Urbanism and Cave Conservation In Central Texas

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Abstract

Cave management issues can be costly and may represent a serious burden to landowners. Cave conservation and cave invertebrate species protection may involve safety concerns, cost and time considerations, profitability, and unfortunately lack of concern. Conservation can be encouraged and incorporated into a project from the beginning to prevent unexpected delays or enormous costs involved in re-planning the design or long negotiations with agencies that may be involved. We can learn from the experiences of those who have gone before us and encourage land owners to think ahead in the process of developing land. Examples of Section 10 (a) permitting for cave-adapted invertebrates in Central Texas and examples of cave management plans with ideas for promoting cave conservation areas as an educational tool or community project will be discussed.

Caves present educational opportunities, and conservation easements can be used as part of a community or educational facility to teach children and adults about the importance of conservation and how they can incorporate conservation into their daily lives. Greenbelts or cave conservation areas are the perfect locations for educational stations where people can read about the extra effort that has been put into planning the development. If the developer shows that they are committed to the long-term health of the environment, they are showing that they are committed to a higher standard of living. A development can increase its appeal, save money, and prevent unnecessary delays by demonstrating that it cares about the over health of community and by helping the resident keep the environment and the community healthy.

Americans sense that something is wrong with the places where we live and work. . . As though the whole thing had been designed by some diabolical force bent on making human beings miserable. And naturally, this experience can make us feel glum about the nature and future of our civilization. From James Howard Kuntsler, "Home from Nowhere," *The Atlantic Monthly*, Vol. 278, September 1996.

Forward

Karst terrains provide a challenge in urbanizing areas, both from an engineering and environmental protection standpoint. Karst terrains and associated voids within limestone can offer engineering difficulties related to ground competency, construction techniques, foundation and roadbed instability, ground water seepage, and septic disposal. Karst terrain is often environmentally sensitive, providing a rapid infiltration or recharge to an aquifer, and frequently supporting rare and endemic flora and fauna. These regions are susceptible to impacts from urban development, which can include contaminated runoff with high sediment loads, hydrocarbons, fertilizers, and pesticides. Additionally, impervious cover can significantly alter water, air, and nutrient infiltration characteristics of aquifers and subterranean ecosystems. Environmental significance and sensitivity of karst regions have only been recently realized in the past couple of decades. Efforts to minimize the impacts of urbanization on karst terrains have had little impetus prior to the past decade. Much of the recent atten-

tion to these regions has been fostered by federal listing of many cave-dwelling or spring-dwelling organisms as threatened or endangered.

In Central Texas, a large karst region known generally as Edwards limestone provides recharge to the Edwards Aquifer and supports a high degree of biological endemism in subterranean cave systems. Seven species of troglobitic invertebrates and a host of aquatic salamanders, fish, plants, and invertebrates associated with Edwards limestone spring outlets have been placed on the federal endangered species list. A larger number of other karst- or aquifer-related species are being considered for listing and many others are endemic to the area. Sprawling urban development is occurring around Austin, San Antonio, and smaller communities over and near Edwards Limestone. The result has been intensive clashes between development and environmental protection interests with resulting lawsuits, increasing regulatory requirements, and increased development costs. Local, state, and federal agencies in the urbanizing areas are requiring cave conservation and aquifer recharge protection.

Introduction

Unexpected delays, extra costs to redesign site plans, and extended negotiations with regulatory agencies may be avoided if conservation plans are incorporated into a site plan from the beginning of a proposed development. Landowners may plan ahead for cave conservation to save valuable time and money. This strategy includes: planning ahead for conservation, using cave preserves as amenities or educational features, protecting caves, and promoting a higher standard of living through the use of common areas and green space.

This paper examines several land planning strategies designed to incorporate sensitive area conservation while gaining benefits from these green spaces, for the enjoyment and education of the public. Several examples of land development conflicts and successes with karst conservation are explored.

New Urbanism

Traditional communities strike a balance with natural elements that provides a unique identity as well as physical limits on development. Caves, springs, local weather, vegetation, views, harbors, and topographic features define the individuality of a memorable place or neighborhood (Katz *et al*., 1994). In contrast, current communities are defined by our total reliance on automobiles, ozone action days, paved parking lots, traffic jams, contaminated soil, degraded natural habitats, pollution, and crime that destroy our view of our neighborhood and home. Understanding the natural beauty of a place can be expressed in the design of a community, striking a balance between the natural and manmade environment.

New urbanism is a city planning technique that revives the 1920s notion that people and the environment should be part of city designs (Kuntsler, 1996). New urbanism offers an alternative to the sameness of the suburban landscape. In order to achieve new urbanism goals of walkability and increased social interaction, a community is designed with high density development concentrated in the less sensitive areas, with lots of open green space in between (Katz *et al*., 1994).

