PRELIMINARY REPORT OF BIOLOGICAL INVESTIGATION

VALDINA FARMS SINKHOLE ~ MEDINA CO., TEXAS

by

Glenn Longley

ENVIRONMENTAL SCIENCES
OF SAN MARCOS
SAN MARCOS, TEXAS 78666

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For

EDWARDS UNDERGROUND WATER DISTRICT
2603 Tower Life Building
San Antonio, Texas 78205

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INTRODUCTION

Valdina Farms Sinkhole occurs on the recharge zone of the Edwards Aquifer in Northwest Medina County. The cave is located 0.4 mile east of Seco Valley Road at a point 2 miles north of the entrance to Valdina Farms. Valdina Farms is owned by Mr. Robert Woodward. The Sinkhole is located near an un-named branch of Seco Creek where it enters the Seco Creek.

Geologists of the U.S. Geological Survey have observed large quantities of water entering the sinkhole during floods. The Edwards Underground Water District proposes to construct a dam on Seco Creek with a diversion channel that would direct additional water into Valdina Farms Sinkhole. The U.S. Geological Survey estimates that the proposed construction would add an average of 1400 acre feet of water to the aquifer each year. This flow would otherwise leave the recharge zone. The diversion channel is to be constructed in a manner such that boulders, large rocks and other large debris will not enter the cave. The entrance to the diversion canal will be several feet off the bottom of Seco Creek, and the channel will have a large bar screen on it. This arrangement will keep large rocks and trees out of the sinkhole. This will effectively prevent the cave from being clogged with debris.

BACKGROUND

An excellent description of the cave occurs in the publication, "The Caves of Medina County" prepared by the Texas Speleological Survey (Reddell, 1967). References to 80 publications that include discussions of cave biology in Medina County are included in a list taken from Reddell, 1968 (Appendix I). I have prepared a list of references to the genus Eurycea in Texas (Appendix II). These references are to the most important papers on the cave and spring dwelling salamanders in Texas. I have also obtained a list of references prepared by Samuel S. Sweet which include more references to Texas cave salamanders (Appendix III). I have reviewed a manuscript by Samuel S. Sweet that discusses the relationships between surface dwelling and cave dwelling populations of the salamanders of the genus Eurycea along the Balcones Escarpment in Texas. Mr. Sweet has concluded from his studies that Eurycea troglodytes Baker, 1957 (Valdina Farms Sinkhole Salamander) is a hybrid swarm and thus an invalid taxon which should be placed in synonymy with Eurycea neotenes Bishop and Wright, 1937 [part] (surface dwelling salamander found in many springs on Edwards Plateau) and Eurycea tridentifera Mitchell and Reddell, 1965 [Part] (a form found in Honey Creek Cave, Comal County, Texas) (Sweet, 1977).

I have reviewed many of the papers and reports that discuss Valdina Farms Sinkhole and have also read as many as possible that discuss the cave biota. I have been working directly with the subterranean aquatic fauna

of the Edwards Aquifer since 1973. During the last year I have published three papers that describe new species from the Edwards Aquifer. I am in the process of writing several other papers at the present time which will describe new species and discuss the ecology of the Edwards Aquifer in much detail. I have been requested to present papers at the Second International Groundwater Symposium to be held in Roanoke, Virginia, next September. I spent a week at the U.S. National Museum, Smithsonian Institution in Washington, D.C. consulting with researchers there on various groups of organisms that occur in the Edwards Aquifer. My overall goal is to eventually get a very good picture of the relationships of all the organisms inhabiting the aquifer and their population ecology. My studies have indicated that this aquifer has the greatest diversity of subterranean fauna of any aquifer in the world. This view was first proposed by scientists at the U.S. National Museum after seeing the diversity of organisms in my collections.

I feel that because of my experience working with the aquifer continuously I can speak with some authority about what effect a proposal such as the one by the EUWD would have on the aquifer in the area of Valdina Sinkhole.

In February of this year I submitted a report to the U.S. Fish and Wildlife Service, Office of Endangered Species on the status of Eurycea rathbuni, the Texas Blind Salamander. This report is being published by the Fish and Wildlife Service in their Endangered Species Series (Longley, 1977). I also currently am under contract with the U.S. Fish and Wildlife Service to prepare a report for them on the two species of blind catfish occurring in the Edwards Aquifer in Bexar County.

