threats.
2. Determine if populations of Anguispira picta exist outside Buck Creek Cove.
 - 2.1 Locate sites on the southern Cumberland Plateau where habitats similar to Buck Creek Cove may exist.
 - 2.2 Survey sites for potential snail populations.
 - 2.3 Investigate status of any newly found population.
3. If new populations of Anguispira picta are found, reevaluate the plan and make necessary revision in objectives and the step-down outline.

C. Narrative

1. Protect, evaluate, and manage the known population and habitat of Anguispira picta in Buck Creek Cove.

Since this one cove contains the only known population of A. picta, it is essential for recovery that the snail population and its habitat be protected from further disturbance. Logging, livestock grazing, and limestone quarrying are all important sources of income to residents of the Sherwood area. Several surveys have shown that some parts of the cove that once contained live snails are so degraded that only shells are now found. These areas were selectively logged and/or opened to grazing, both of which dry out the habitat. Quarrying of limestone within the cove would be disastrous.

- 1.1 Protect the snail's essential habitat within Buck Creek Cove by acquisition, conservation easement, land donation, cooperative agreement, or other feasible means.

This protection could be implemented by the Fish and Wildlife Service, state government, local government, or private group such as The Nature Conservancy, which has already taken an active role in this work.

- 1.1.1 Support and, where necessary, assist TNC and TWRA in their ongoing attempts to obtain a conservation agreement with the Robert A. Hoosier family, whose land provides the only reasonable access to Buck Creek Cove.

In the past, the Hoosier family has protected their own land by refusing to allow lumbering or quarrying by outside interests. They seem proud of their cove's uniqueness and should be encouraged in such stewardship. The TNC and TWRA have drafted a cooperative agreement and forwarded it to the Hoosiers who to date have been reluctant to sign it. (They don't want to "lose" their ancestral land nor its income.) Although present efforts to obtain a signed cooperative agreement have not been successful, the TNC and TWRA should continue to cultivate the friendship and cooperation of the Hoosier family on a strictly informal basis, while striving for the stronger and possibly more permanent protection of a written agreement.

- 1.1.2 Contact all landowners in Buck Creek Cove to determine if anticipated land use changes might affect the species or its habitat. (See Figure 3 and caption for property boundaries.)

It is hoped that all landowners will cooperate with the TNC, TWRA, and Fish and Wildlife Service, but the Hoosiers at the mouth of the cove and the Carter heirs (because of the large extent of their tract) are most important. Significant human disturbance in the cove may adversely affect the snail or its habitat (for instance the logging 15-20 years ago on the Wynne lands).

The mineral rights on the Carter lands have already been sold, and could be a prelude to exploitation of the limestone. The species cannot be fully secure without some control of land use in the cove.

- 1.1.3 Implement any necessary protection measures with landowners.

When possible, gain the cooperation of landowners.

Associated measures may eventually include the need for fences, signs, or gates. If landowners are not in agreement, investigate other options for protecting the habitat.

- 1.2 Assess and monitor population level and habitat quality.

Techniques for population monitoring must be developed and baseline population data established if the status of the snail is to be adequately monitored. The population in the

Figure 3. Topographic Map of Buck Creek Cove (USGS Sinking Cove Quadrangle) showing property boundaries (see boundary caption on following page).

