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# Exploring the Future of Friesenhahn Cave

Dylana Watford

*Trinity University, [dwatford@trinity.edu](mailto:dwatford@trinity.edu)*

Katherine Banick

*Trinity University, [kbanick@trinity.edu](mailto:kbanick@trinity.edu)*

Graham Bates

*Trinity University, [gbates@trinity.edu](mailto:gbates@trinity.edu)*

Tori Carey

*Trinity University, [vcarey@trinity.edu](mailto:vcarey@trinity.edu)*

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# EXPLORING THE FUTURE OF FRIESENHAHN CAVE

Dylana Watford, Katherine Banick, Graham Bates, Tori Carey

Senior Seminar ENVI/GEOS 4301

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## ABSTRACT

Friesenhahn Cave in San Antonio, Texas, offers a wealth of paleontological artifacts. The cave is owned by Concordia University and is primarily managed by Dr. Laurence Meissner, professor of biology at Concordia. Since its discovery in the early twentieth century, researchers have discovered numerous Pleistocene fossils; aside from the La Brea Tar Pits in California, Friesenhahn Cave is the most Pleistocene fossil-rich site in the United States. Recently, little research has been conducted in the cave, though it is believed that many fossils remain to be discovered. We propose the establishment of the Friesenhahn Cave Foundation, a non-profit organization whose purpose would be to promote research, education and conservation regarding the cave. We analyze comparative models to help develop an effective framework for the Friesenhahn Cave Foundation, which would be governed by a nine-member board. It would be the responsibility of the board to accomplish Foundation goals. We include a mission statement in an effort to help the board achieve these goals. Moreover, we outline board member duties, explore funding possibilities and discuss effective outreach methods.

## INTRODUCTION

The Friesenhahn Cave is one of many caves in the greater San Antonio Area and has proven a valuable resource for academic research in paleontology; the cave is one of the most important sources of Pleistocene vertebrate fossils in North America (Concordia University). The site of the cave is currently owned and operated by Concordia University, and it is in need of a long-term management plan to ensure its protection and longevity. The University is looking for ways to increase funding for the preservation of the cave and the surrounding area and to increase educational and research activity associated with the cave.

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We suggest that the best way to actualize the desires of Concordia University would be to establish a non-profit foundation whose purpose would be to obtain funds, to promote awareness of the cave, and to promote educational and research activities. We have included a proposed mission statement that concisely describes the purpose of the foundation. We have also explored the most efficient development of the non-profit foundation, which would necessarily include a that might help sustain preservation efforts in the future. Relationships with local schools, universities, and museums will be important to the efforts of the foundation. In this report, we recommend the involvement of numerous organizations and people with the foundation, so it will be wise to take their needs and concerns into consideration when developing a management plan. In addition, we have examined the management practices for the Robber Baron Cave, and we have also investigated the research and preservation efforts, as well as the board structure, of the Welder Wildlife Foundation, which we use as comparative models for the Friesenhahn Cave Foundation. As part of these efforts, we recommend exploring the purchase of a conservation easement or the pursuit of a National Natural Landmark accreditation.

### FRIESENHAHN CAVE

Friesenhahn Cave is located in northern Bexar County, Texas, approximately one mile west of Highway 281 and a few miles north of Highway 1604 [Figure 1]. The lot is approximately square, about 400 feet by 400 feet, and is completely surrounded by a subdivision with houses that come within feet of the property's border. The cave site is currently landlocked; the only access point from the street is owned by a developer (Meissner).

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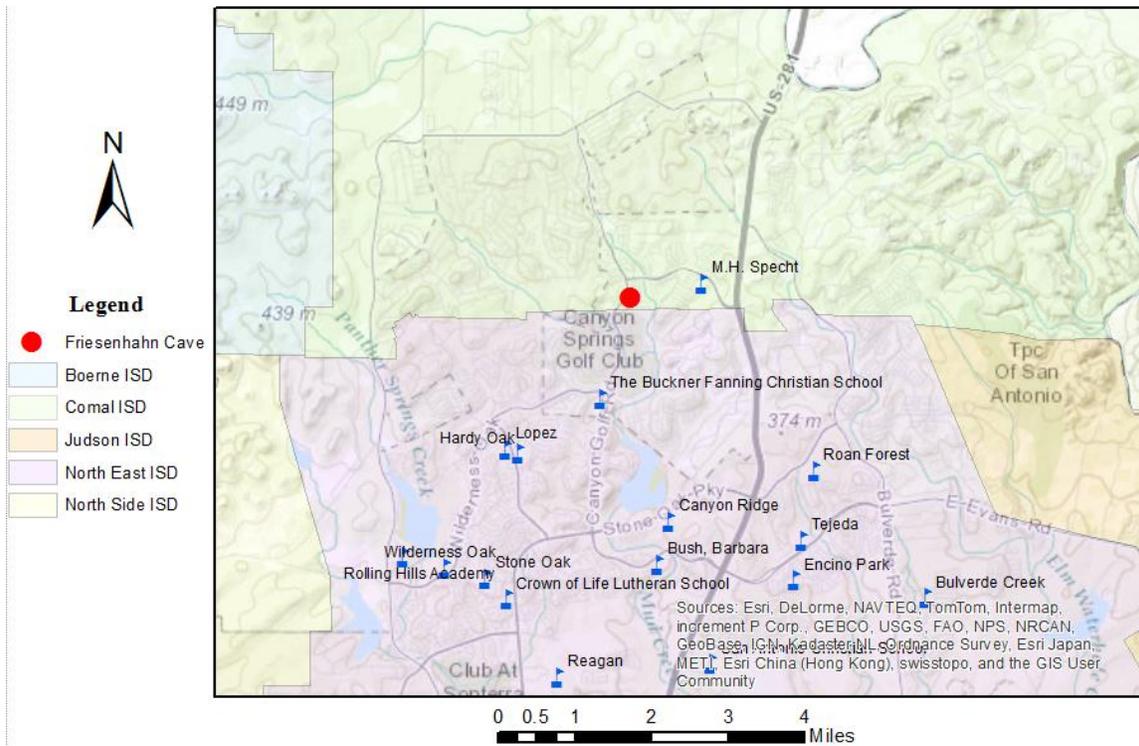


Figure 1: Map of northern Bexar County showing the cave location and San Antonio school districts and schools (Andrews; Esri; KlizcanoCOSA). This map was created using ArcGIS® software by Esri. ArcGIS® and ArcMap™ are the intellectual property of Esri and are used herein under license. Copyright © Esri. All rights reserved.