On November 11, 1977, at the request of the Edwards Underground Water

District (EUWD) I travelled to Valdina Farms Sinkhole. At approximately 7:30 p.m. we met Mr. Harlan Wolff at his business in Hondo, Texas. Mr. Wolff and Mr. Richard D. Reeves, Hydrologist, U.S.G.S. directed us to the Valdina Farms. We met the ranch foreman, Mr. Colvin and proceeded to the cave entrance, arriving at approximately 9:30 p.m. where we examined the entrance and made camp. No activity by bats was noted.

As a support team I had the following persons: Mr. Jack Ralph, my graduate student in Aquatic Biology at Southwest Texas State University; Mr. John Chelf, experienced vertical caver and President of the SWTSU Caving Club; Mr. Dale Pate, experienced vertical caver and employee of the U.S.G.S. Water Resources Division in Austin, and Miss Maria Cossey, experienced vertical caver and biology student at SWTSU.

DISCUSSION

On Saturday, November 12, 1977, we entered the sinkhole. This was done after preparing two special caving ropes for the descent by rappel. At approximately 8:30 a.m. Mr. Floyd Potter, Texas Parks and Wildlife arrived with the following individuals: (name misplaced), Head-Non-Game (=Endangered Species Section), Texas Parks and Wildlife; Bruce A. Moulton, Environmental Division, Texas Department of Water Resources (formerly Texas Water Development Board) and Bob (last name missing), graduate student of Dr. Clark Hubbs at the University of Texas, Austin (representing the Sierra Club) - primary training Icthyology. Mr. Potter provided a truck with a winch having a steel cable for the descent of his group. Mr. Potter did not enter the sinkhole.

Everyone entered the entrance pits before 11 a.m. Equipment was lowered to the floor of the entrance pit. This included plankton nets, hand screen, and large curcular net, water sample jars, lighting, rubber 2-man raft, specimen jars, etc. When all equipment was at the bottom we proceeded down the east passage to the pool of water having some quano in it (Pool "A") shown in Figure 1. The first water samples were taken from this pool before it was disturbed. A small catfish, Ictalurus natalis (yellow bullhead) was observed in this pool. The fish was estimated to be 2 inches long and since eyes were present there was little doubt but that it was washed in from the surface during rains. Material for biological examination was collected from this pool. Since the water was apparently too deep to cross without swimming I decided to explore the remaining

western passages before attempting the crossing of the pool. When one stands at the brink of the pool, the end cannot be seen due to a curve in the passage.

We walked back toward the base of the entrance pit and numerous cave crickets (prob. Ceuthophilus cunicularis) were noticed on the walls and floor of the east passage. Small gnats were attracted to our lights. When we reached the base of the entrance pit, we entered the west passage. One rather slick descent occurs at approximately 360' to the west of the entrance pit. This was rigged with a nylon rope for use in lowering equipment and serving as a handline. We continued on until a long pool was encountered (Pool "B"). Before taking samples for water chemistry we observed another catfish (yellow bullhead) probably 5-6" long. I led the group down this water passage observing every portion in front of me before disturbing it. This pool was one that Samuel S. Sweet has been most successful in collecting the salamanders, Eurycea troglodytes. No salamanders were seen. The pool reached depths of approximately 5½ feet, and we had to hold gear above our heads to keep it from being completely soaked. In this passage there were some stalactites up to 3 feet long. As we waded through this passage we could hear running water and as we arrived at the end of the pool we were at the intersection of a passage running at approximately a 90° angle to the passage we had just left. A small gravel bar was present at the end of the pool in this area and a small stream of water runs from the gravel at this point forming a small riffle. This riffle area had been indicated as a particularly good collecting site by Mr. Potter. He had indicated that the salamanders could be found in the gravel. Some time was spent at this area searching through the gravel for organisms of any kind. None were found. From this point