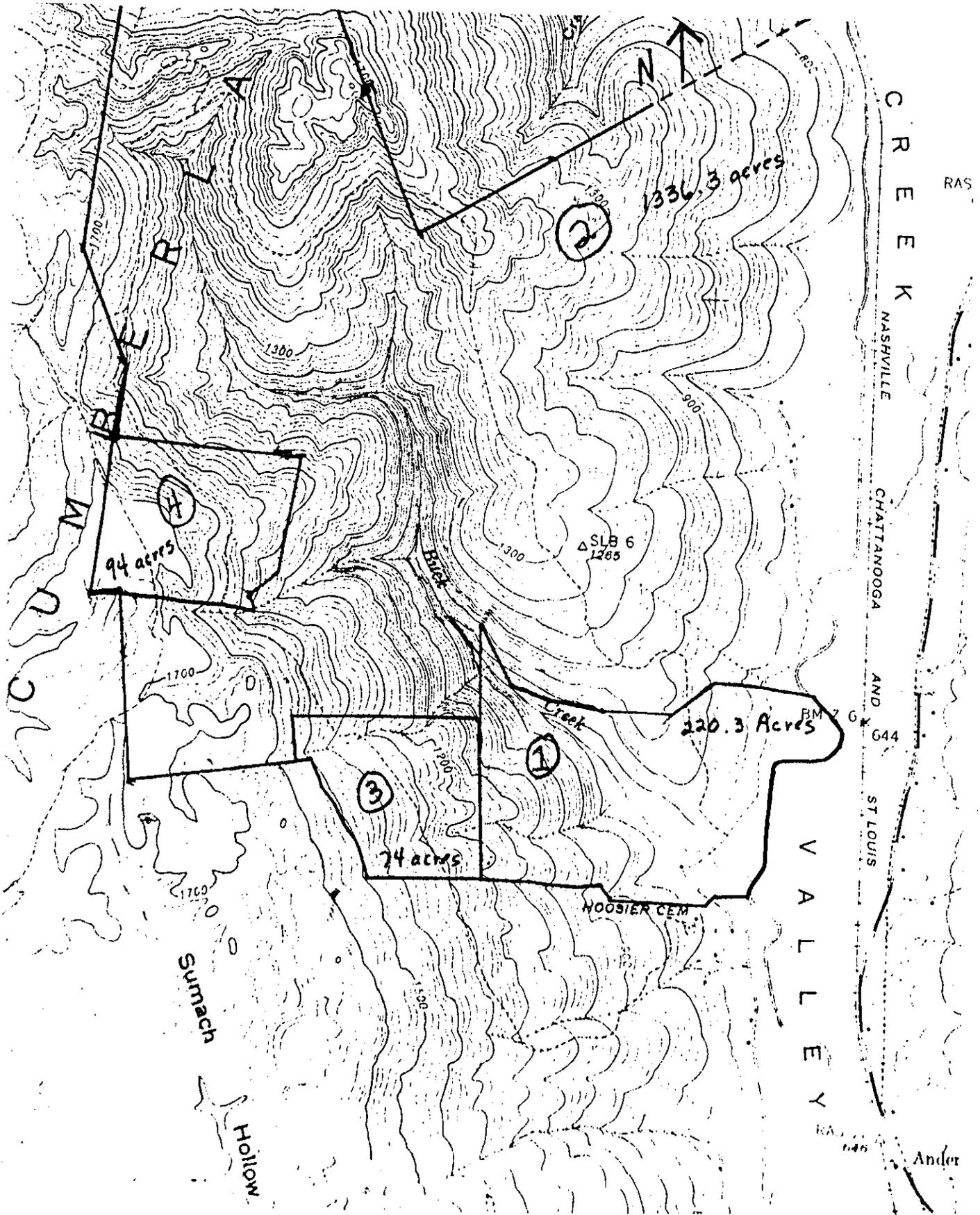


Figure 3. Boundary Caption

- (1) Robert A. Hoosier
Rt. 1
Sherwood, TN 37376
- (2) Clyde T. Carter
1103 Fleetwood Drive
Lookout Mountain, Georgia 37350
Phone (404/820-1730)
(Administrator for the huge Carter Estate and probable owner of the Buck Creek Cove lands)
- *Mineral rights - R. D. Campbell
c/o Gene Campbell
1467 Market Street
Chattanooga, TN 37402
- (3) L. L. Wynne
Sherwood, TN 37376
(deceased, immediate family moved away from area long ago)
- (4) R. P. Stevens
Sherwood, TN 37376

*Further details available from Tennessee Nature Conservancy or Saul Steel, Wilms Cove Road, Winchester, Tennessee 37398 (615/967-2044), former land overseer for the Carter family.