The cave is located on the southeastern part of the Edwards Plateau, which is underlain by a series of thick limestone beds in which many solution caverns have developed (Evans 7). Various native animals, especially saber-toothed cats, frequented some of these caves during the Pleistocene (2.6 million to 11,700 years ago), and the caves have preserved many of their remains (Evans 7). However, the Friesenhahn Cave is the only richly fossiliferous cave among the many that have been explored in the region (Evans 7). Indeed, Friesenhahn Cave has been identified as one of the most important paleontological sites in the United States ("Friesenhahn Cave"). Besides the La Brea Tar Pits in California, it is believed that no site in the United States has yielded a greater variety of significant Pleistocene vertebrate fossils ("Friesenhahn Cave"). From excavations conducted by the University of Texas at Austin over 40 years ago, the Friesenhahn Cave has yielded over 4,000 isolated teeth and bones of more than 30 genera of ice

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age mammals, reptiles, and birds, many of which are on display at the University of Texas Memorial Museum in Austin ("Friesenhahn Cave").

The entrance to the cave is a vertical, well-like opening which is 6 to 10 feet in diameter and 30 feet deep (Evans 7). This opening passes through limestone into an underground chamber about 60 feet long and 30 feet wide [Figures 2-4] (Evans 7).

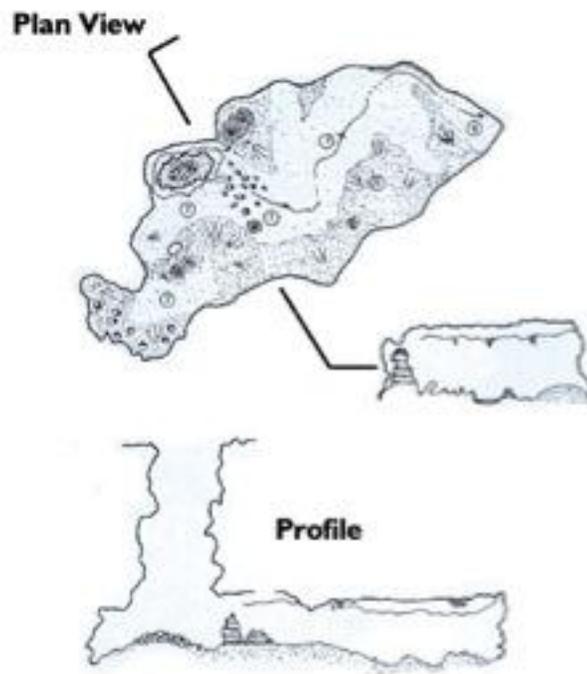


Figure 2: Plan and profile view of Friesenhahn Cave (Gentet et al.).

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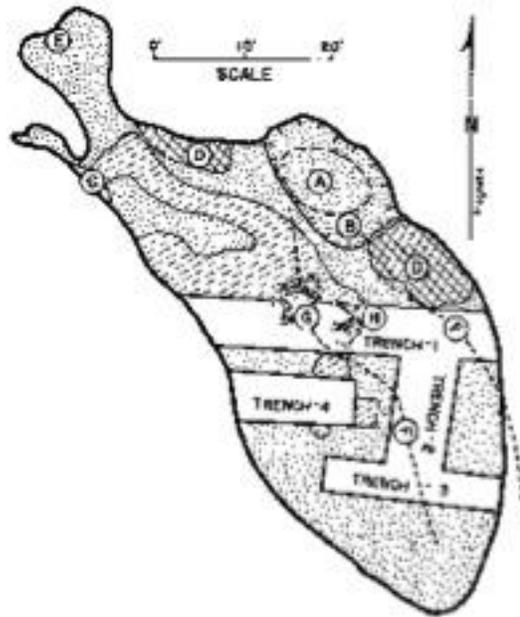


Figure 3: Floor plan of Friesenhahn Cave ("Friesenhahn Cave").

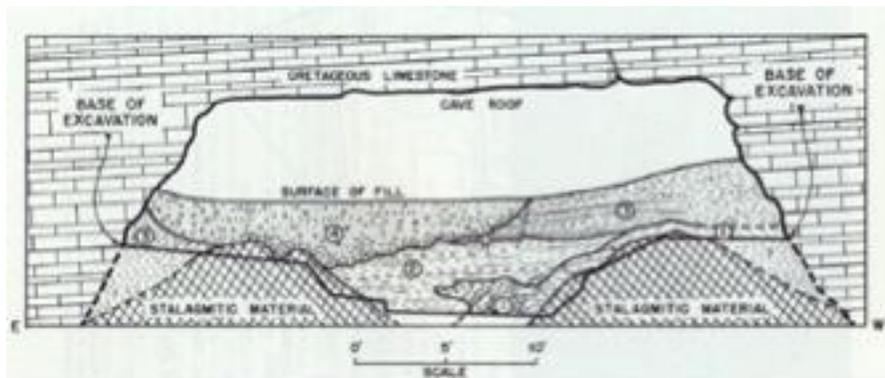


Figure 4: Cross Section of Friesenhahn Cave showing stratigraphic relation of several units of fill ("Friesenhahn Cave").

The cave, though small, records a wealth of information about the paleontological history of south central Texas. Much can be learned from the cave deposits that are applicable to fossil deposits in other areas (Evans 9). The fossils are especially interesting because they represent an

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ecologic assemblage from a local environment accumulated in a relatively short interval of geologic time, and they include important new material from previously little-known species. For instance, *Geochelone wilsonia*, a turtle species represented by very few specimens worldwide, was discovered in the cave ("Friesenhahn Cave"). Clearly, this site is a valuable resource for paleontological research.