we continued down the passage which turned to the southwest. More water passage (Pool "C") was encountered, and no salamanders were seen. At the end of this water passage another riffle area was encountered. The gravel of this riffle was also carefully searched for organisms, and none were found. From this point we climbed up a narrow opening into a large room with sloping floors. One could observe water through the rubble on the floor at the base of a pit. One small member of my support team, Mr. John Chelf, crawled through a very narrow opening that led to this water (Pool "D"). He reported that the water apparently continued in passage to the southwest. No organisms were seen in this pool. We retraced our movements to the intersection where we continued to the northeast. The passage became very low and narrow (tubelike), and the bottom was covered with 5-6 inches of fine clay mud. After approximately 180 feet of crawling on hands and knees and stooping we reached more of this type passage at a slightly lower level. It contained water (Pool "E") with thick mud on the bottom of the pool. We crawled through this for about 80 feet reaching a room with space to stand up, but having very thick, deep mud on the floor. It was almost impossible to walk or crawl through this area. Passage continued in two directions from this point. One continued up and to the right into rooms with no apparent other exits. The other continued up a very slick, mud covered, steep incline to the left. At the top of this incline one had to drop down a steep slope at the base of which was a small tube with deep mud on the bottom. This tube continued downward to a small pit. From this pit a steep mud covered slope was encountered. When the crest of the slope was reached the other side was a very deep pit that would require ropes to traverse. Apparently this was as far as this cave has been penetrated. No evidence was present for activity beyond this point. In the

last room before the deep pit there were numerous stalactite and soda straw formations. The chore of returning up the muddy incline from this room was difficult. At this point nothing in our packs was dry, and we were covered with thick mud from head to toe. We returned to the intersection where we sat in the pool (Pool "B") and made an attempt to remove enough mud from ourselves and our equipment so that we could continue. We returned through the west passage to the base of the entrance pit. Since night was near, we decided to leave the equipment in the cave and return the next day to cross the deep water in the east passage. We climbed out on ropes and the other group were pulled out using the winch and parachute harness. I would like to point out that this is not a recommended method for leaving the cave since the hook at the end of the cable tends to get caught at the rock lips. Several potential problems exist with the winch: 1) The cable may catch in crack and pull hook off end, 2) It may catch on a rock and pull the rock loose, and 3) there is too little control by person on the cable.

During the entire time in the cave few signs of recent activity by bats were noted. A few very small piles, <1 foot in diameter, of quano were noted that appeared to be of fairly recent origin. No very large accumulations of quano were noted. Most of the large deposits in the cave appeared to be mud. It is possible that below the mud were some older deposits of quano. No bats were noted in the cave. No sign of activity from the past summer was noted unless the very small piles of quano were from then. A few old bat skeletons were found but were in very poor condition. In the evening of November 12th no bats were seen leaving the cave. We camped a second night next to the entrance. Floyd Potter and his group left the sinkhole before dark Saturday evening.

The morning of November the 13th we entered the cave a second time. We

spent much time at the base of the pit looking for biological specimens. A listing of the organisms found in the cave appears in Table 1. We pumped up the 2-man raft and carried it to Pool "A" in the east passage. I crossed the approximately 30 yards of water passage first, and the others pulled the raft back and Mr. Ralph and Miss Cossey also crossed the water in the raft. We then walked another approximately 135 feet and came to Pool "F" which filled the passageway as the passage sloped downward to the east. An approximately 7 inch yellow bullhead catfish (Ictalurus natalis) was noted in this pool. The pool did not have bat quano in it. No salamanders were seen in this pool. No other organisms were found in this pool. No bats were seen the second day of exploration. In the passage between the two pools there are two roof passages that appear on the map (Figure 1) as domes. These are not domes, but passages in which no end could be seen. Special climbing equipment would be necessary to enter these since they go almost straight up. It is very possible that these connect with the bed of Seco Creek which is located just east of the entrance to the cave. We returned to the base of the pit and removed the equipment and climbed out. By the time we had everyone and everything out of the cave it was late afternoon.

The cave was extremely muddy and most rooms had been flooded at least 3/4ths of the way to the ceiling. It appears that water has stood in most parts of the cave at much higher levels in the not too distant past due to the amount of silt accumulation on all walls and floors with any surface exposed upward.

We also were shown another fissure (pit entrance) near the bed of Seco Creek about 1/4 mile upstream by Mr. Harlan Wolff who had done the survey for the project. It is very possible that this cave connects with Valdina

Table 1. List of organisms reported from Valdina Sinkhole.