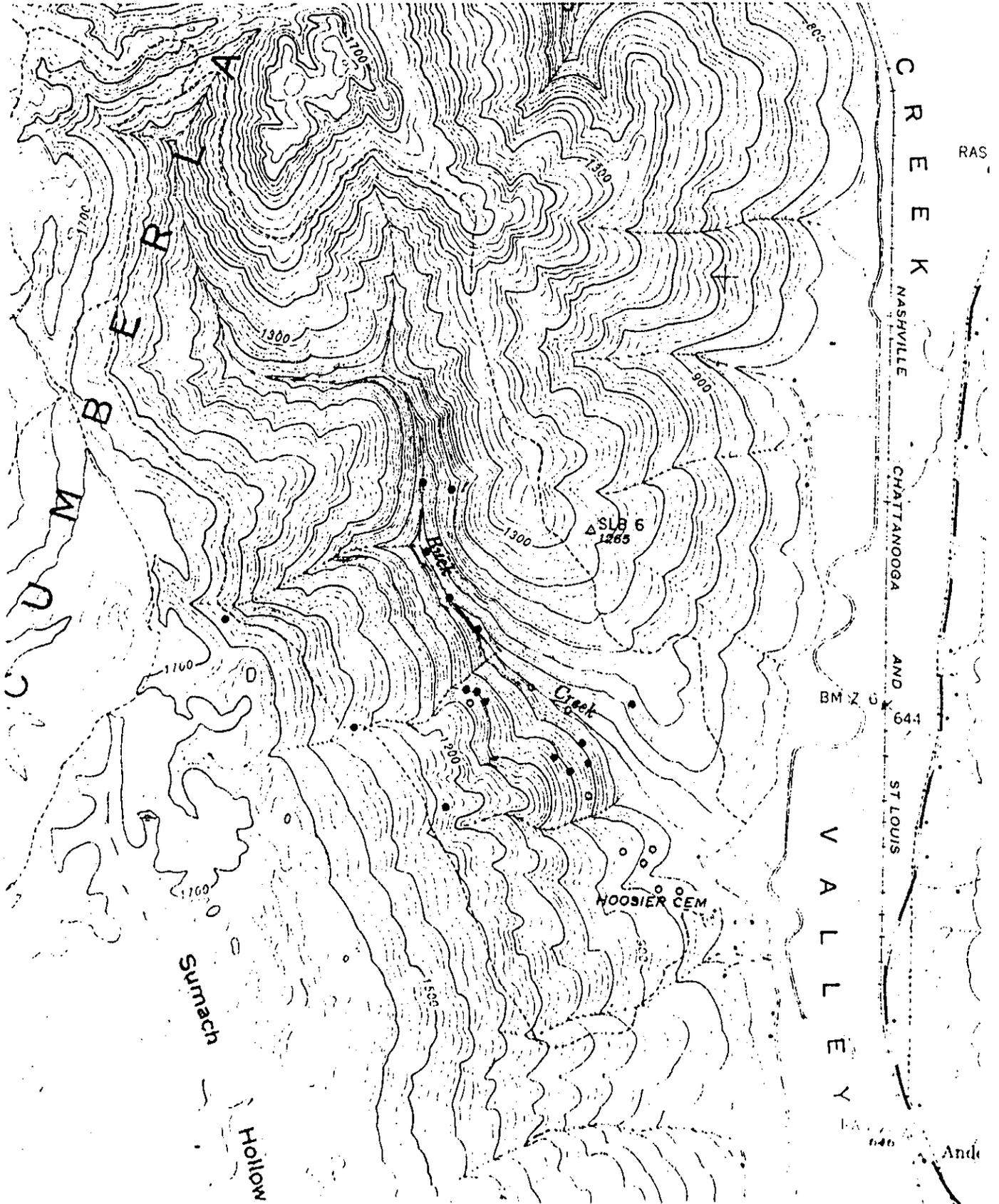
present undisturbed habitat is presumed healthy, but establishment of baseline data should determine the existence of any downward trend not readily apparent.