Currently, Concordia University in Austin, Texas, owns the cave as well as the small area of land surrounding it ("Friesenhahn Cave"). Dr. Laurence Meissner, professor of biology at Concordia University, is investigating possible partnerships and development opportunities for the cave. Dr. Meissner would like to develop a plan for the cave that involves a three-pronged approach of conservation, research, and education. Our goal is to provide Concordia University with recommendations on management not only of the care, maintenance, and safety of physical resources, but also of decisions pertaining to organizational structure of a governing board for future research projects as well as funding for those efforts. Although the current president of Concordia University is willing to consider proposed plans, there are very limited funds available; therefore, part of any plan must include a way to obtain funds to support conservation, research, and education efforts. In order to ensure sustainable protection of the cave, there needs to be a long-term plan, likely involving the establishment of a non-profit organization that can manage, promote, and raise funds for the cave.

Current stakeholders for Friesenhahn Cave include Concordia University, the University of Texas at Austin, the University of Texas at San Antonio, the Texas Memorial Museum, and Concordia faculty member Dr. Meissner. All of these stakeholders have put a significant amount of work into excavating the cave, so it would make sense for them to remain important stakeholders and to be involved in the planning and management of the property. Dr. Meissner is

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currently directing research at the site, but there is the potential to involve more stakeholders in the research process (Meissner). Local schools and universities also have a potential interest in the future of the cave. Due to their close proximity to the cave [Figure 1], local schools would benefit most from the educational and research opportunities the cave has to offer. The local residents would be stakeholders as well, for they live near the cave and are thus affected by activities in and around it. These residents may have a direct interest in the future development of the cave, as their property values might be impacted by decisions made regarding the site.

### RESEARCH QUESTIONS AND PROJECT PLAN

We have developed a functional conservation plan for the Friesenhahn Cave. To do this, we focused our research upon four questions that serve as a framework for the creation of a nonprofit foundation. In order to ensure the long-term sustainability of Cave related activities, what type of organizational structure should be used to oversee the cave and activities pertaining to it? Preserving this cave will not be free: what financial model should be established to support cave preservation and activities at the site? What is the best way to secure legal conservation and protection measures? For Dr. Meissner and other stakeholders, research and educational activities are a priority; how might we incorporate research and education on the site and in its future management?

Our initial research led us to consider creating a 501(c) (3), non-profit organization similar to the governing body of the Welder Wildlife Foundation (“Welder Wildlife Foundation”). We examined the process of creating a board that could function independently of Concordia University and raise funds for the research, education, and conservation efforts of the cave. We also analyzed the viability of other organizational models and the use of established organizations like the Texas Cave Management Association. In addition, the attraction of visitors

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to the cave might be important for the solicitation of donations that could facilitate conservation efforts. In order to help establish a reputation as an educational center, incorporating models of community and education outreach will also be essential. From these ideas and our research, we have created a proposal that could achieve the goal of developing a functional and sustainable conservation management plan for the Friesenhahn Cave.

### MISSION STATEMENT

The development of a mission statement should be one of the first tasks completed by the founding members of the Friesenhahn Cave Foundation. The mission statement will be a way for the board to explain their purpose and goals to future board members, potential donors, and the general public. A clear, strong mission statement will provide a guidepost for the Foundation, increasing the likelihood of long-term sustainability. There is a plethora of relevant mission statement models, particularly from conservation groups in Texas, such as The Texas Land Trust Council (“Mission Statement”). We suggest that the Friesenhahn Cave Foundation develops a mission statement similar to the example below:

*It is the desire and purpose of the Friesenhahn Cave Foundation to preserve this source of knowledge and to provide a means to educate people about the significance of the cave and the discoveries that have been made within it. We believe that such an important site should be recognized as a source of local pride with the hopes that it connects people to the history of this land.*

This mission statement clearly states the purpose of the cave, which is primarily to promote educational outreach activities and research at the cave. It is also important to show that the Foundation stands behind preservation of the natural beauty surrounding the cave. Since there is potential for further development in the area, it will be important for the board to stand

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behind this goal. Also, current and future generations should be able to visit this site and experience a connection to nature and the area's past. One goal of the Foundation should be to inspire people to learn more about Texas' prehistoric wildlife and explain why it is important for people to be involved in excavating and protecting this cave and others similar to it. A mission statement that clearly outlines the Foundation's key goals will help guide the actions and decisions of the Foundation.

### BOARD OF DIRECTORS

The best way to realize a mission statement similar to the one above is to establish a board of directors for the Friesenhahn Cave Foundation. Establishing a board of directors is particularly important for a non-profit organization. In *Financial Planning for Nonprofit Organizations*, Blazek argues that without a strong board to support the foundation, the foundation's missions and its integrity could be severely damaged (Blazek). One must consider which positions to create, how to fill those positions, how to distribute duties, and how to coordinate efforts between board members when creating a board (Blazek).

An active board can bring more visitors to the site by raising community awareness about both the cave's existence and its accessibility to the public. Though we do not suggest complete public access due to concerns about degradation of the site, we do encourage hosting visitors, particularly researchers or master naturalists, at the cave site. Specific members of the board can organize trips to the site and oversee activities at the cave to ensure their success. Currently, Friesenhahn Cave is frequented only by those who contact Dr. Meissner. However, a board could foster more research by managing and promoting cave visits. Scientific findings from such visits could foster appreciation for the natural history and the paleontology of Texas. Also, a board can

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help maintain the property, both aesthetically and financially, and monitor activity surrounding the cave.

Furthermore, a board is an excellent way to form a network with surrounding communities, including schools and museums. Education and community outreach should be the most important goals of the Foundation, and the board will play an important role in these two areas. The board could both incite and support additional research and educational activities at the cave, both of which are crucial for the cave's conservation. Currently, very little research and very few educational activities are being conducted at the cave site, and without a steady source of funds, it will remain in its relatively inactive state (Meissner).