From Previous Reports	This Report
Mollusca (snails)	Mollusca (snails)
Physa sp.	*Physa* sp.
Arthropoda	Unidentified sp.
Ostracods	
Candona sp.	
Copepods	
Macrocyclops albidus	
Paracyclops fimbriatus poppei	
Isopods	
Asellus sp.	
Protichoniscus reddelli	
Millipeds	
Gosiulus conformatus	
Centipedes	
Unidentified	
Arachnida (spiders)	Arachnida (spiders)
Achaearanea porteri	3 or 4 species
Cicurina sp.	unidentified
Circurina varians	
Nesticus pallidus	
Opilionids	
Hoplobunus sp.	
Pseudoscorpions	
Tejachernes sp.	
Mites	
Unidentified	
Thysanura	
Nicoletia texensis	
Orthoptera	
Ceuthophilus cunicularis	
Hemiptera	
Galgupha sp.	
Diptera	
Gnats (unidentified)	
	Collembola (springtails)
	Two species unidentified
Coleoptera (Beetles)	Coleoptera (Beetles)
Rhadine howdeni	1 species unidentified
Histeridae - Unidentified	
Notomicrus sp.	Annelida
Hamotus sp.	1 species unidentified
Urodeles (salamanders)	
Eurycea troglodytes	
Anurans (frogs and toads)	Anurans (frogs and toads)
Gastrophryne olivacea	*Gastrophryne olivacea*
Rana pipiens (misidentified prob.)	*Rana berlandieri*
Mammals	*Hyla versicolor*
Chiroptera	*Bufo valliceps*
Mormoops megalophylla megalophylla	
Myotis velifer incautus	
Tadarida brasiliensis mexicana	

Farms Sinkhole.

Some figures which are useful in evaluating this project are placed in Appendix IV.

CONCLUSIONS

In general, it is my determination that the proposed project will not adversely effect the salamander in the cave. Terrestrial organisms in the cave will be effected more than any other group. The aquatic fauna, including salamanders, Eurycea troglodytes, isopods and other forms will probably benefit from the increased input of organic matter into the cave by flooding. It seems likely that most of the bat populations have been gone from the cave for some time, thereby eliminating their associated input of energy in the form of quano. I do not feel that the salamanders have left the system, but instead may have retreated into other areas where more organic matter exists. Organic matter in any form, so long as it is non-toxic, will actually stimulate the amount of life in a subterranean system. If the EUWD will control the entrance of large debris into the system, as they have indicated, the cave will not clog up. It is possible that some new passage will open when some of the mud is washed out of the system. Leaves and small drift will furnish more organic matter for the increase of energy flow in the system.

It has been my experience while studying other parts of the aquifer to find that organisms are generally not restricted to one cave, but instead are found in several caves in a particular area. The argument that certain of these forms are not found in other areas is based only on those known accessible caves in the general area. Many other caves may exist in the area that have not been discovered (example - the cave 1/4 mile upstream

in Seco Creek discovered during surveying).

It is obvious to those of us that are familiar with the hydrology of the aquifer that recharge enhancement is a necessary procedure to help meet the ever increasing demands on the aquifer. Estimates of water use by the year 2020 show that the estimated use will exceed by greater than 30% the present average recharge (Longley, 1975). The loss of head in the aquifer to levels below spring openings at New Braunfels and San Marcos would have a far greater detrimental effect on biota than would the recharge into Valdina Farms Sinkhole. For example, in the San Marcos River there are two endangered species of fish, one salamander and several invertebrates. If the spring flow stops these forms will become extinct in all but man made refugiums. The main thing that would endanger these species is loss of spring flow.

Another argument that has been made is that the flooding will cause collapse of unstable parts of the cave. I did not note any particularly unstable appearing parts of the cave in the area near the entrance pit which would collapse under the effect of increased inflow. Any collapse that would occur should not plug the very large passages near the pit entrance. Areas away from the entrance will have the flow stabilized by the morphology of the cave. I do not foresee a torrent raging through the cave after the water level rises in response to the first water entering. There is very little chance of the cave completely flooding to the ceiling of all rooms due to the enormous size of many passages.

I would recommend that (if this project is allowed to proceed as it should be) a follow up study of this cave be made after flood waters from Seco Creek have entered the cave. This would allow biologists to view the effects of such a modification so that recommendations can be made for future projects of a similar type.