1.2.1 Develop monitoring techniques.

Initial work should concentrate on distribution within the cove, estimates of population density and levels of population fluctuations. Better estimates of the snail's numbers and distribution (see Figure 4) will require thorough searches of the cove and that the snails be sampled or censused. A mark/recapture program should be initiated during the first season (see Blinn, 1963; Elwell and Ulmer, 1971; and Southwood, 1978, for suggested methods). Monthly surveys are not an unreasonable goal for the first year or two. Sampling should be under as uniform conditions as possible including consideration, though, that snails may be more active at night, after rains, or at moderate temperatures. After 4-5 years of data accumulation, estimates can be made to evaluate the population's stability. Anguispira alternata (Elwell and Ulmer, 1971) is thought to mature 2-3 years after hatching. Population trends (after initial work) over a 3-year period should show if recruitment is occurring on a regular basis. Regular recruitment could be one criterion for population stability.

Figure 4. Topographic Map of Buck Creek Cove (USGS Sinking Cove Quadrangle) showing snail localities observed in 1981.

- o shells only
- live snails



Attention should be paid to habitat and environmental factors, such as rainfall and temperature patterns, flooding and drought, extent of treefalls and exposure of new limestone.

1.2.2 Implement monitoring program.

After baseline data have been established, it will be necessary to continue at least periodic monitoring to assure that the population and habitat remain within acceptable parameters. This activity could be handled by any of the agencies and organizations identified in task 1.1.

1.3 Manage A. picta habitat if justified.

The need for habitat management will depend on the population status and the feasibility of applying management actions.

1.3.1 Conduct preliminary evaluation as to the necessity for management.

A. picta has sustained some habitat loss due to human activity, but the total loss may not be significant in terms of maintaining a healthy self-sustaining population. Evaluation of the data obtained from task 1.2.2 will aid in making a final decision. If there is an apparent need for restoring or managing habitat, it will be necessary to complete task 1.3.2, but only if task 2. has been completed and it is evident that no populations exist outside of Buck Creek Cove.

1.3.2 Study limiting factors and develop management techniques.

At present little or nothing is known about the snail's life history or population dynamics. Information is needed on reproduction, activity patterns, food and habitat requirements, predation, mortality rate, and interspecific relationships.

Interspecific interactions may prove important since many other types of snails including another Anguispira (A. alternata crassa, a widespread southern form) occur in the cove.

Additionally, A. cumberlandiana and subspecies, another complex of Anguispira species that are very similar to A. picta, occur all around Buck Creek Cove but not in it. Why this is so is unknown.

Once sufficient data are available, an evaluation should be made as to the possibility of applying management actions, and recommendations should be prepared accordingly.

1.4 Determine present and foreseeable threats to the species.

1.4.1 Evaluate potential for overcollection, and if needed develop post-delisting control measures.

If overcollection is a threat, develop in concert with the State and local governments and/or landowners a method for regulating collection of the species after delisting. However, such strictures should not be so harsh as to interfere with beneficial studies by trained malacologists.

1.4.2 Assess other threats.

It is assumed that logging, over-grazing, and the prolonged drought of 1980-81 (made more severe by chanelization of Crow Creek downstream) have had some adverse effects on the species. Other human activities within the cove may be threatening to the species. A major forest fire or limestone quarrying could easily destroy the entire population.

2. Determine if populations of Anguispira picta exist outside Buck Creek Cove. Discovery of new populations would require a reevaluation of recovery objectives and could make recovery easier. The evaluation of other potential habitat areas should be accomplished prior to any extensive financial involvement in long-term protection, monitoring, or management of Buck Creek Cove habitat.

- 2.1 Locate sites on the southern Cumberland Plateau where habitats similar to Buck Creek Cove may exist.

Existing soil and topographic maps should be very useful in locating sites that may contain appropriate habitats for the snail.

- 2.2 Survey sites for potential snail populations.

Likely areas should be searched for Anguispira picta populations. The assistance of qualified taxonomists may be required to verify the identification of species. If doubt exists, several shells should be collected and retained for positive identification.

- 2.3 Investigate status of any newly found populations.

Data on population status (see task 1.2) will be required for any new areas. This information will be necessary to evaluate recovery.

3. If new populations of Anguispira picta are found, reevaluate the plans and make necessary changes in the objectives and the step-down outline.