The board would be comprised of key stakeholders who have significant interest in the cave's welfare. Keeping the board small at its inception would be most effective, but we recommend the creation of an advisory board as interest in the cave develops. This non-voting board could be a way to keep community members involved with Friesenhahn Cave. Ideally, a website detailing the specifics of the cave and its research would be developed by board members. A regularly updated website is one of the most useful ways to cultivate interest in the cave and keep the community informed. Active, meaningful communication about the cave sets up the foundation for success.

### BOARD MEMBER ROLES

The board's duties should be to govern and direct the non-profit's affairs; therefore, its members must be selected carefully. The personal interests and skills of each board member are important to maintain an active and motivated foundation. We recommend creating a board of nine members, divided into two subcommittees: the executive committee, which includes the president, vice president, secretary and treasurer; and the functionary committee, which includes

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the activities coordinator, the research director, the education director, the trip directors and the community liaison [Figure 5]. It is important to note that each member on the board is not isolated from any other because intercommunication and cooperation are essential. All board members must be willing to communicate with each other. An explanation of the specific roles of each board member follows:

1. *President*. The President oversees everything on the board. To some extent, he or she steers the direction of the board's governing, although the President's vote does not count more heavily than anyone else's. The President is responsible for establishing a regular meeting time and ensuring a productive meeting. He or she dictates the meeting's agenda and has the final say in assigning a project to a certain board member.
2. *Vice President (VP)*. The VP primarily assists the president and can call for additional meetings as he or she sees fit. The VP encourages communication between the two subcommittees and actively attempts to keep the lines of communication open. The VP often is the one who contacts members of the community outside the board about Friesenhahn Cave.
3. *Secretary*. The secretary takes careful notes and records of each meeting; he or she also must be a bookkeeper for events at the cave (both proposed events and actualized events). He or she keeps a log of contacts and can assist in the VP's duty of communication. As such, the secretary and VP often work closely together. The secretary's records and documents must be kept up-to-date with the President; he or she gives monthly reports to the President (or reports after each meeting, whichever is more frequent).
4. *Treasurer*. The treasurer is the Foundation's accountant. He or she monitors expenditures of the board and calculates costs of possible trips, as well as how economical past trips were (this is to create a standard for future trips). The Treasurer is aware of current funds and what sort of

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money may be needed for a particular project. He or she often works with the trip director and activities coordinator to ensure a financially secure project.

5. *Research Director.* The research director would ideally be a current or past professor, or at least someone who is very familiar with the research process and requirements. As the title's name suggests, the research director works closely with universities and students to facilitate research conducted at the university-level at Friesenhahn Cave. The research director would communicate directly with universities (primarily those in San Antonio, Austin, College Station, San Marcos, or other nearby institutions) and promote academic interest in the cave. He or she would relay potential and current projects to other members of the board, especially the activities coordinator, the trip director, and the President.

6. *Education Director.* The education director's role is particularly important. His or her goal will be primarily to work with schools, both near Friesenhahn Cave and those further away. Later on, we will expand upon the duties of the education director, since this role is among the most important in fulfilling our proposed mission statement.

7. *Community Liaison.* The community liaison is responsible for procuring the involvement of museums, other non-profits, government agencies or other members of society. He or she must maintain good relations with these entities by keeping interested parties updated and maintaining open lines of communication. Additionally, he or she must actively promote knowledge of the cave to the San Antonio community at large and create more park amenities. The community liaison participates in special "green" or "eco" events, such as Earth Day or San Antonio's own Fiesta Verde.

8. *Trip Director.* The trip director's primary role is to ensure that activities planned at the cave occur properly. He or she must follow through with ideas and plans and complete

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paperwork (such as liability forms issued by Concordia University, parental permission forms, etc.) necessary to carry out activities. The trip director will work closely with the education and research directors, as well as the community liaison. He or she will be responsible for informing the Executive Committee of proposed trips and keep the officers informed and updated of established trips. The trip director will likely need to maintain contact with Concordia University and Dr. Meissner in particular.

9. *Activities Coordinator.* The activities coordinator works directly with the trip director and teachers in developing safe, fun, educational and effective activities appropriate for the cave's visitors. The activities coordinator must work closely with the education and research Directors. Because each trip will vary slightly, the activities coordinator must adjust his or her plans to account for inevitable differences. Based on interest and feedback from visitors (which the activities coordinator should illicit and consider), the activities coordinator can propose the addition of new amenities to the cave site, such as a parking lot and information kiosk.

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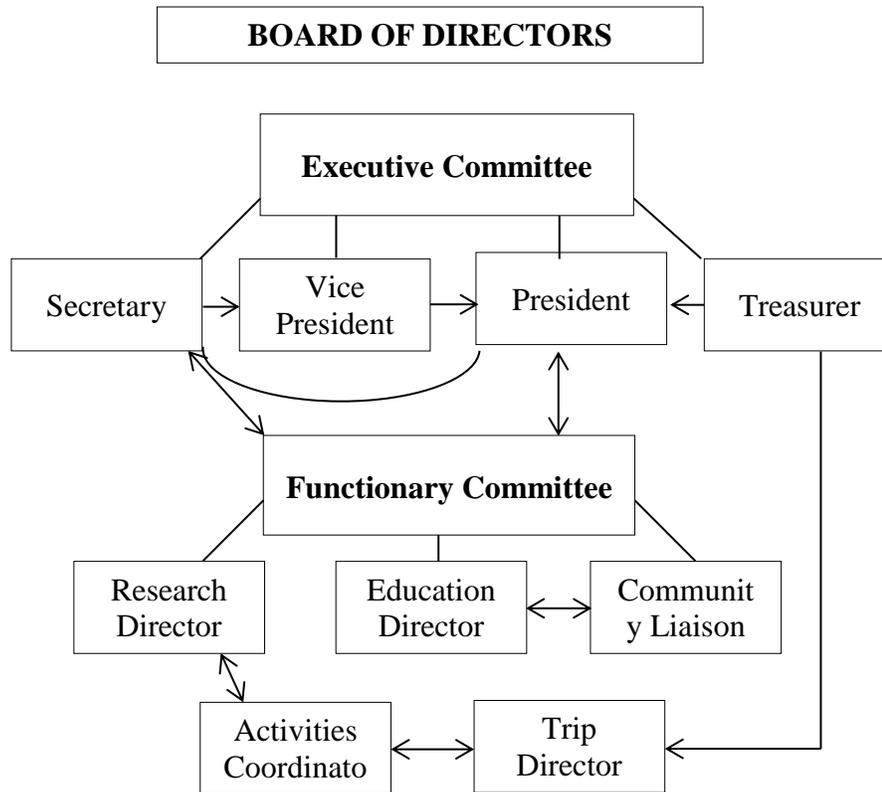