SUMMARY

In summary, the following main conclusions have been derived from this study:

1) The project will not cause the extinction of Eurycea troglodytes (Valdina Farms Salamander).
2) There is considerable doubt that the salamander is a distinct species, but instead is a form of Eurycea neotenes (Edwards Plateau Spring Salamander).
3) The cave will not plug up as a result of the proposed project.
4) The additional recharge that will include some non-toxic organic matter will stimulate the subterranean ecosystem.
5) The recharge will be of considerable benefit to the aquifer which is having ever increasing demands placed on it by pumping.
6) This will likely benefit organisms in springs fed by the aquifer due to prolonged flow.
7) This site is one of the best possible choices for additional recharge due to the low population density in the watershed above the site. Due to its location this area will not be heavily populated in the foreseeable future.
8) Any risk to terrestrial forms in the cave is far outweighed by the benefits to organisms in other areas (this includes man).
9) Pesticide use in the area above the watershed should be maintained at present levels which apparently are minimal.
10) Persons involved in the evaluation of this project should look at

the overall benefits and weigh them against the potential costs environmentally.

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APPENDIX I

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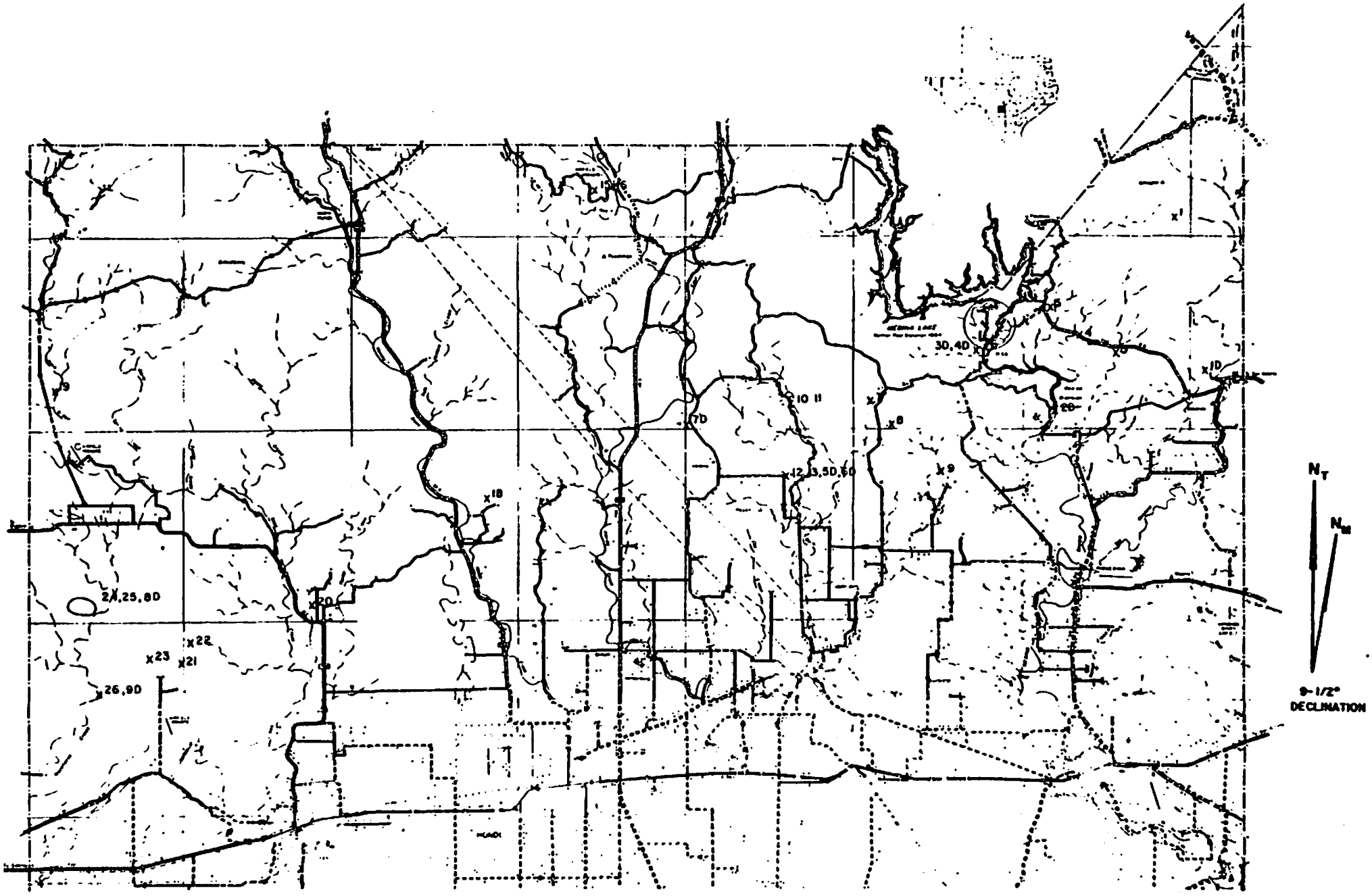
APPENDIX IV