New finds would necessitate revision of recovery objectives since the present actions assume the snail is found only in Buck Creek Cove.

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PART III.

IMPLEMENTATION SCHEDULE

Priorities within this section (Column 4) have been assigned according to the following:

- Priority 1 - Those actions absolutely necessary to prevent extinction of the species.
- Priority 2 - Those actions necessary to maintain the species' current population status.
- Priority 3 - All other actions necessary to provide for full recovery of the species.

IMPLEMENTATION SCHEDULE

Painted Snake Coiled Forest Snail

General Category	Plan Task	Task Number	Priority	Task Duration	Responsible Agency			Estimated Fiscal Year Costs			Comments/Notes
					FWS Region	Program	Other	FY 83	FY 84	FY 85	
A2	Develop conservation agreement with Hoosier family	1.1.1	2	1 yr.	4		TNC, TWRA	500	--	--	(Note: All estimates are for FWS costs only)
I14	Contact landowners	1.1.2	2	1 yr.	4		TNC, TWRA	1,000	--	--	
A1, A2, A3, A6, A7	Implement protection measures	1.1.3	2	Continuing	4		TWRA, TNC	2,000	2,000	2,000	
R1	Develop monitoring techniques	1.2.1	3	1 yr.	4		Contractor	--	2,000	--	Contract conceivably could include tasks 1.3.1, 1.4.1, 1.4.2, 2.1, 2.2, 2.3.
I1, I2	Implement monitoring program	1.2.2	3	Continuing	4		TWRA, TNC Others	--	--	1,000	
R2	Evaluate the necessity for management	1.3.1	3	1 yr.	4		Contractor	--	1,000	--	
R4	Develop management techniques	1.3.2	3	1 yr.	4		Contractor	--	--	Unknown	Possibly for FY 85 or later.
M3	Manage habitat if needed	1.3	3	Unknown	4		TWRA	--	--	--	This task is possibly for future fiscal years.
I14, M7	Evaluate overcollection; develop necessary controls	1.4.1	3	1 yr.	4		Contractor	--	1,000	--	
I2, I9, I10, I11	Assess other threats	1.4.2	3	1 yr.	4		Contractor	--	500	--	

IMPLEMENTATION SCHEDULE

Painted Snake Coiled Forest Snail

General Category	Plan Task	Task Number	Priority	Task Duration	Responsible Agency		Estimated Fiscal Year Costs			Comments/Notes	
					FMS Region	Program	Other	FY 83	FY 84		FY 85
16	Determine potential habitat sites outside Buck Creek Cove	2.1	3	1 yr.	4		Contractor	--	4,000	--	Cost estimate also includes task 2.2.
11	Survey potential habitat	2.2	3	1 yr.	4		Contractor	--	--	--	
11	Evaluate any new populations	2.3	3	Unknown	4		TMRA, TDC	--	--	1,000	
04	Reevaluate recovery objectives if new populations are found	3.	3	1 yr.	4			--	--	--	
					Abbreviations:						
					TMC - The Nature Conservancy						
					TMRA - Tennessee Wildlife Resources Agency						
					TDC - Tennessee Department of Conservation (Heritage Program)						

GENERAL CATEGORIES FOR IMPLEMENTATION SCHEDULES *

Information Gathering - I or R (research)

1. Population status
2. Habitat status
3. Habitat requirements
4. Management techniques
5. Taxonomic studies
6. Demographic studies
7. Propagation
8. Migration
9. Predation
10. Competition
11. Disease
12. Environmental contaminant
13. Reintroduction
14. Other information

Management - M

1. Propagation
2. Reintroduction
3. Habitat maintenance and manipulation
4. Predator and competitor control
5. Depredation control
6. Disease control
7. Other management

Acquisition - A

1. Lease
2. Easement
3. Management agreement
4. Exchange
5. Withdrawal
6. Fee title
7. Other

Other - O

1. Information and education
2. Law enforcement
3. Regulations
4. Administration

* (Column 1) - Primarily for use by the U.S. Fish and Wildlife Service.