Figure 5. Schematic diagram of our proposed Board of Directors. Within the functionary committee, we suggest creating board members designated specifically for initiating education and research as well as outreach to the community.

## FUNDING AND DONORS

Funding is an important aspect of any nonprofit organization. Concordia University's current president is willing to support a plan that is put forward regarding the future of Friesenhahn Cave, but this plan must include funding. For the cave, it will be beneficial to consider individuals, board members, corporations, and foundations as potential donors.

An appeal can be made to local residents for funding support, since they will be most directly affected by what happens with the cave property. Having a well-managed natural area would enhance property values and provide intrinsic environmental and aesthetic value to the area, which is a great incentive for local residents to support the Foundation (Crompton).

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According to Wilbur in *The Complete Guide to Nonprofit Management*, it is best to start with the board members for access to key corporate and foundation donors (111). For instance, having board members associated with the Texas Natural Science Center, the University of Texas at Austin, or the Texas Cave Management Association could provide the opportunity for these organizations to become donors.

Funding from the Texas Natural Science Center (TNSC) at the University of Texas at Austin, would be beneficial to the cave because it could help support both educational programs and paleontological research at the cave site. The TNSC might be interested in funding the cave because it “works to create awareness, understanding and appreciation of the past, present and future of biological diversity, especially that of the state of Texas,” (“What is the TNSC”). Both the Texas Memorial Museum and the Vertebrate Paleontology Laboratory (VPL) are part of the TNSC (“What is TNSC”). While the Texas Memorial Museum deals more with educational programs, the VPL focuses primarily on research. They could support paleontological research being done at the cave as well as educational programs at the cave site. All TNSC educational programs are funded by donations from individuals, corporations such as National Instruments, Tokyo Electron America, AMD, SBC, Temple-Inland, ConocoPhillips, as well as other foundations (“What is TNSC”). The research at VPL is funded by the Geology Foundation of The University of Texas at Austin, the National Science Foundation, Texas Advanced Technology Program, and the Intel Foundation (“Vertebrate Paleontology Laboratory”). Therefore, funding from the TNSC could provide access to funding from numerous other individuals, corporations, and foundations. Having access to any of these funds would prove useful in maintaining and protecting Friesenhahn Cave.

## OUTREACH

### EDUCATIONAL OUTREACH

Local schools will be especially important for outreach efforts. Frequent field trips to the actual site are impractical due to dwindling school budgets and because the site itself is not suitable for younger students. However, we suggest the board inform local teachers and students about the cave by means of portable education kits. Leilah Powell of the Brackenridge Park Conservancy suggested making kits that can be designed to serve as an entertaining and educational way to make the cave “mobile.” The education director of the board will be responsible for working with local K-12 teachers in an attempt to develop the best methods for reaching students. By keeping an ongoing discourse with local teachers, the education director can develop an education kit that fits the teaching needs of most schools and that allows for modifications to suit individual teacher’s needs. Teachers will have the option to rent trays of a selection of fossils that were discovered in the cave, which they can then incorporate into their lesson plans. The education director can develop and maintain several educational webpages that target the different grade levels. The webpage should be interactive and provide the students with interesting and vital information about the geological and historical significance of the Friesenhahn Cave.

Since the Friesenhahn Cave is a valuable resource to the schools of the area, it is particularly important to foster a relationship between the Comal Independent School District (CISD- the cave’s property is within this school district), the bordering North East Independent School District (NEISD) and the Friesenhahn Cave Board. The education director will fill the role of liaison between local schools and the board. In particular, the education director will actively communicate with the following schools, all of which are within five miles of the cave: Tuscany Heights Elementary (NEISD), Roan Forest Elementary (NEISD), Encino Park

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Elementary (NEISD), Canyon Ridge Elementary (NEISD), Hardy Oak Elementary, Specht Elementary (CISD), Jose M. Lopez Middle School (NEISD), Barbara Bush Middle School (NEISD), and Reagan High (NEISD) [Figure 1].

However, communication should not be limited to these schools. The education director will act as the communication link between schools and the board and will coordinate with interested schools to schedule a visit and ensure that the proper paperwork is signed and processed. The education director will also handle any education rentals (such as the fossil trays). Schools that wish to rent a cave educational kit will send a request to the education director, who will then deliver the kit to the school and later pick the kit up when the rental period is finished.

Additionally, the education director will reach out to local students through outlets other than these schools. Other local organizations, such as the Brackenridge Park Conservancy, have had success in educating the public about their specific efforts through national organizations interested in connecting the nation's youth with nature. The nonprofit organization Children and Nature Network is active in the Bexar County area and is a promising means for educational outreach. The Children and Nature Network works with local organizations, bringing them together in single venues to connect with the public. The education director will be responsible for discovering, building and maintaining beneficial relationships with pertinent organizations. This will likely require at least bimonthly meetings and forums, which will keep the Friesenhahn Cave Foundation aware of new or upcoming opportunities to educate the public about the cave. It will be the education director's responsibility to decide how best to represent the cave and the board in such events. This will likely involve a trifold tabletop display (including important information about the geology and history of the cave) and simple educational activities (e.g., fossil sorting). The community liaison and education director will collaborate to provide

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information on how members of the community, including students, can stay involved with the cave, and how community members can actually visit the cave.