INDEX TO THE CAVES OF MEDINA COUNTY

(From Reddell, 1967)



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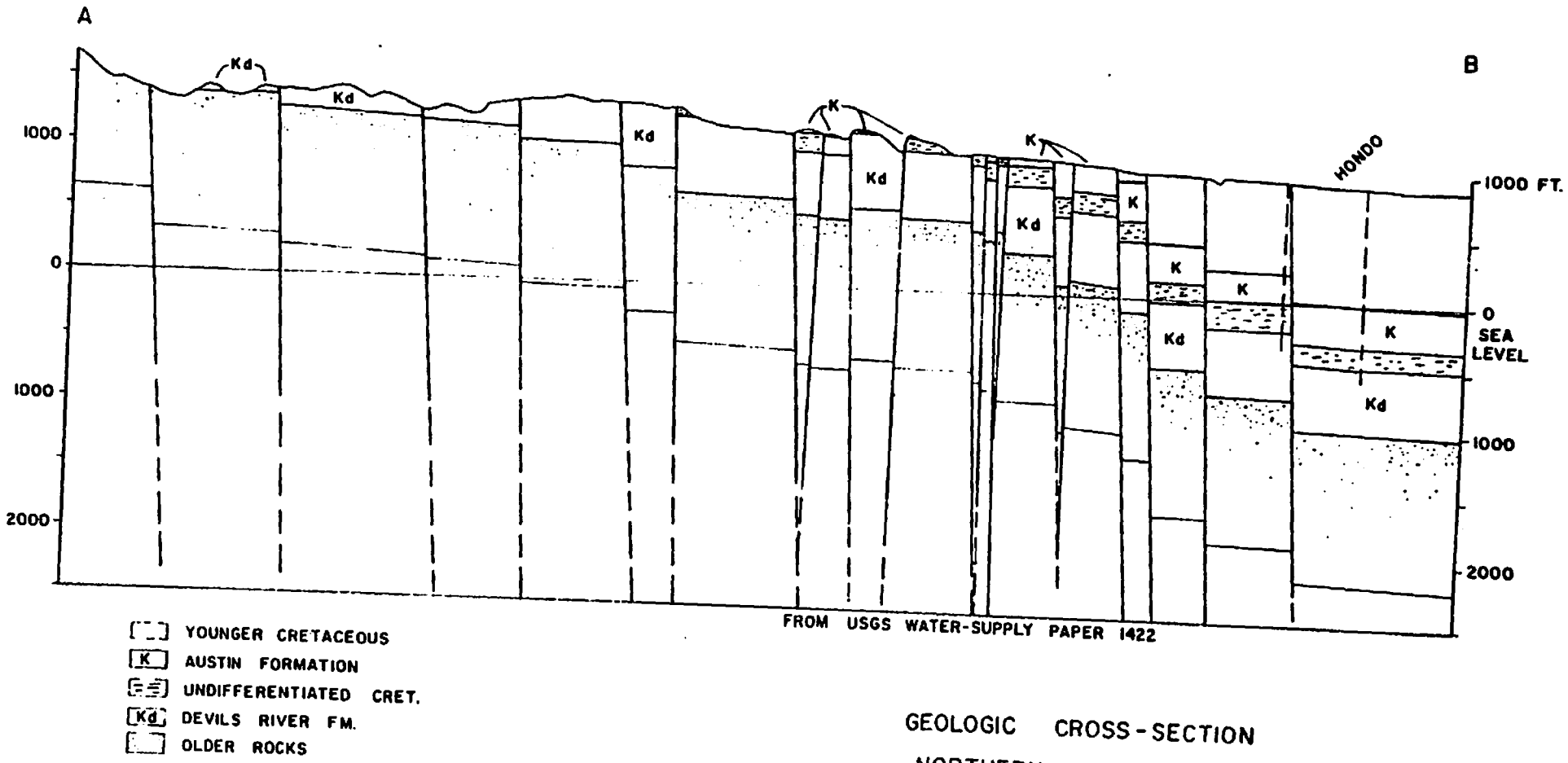