### COMMUNITY OUTREACH

To expand community outreach and volunteer services, we suggest involving the Texas Master Naturalist program. This program develops a group of educated volunteers to provide education, outreach, and service dedicated to the beneficial management of natural resources and natural areas within their communities ("Texas Master Naturalist"). Friesenhahn Cave could rely on such volunteers to implement youth education programs, upkeep the cave and the surrounding natural area, and to provide leadership in relevant local public events. They could also assist the education director with the distribution of education kits to local schools. Master Naturalists are currently involved in numerous projects similar to those mentioned above, including developing and maintaining natural areas, leading school classes on nature hikes, and conducting workshops at local schools ("Texas Master Naturalist"). There is already a San Antonio chapter of Master Naturalists, so incorporating them into the future of the cave should not be a difficult task. The involvement of Texas Master Naturalists can foster a taskforce of well-informed volunteers dedicated to Friesenhahn Cave. The Foundation can rely on them to help spread knowledge of the cave and interest in it, thereby bridging gaps between the public and those already involved in the cave.

### MUSEUM OUTREACH

An additional key resource for educational and community outreach is through Texas museums. Many museums within Texas feature local artifacts and fossils. As a significant source of these, the Friesenhahn Cave is an ideal partner for any of these museums. The cave's close proximity to many museums in both San Antonio and Austin make its extensive collection of

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unique, well-preserved fossils a suitable exhibit for museums. The board should establish a partnership with these museums to ensure that these opportunities can be realized.

An exhibit in a museum would display certain fossils discovered in the cave. Such an exhibit could provide interesting facts and information about the fossils, the cave itself, and the history of the area. A well-curated museum can discuss a significant amount of information using just one artifact, or even a cast-model of larger fossils. Different museums could structure the educational information in different formats to target specific age groups. Collaboration with museums would give the cave some well-deserved publicity and it could attract potential donors into viewing the cave as a philanthropic opportunity. Museums would allow for more people to experience the cave without having to go see it in person.

There are many museums within the San Antonio and Austin areas with which it would be ideal for the board to work. The Witte Museum in San Antonio is an excellent starting place. It influences many people from Bexar County and beyond, with 125,000 school-aged children visiting the museum each year (*The Witte Museum*). The Witte already reaches out to many people, targeting audiences who would surely be interested in Friesenhahn Cave. At present, there are eight long-term exhibits open in the Witte, and the majority of which are focused on Texas (“Long-Term Exhibits”). The artifacts from Friesenhahn Cave could be added to already-existing exhibits, such as “A Wild and Vivid Land: Stories of South Texas” or “Texas Wild: Ecology Illustrated” (“Long-Term Exhibits”). For the latter case, we suggest presenting ecological information about the cave’s current site, as several unique species have been found there. We have compiled a list of contacts for the Witte Museum, which we have provided for the board (Appendix 1).

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In addition to the Witte Museum, the Texas Memorial Museum in Austin is also a suitable choice. It already houses several fossils from the cave, including the noteworthy saber-toothed tiger skeletons. The community liaison should reinforce communication and cooperation with the Texas Memorial Museum, as its Hall of Geology and Paleontology could integrate the discoveries of Friesenhahn Cave. This Hall displays many different dinosaur and fossil specimens, including Texas-specific fossils, such as those that Friesenhahn Cave provides (*Texas Natural Science Center*). The Hall features a unique interactive activity where visitors can identify fossils from the Austin area in addition to an exhibit known as the “Paleo Lab”, where on-site paleontologists and interns respond to questions while preparing fossils for display and research (*Texas Natural Science Center*).

The Texas Memorial Museum is already partnered with the University of Texas’ Texas Natural Science Center. Therefore, it seems likely that the museum would be willing to unite with the board in an effort to achieve the goals of education. Indeed, the educational component of this museum meshes well with the goals of the Foundation. We have also developed a list of contacts at the Texas Memorial Museum to be given to the board (Appendix 1).

### RESEARCH AND UNIVERSITY INVOLVEMENT

Research has been and will continue to be an important aspect of Friesenhahn Cave. As previously mentioned, the cave has been identified as one of the most important paleontological sites in the United States, making it a prime study area for paleontological research (“Friesenhahn Cave”). Of course, there are many more research opportunities at the cave site that do not involve paleontology. Research could also be conducted on the cave system itself or even on the surrounding ecology. A partnership with local universities such as the University of Texas at San Antonio, Trinity University, Texas State University, and the University of Texas at Austin

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could provide ample researchers, professors and students alike, for the cave. These partnerships would also support higher-level educational opportunities. It would be beneficial if a few professors from these universities become members of the advisory board to work closely with the research director. Any input or advice on cave research activities that they could give the research director would assist in the board's decision-making processes. The board would have to oversee (by means of the research director) proposed project ideas and research agendas involving the cave. It would also make final decisions regarding which research plans could be actualized.

### COMPARATIVE MODELS

We found two management models suitable for Friesenhahn Cave: the Robber Baron Cave and the Welder Wildlife Foundation. The Robber Baron Cave is a historically significant cave in San Antonio. It is currently under the management of a non-profit organization which has successfully managed both the cave and the surrounding property. The Welder Wildlife Foundation is also under the management of a non-profit organization. It serves as an example of how to integrate research interests with preservation efforts. Both the Robber Baron Cave and the Welder Wildlife Foundation are excellent illustrations of the importance of establishing a clear and sustainable method for any conservation project.

### ROBBER BARON CAVE AND THE TCMA

The Robber Baron Cave is similar to Friesenhahn Cave in several ways. Both Friesenhahn Cave and Robber Baron Cave are located in Northern San Antonio, where there is suburban sprawl. Thus, both caves face the detrimental effects of development and will have to establish methods to maintain cave health. While the Friesenhahn Cave is currently owned by a

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university, Robber Baron Cave is under the management of the nonprofit organization known as the Texas Cave Management Association (TCMA). The transition of the cave site to a preserve managed by a non-profit organization led to restoration of the Robber Baron Cave, which made it more accessible to the public (Palit 2). A similar transition might be beneficial for Friesenhahn Cave, though access would be more limited. While the university need not give up ownership of the property, it could cooperate with an organization, like TCMA, that would establish and implement a governing structure. Otherwise, Concordia could model its own nonprofit after the TCMA.

The TCMA, “a non-profit organization [501(c) 3] dedicated to the study and management of Texas cave resources,” is one of 34 Texas land trusts and manages and owns numerous caves in Texas (“About Us”). In the hopes of promoting education, advancing research, and providing “responsible recreational access,” TCMA developed a management plan for the Robber Baron Preserve to supplement its current governing board. This plan clearly states the cave’s defining biological, geological, hydrological, meteorological, and historical resources (Mitchell 2).

In order to preserve these resources, TCMA also developed a strict access policy. The surface of the Robber Baron Preserve serves as a publicly accessible park and educational area. However, the cave itself is only open to the public through specially arranged guided tours. The Robber Baron Preserve manager approves the tours and their leaders, and all who enter the cave must sign a TCMA Liability Release Form. Each trip leader is required to provide the preserve manager a report of the visit. Though access is closely monitored, the Robber Baron Preserve is meant for the public. The Friesenhahn Foundation should consult a lawyer and draft a liability waiver, similar to the one used for Robber Baron, for all visitors to sign before entrance.

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The TCMA provides information to visitors both through a permanent kiosk at the cave site and an updated webpage (Mitchell 4). The Friesenhahn Foundation should consider a similar kiosk to be placed at the Friesenhahn Cave, which would include specifics about the cave's historical and geological significance, as well as a detailed map of the cave. The Robber Baron Preserve also works closely with the neighborhood, keeping periodic contact with the local neighborhood association, and the management plan recommends a yearly neighborhood work and visitation day (Palit 2). The intent is to “develop an aesthetically pleasant area in the residential neighborhood, encouraging pride and ownership, while continuing to preserve the land” (Palit 2).

The adapted management plans for the Robber Baron Preserve seem to be working well. Trash-dumping and vandalism incidents at the site have decreased, and the cave biota is thriving (Palit 2). In this particular case, the involvement of a non-profit organization that specializes in Texas caves was able to restore and preserve the cave site while creating stewardship within the developing community through education and involvement. While TCMA's management of Robber Baron serves as an excellent model for Friesenhahn Cave in many ways, there are some distinctions to consider. The Friesenhahn site is comparatively small and would not be able to hold large parties at one time. Friesenhahn's management plan will have to consider the site's limited space, especially in regards to parking. As stated in the mission statement, preservation is a key goal for the Foundation. While Robber Baron can be accessed by the public, this would not be the case for the Friesenhahn Cave. Alternatives to cave-site access, such as a virtual park, will need to be considered when engaging the community in the future of the cave. However, due to the potential for an increased number of approved researchers at the cave site, the board might need to consider the construction of a low-impact parking lot. A good location for this would be

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at the southwest corner of the lot where there is already a small clearing. To prevent vehicle runoff from reaching the cave, we suggest planting native species that could filter some of the inevitable runoff. Though we hope to keep visitation low, if deemed necessary, a small catchment could be built near the lot, to contain the pollution.

A close working relationship with the neighbors, like that of the Robber Baron model, is also essential; houses surround the site on all sides. Residential awareness of the cave's value as an educational and historical treasure will be a key factor in revitalizing the Friesenhahn Cave. A working relationship with the developer owning the land in front of the site is essential. One possible solution to the potential conflict of interest between Concordia and the developer would be for the Foundation to raise the funds to buy the land from the developer.

If the TCMA helps manage the Friesenhahn Cave site, it would play a vital role in obtaining funds to preserve the site and to make it accessible to the public. TCMA relies entirely on volunteers and donations to complete its projects. Private donors make contributions via the TCMA website. TCMA receives some additional funding through its membership program, which grants "access to TCMA caves (with restrictions for resource protection), voting privileges for TCMA directors, subscription to the newsletter" and other publications ("TCMA Brochure") in exchange for varying membership fees. TCMA's larger projects, such as the restoration of the Robber Baron Cave, are usually funded by grants from various parties, such as Texas Parks and Wildlife and U.S. Fish and Wildlife (Palit 2). TCMA's experience with the process of obtaining grants could help the Foundation receive funds for the preservation of Friesenhahn Cave. Even if TCMA is not responsible for the management of Friesenhahn, their model for funding could be adopted for the Friesenhahn Cave Foundation. The Foundation could

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establish similar membership programs to incentivize donations. This will be largely contingent on the maintenance of an easily accessible website.

### WELDER WILDLIFE FOUNDATION

Located in Sinton, Texas, the Welder Wildlife Foundation is a non-profit which protects a 7,800-acre natural area refuge (Welder). It was established by the will of Mr. R.H. Welder in 1954, in which he explicitly stated that the purpose of the refuge must include providing “conditions in which wildlife could live....and...opportunities for research and education in wildlife conservation and related fields” (Welder). The goals of Welder Wildlife Foundation are analogous to our proposed mission statement. Education and research are primary reasons to keep both of these sites preserved. With regards to research, the Welder Wildlife Foundation has awarded substantial research fellowships to over 300 graduate students pursuing both master’s degrees and Ph.D.’s (Welder).

In addition, the board of directors for the Welder Wildlife Foundation has been carefully maintained over the years. The first director was a conservationist and ornithologist; the succeeding directors have each had special interests in Texas’ native flora and fauna (Welder). Moreover, the Foundation maintains a well-formatted website. Here, users can find information about current board members and directors, as well as information about fellowship applications. The Foundation was initially supported by royalties from the oil, gas, and cattle industries, investment interest and various contributions (Welder).