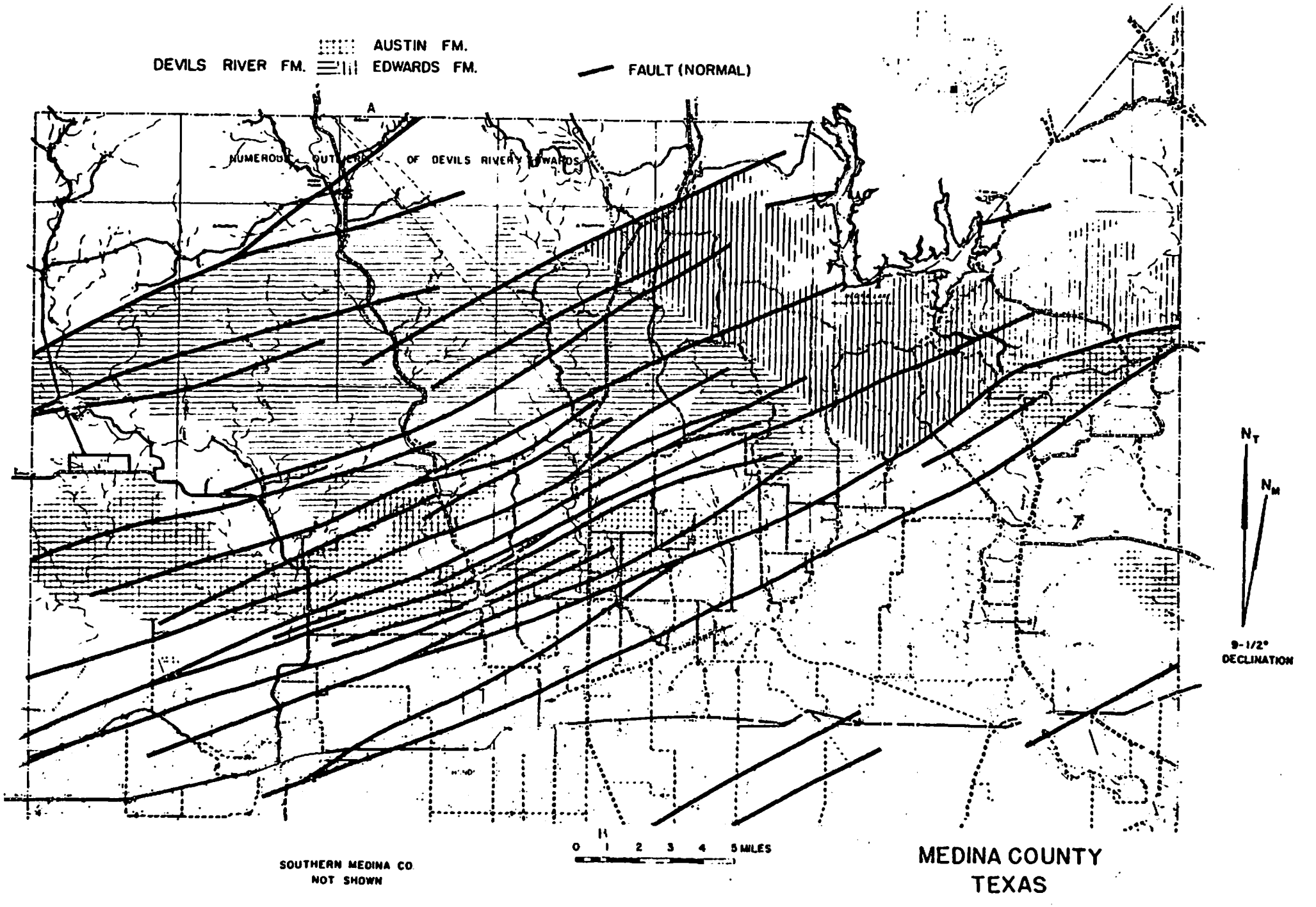


GEOLOGIC CROSS-SECTION
NORTHERN MEDINA CO.

(From Reddell, 1967)



(From Reddell, 1967)