The great variety of plants and wildlife in the area fosters an ample supply of research opportunities (Welder). Indeed, over 400 species of birds, 55 mammal, reptile, and amphibian species, and more than 1,300 plant species have been documented on or near the refuge (Welder). Clearly, the Welder Wildlife Foundation supports a valuable sector of land – and a

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sizeable one. In this sense, it is quite different from Friesenhahn Cave. The property surrounding Friesenhahn Cave is remarkably small and lined with housing developments. However, the cave and its surrounding few acres could be a small haven for flora and fauna within the bustling suburban community. Additionally, the site can provide a plethora of information about how housing developments impact wildlife and flora.

Unfortunately, the Friesenhahn Cave site does not have the space to provide students with substantial amenities similar to those within the Welder Wildlife Refuge. However, if the Foundation could raise funds, it could initiate research programs to support research and interest amongst university students. Surrounding universities, including those listed earlier, could participate.

### FURTHER RECOMMENDATIONS

Based on our research findings, we present two options to help accomplish the Friesenhahn Foundation's conservation goal.

### CONSERVATION EASEMENT

A conservation easement is one option to help ensure conservation of the Friesenhahn Cave site in perpetuity. A conservation easement is a binding agreement between two parties: the landowner and the holder of the conservation easement. Under this contract the landowner agrees to restrict certain uses of the land (Conservation Easements 4). This will legally bind current and future landholders to the agreed upon conservation terms, ensuring conservation of the cave site from development, even if Concordia University no longer holds the rights to the land. The landowner retains the legal title to the property, but either a governmental agency or a qualified land trust must be the holder of the conservation easement, and they have the right to

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periodically assess the property in perpetuity. This means that the landowner would deed some rights of the land to the easement holder, such as the right to grow crops or develop structures both now and in the future (Conservation Easements 4).

One of the main incentives for a conservation easement is a tax exemption. However, because Concordia University is already exempt from paying taxes on the cave site, a conservation easement might not be worth pursuing. Therefore, we are hesitant to consider this course of action. The cave is currently landlocked by the property of the developer, meaning that if the developer chooses to build or develop the land in any way, there may be no way for visitors to enter the cave site without establishing a new easement. However, the area of land that is owned by the developer is far too small for development of any kind and it does not seem to be an immediate threat to the cave. If it does become an issue in the future, then the board would be able to step in and take the necessary measures to ensure the preservation interest. In any case, the board must be aware of these circumstances and remain vigilant about the developer's actions.

### NATIONAL NATURAL LANDMARK

A viable option for the Friesenhahn Cave Foundation would be to establish the cave as a National Natural Landmark (NNL). The NNL program acknowledges and supports conservation of natural sites that feature biological and geological resources (“National Natural Landmarks Program”). NNLs are owned both publicly and privately (“National Natural Landmarks Program”). Friesenhahn Cave could be an appealing candidate for such recognition. As previously mentioned, it boasts impressive geological formations and provides an incredible array of paleontological artifacts. These numerous fossils and remains all contribute to a larger history of this region, extending millions of years into the past. It is a goal of the NNL program

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to protect natural sites that can strengthen our understanding of the diverse landscapes in the United States, thus Friesenhahn Cave is a good candidate for the program (“National Natural Landmarks Program”). A second goal of the program is to “strengthen the public’s appreciation of America’s natural heritage”, which is precisely what the Friesenhahn Cave Foundation might aim to do with its community liaison. Since the Foundation’s goals would likely mirror those of the NNL Program, it is feasible that the board would attempt to gain NNL status for the site and cave area.

NNLs vary in size (from less than four acres to over 900,000 acres) and becoming NNL-certified is a process which involves obtaining approval from three different scientists, as well as community recognition (“Frequently Asked Questions”). NNL designation has few tangible benefits, but owners can apply for funds to help manage their sites (“Frequently Asked Questions”). Despite its small size, we feel that Friesenhahn Cave could benefit from becoming a NNL. At the very least this could help raise awareness about the cave and it is a way to guarantee preservation of the cave. The La Brea Tar Pits in California have gained NNL status, and in terms of its paleontological importance, Friesenhahn Cave is second only to the La Brea Tar Pits. Since Friesenhahn Cave and the La Brea Tar Pits provide us with similar scientific knowledge, it is logical that Friesenhahn Cave is recognized on a national scale as well.

## CONCLUSION

The most suitable way to achieve the goals of Dr. Meissner and Concordia University regarding Friesenhahn Cave would be the establishment of the Friesenhahn Cave Foundation. The purpose of this Foundation would be to manage education, research, and preservation of the cave. The creation of a governing board for the Foundation is also important, as it will support the Foundation and its mission. However, in order to sustain preservation efforts into the future,

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the Foundation will need funding support not only from board members, but also from individuals, corporations, and foundations.

While the board should have many different duties, primary among them must be to appeal to schools and the surrounding community. Extensive effort must be made to involve the public and increase awareness about Friesenhahn Cave. In doing this, our proposed mission statement will best be realized. Specific members of the board, whose roles are defined by the needs of the mission statement, can optimize various techniques to educate, promote research and ultimately preserve Friesenhahn Cave. In particular, the education director, research director and community liaison can establish more activity around the cave and safeguard its future. Indeed, as the responsibilities of these roles are filled, appreciation for Friesenhahn Cave will increase. With further communication and promotion, a strong foundation and board could be created and the Texas community—and possibly the global community—would benefit greatly from the geological treasure that is Friesenhahn Cave.

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**APPENDIX 1: MUSEUM CONTACTS**

	<b>Position</b>	<b>Email</b>
<b>Witte Museum</b>		
Marise Mcdermot	President/CEO	marisemcdermott@wittemuseum.org
Randall Webster	VP of Exhibitions	randallwebster@wittemuseum.org
Amy Fulkerson	Curator of Collections	amyfulkerson@wittemuseum.org
<b>Texas Memorial Museum</b>		
Pamela R. Owen Ph.D.	Senior Paleontology Educator	p.owen@austin.utexas.edu