An example of new urbanism planning is found in Austin, Texas. The Hyde Park neighborhood in Austin, Texas, is known as a Traditional Neighborhood District, a term used to describe a neotraditional approach that embodies the preWorld War II neighborhood plan that is considered an effective tool to control sprawl (Wagner, 1997). As shown in Figure 1, a Traditional Neighborhood District has specific characteristics that result in a compact, mixeduse, pedestrian-oriented community (COA, 1997). The Traditional Neighborhood District includes formal and informal open spaces that encourage community activity, identity, and civic pride. Greenbelts and preserve areas are an important element of Traditional Neighborhood Districts and may be used to protect endangered species and sensitive environmental features such as caves or other natural features. By creating nature trails and preserves, a community becomes more walkable. Accessible trails increase the chance for community interaction. This design also reduces the environmental impact by decreasing the amount of land used for development.

New urbanism and traditional neighborhood design may effectively incorporate cave management plans while simultaneously preventing possible governmental violations or accidents. Cave management plans are used to develop conservation zones and to define boundaries of environmentally sensitive areas. Preplanning for cave conservation can reduce bureaucratic negotiations by anticipating the protection needs for a planned community.

Cave Management in Central Texas

In central Texas, federally protected species and aquifer protection define the need for cave

"Open Space: Formal and informal open space is located throughout a TND. The design of the neighborhood gives priority to open space. These spaces enhance community activity, identity and civic pride. The neighborhood plan creates a hierarchy of useful open spaces: a formal square in the Neighborhood Center, parks and playgrounds throughout the neighborhood, and streets that promote walking and encourage informal meetings." (COA, 1992)

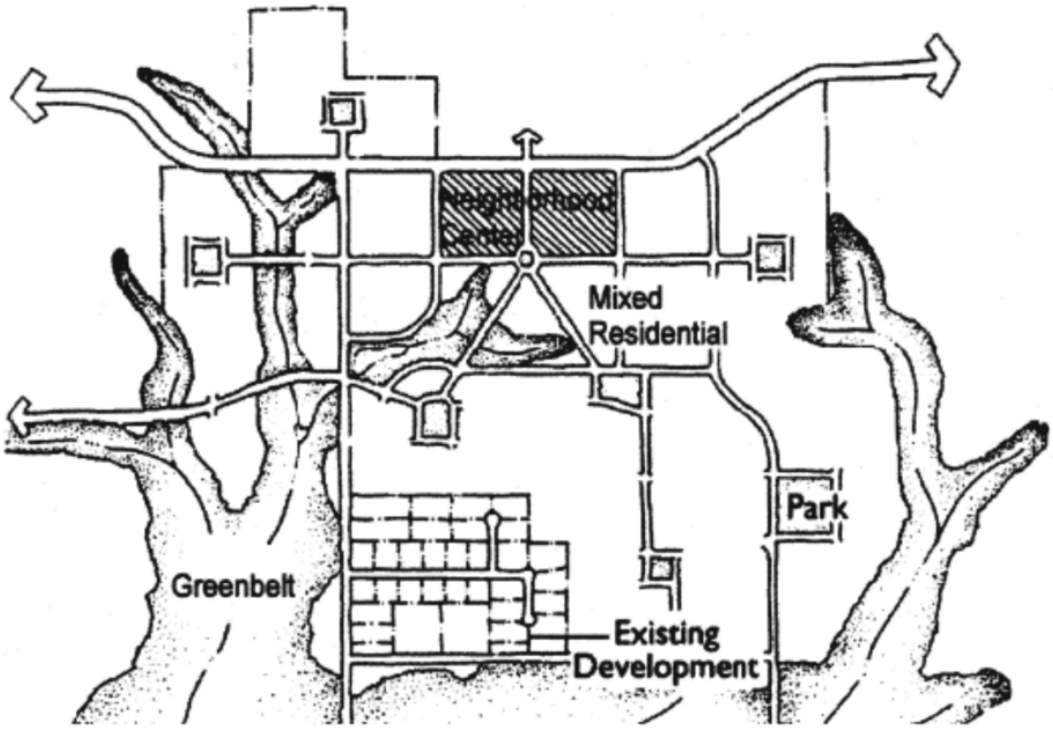

FIGURE 1
OPEN SPACE PLAN

conservation. Caves are distributed throughout the world and are protected for many reasons including: habitat of endangered flora and fauna; rare minerals or unique formations; important sites for hydrogeologists, paleontologists, climatologists, and geomorphologists; historic and prehistoric cultural resource values; recreation; and aquifer recharge protection (IUCN, 1996). Following are three examples of cave conservation in central Texas, including Lakeline Mall which resulted in an unusual amount of delays and exorbitantly high consultation fees due to negotiations with U.S. Fish and Wildlife Service relating to cave conservation efforts. Buttercup Creek and Village at Western Oaks also experienced delays and extra costs. However, these were not as significant as those experienced by the Lakeline Mall project. Buttercup Creek and Village at Western Oaks projects are examples of alternative designs that incorporate many of the philosophies of New Urbanism.

Lakeline Mall Legacy, Austin, Texas

Lakeline Mall, a 116.0acre site in northwest Austin, was purchased by Simon Property Group in 1986. The Austin area was at an apex of a growth boom in the 1980s causing rapid urbanization and development over an envi-

ronmentally sensitive karst region known as the Jollyville Plateau. Caves were found on the proposed mall property, but they were not considered significant to recharge of the local aquifer because they were found within an isolated remnant of Edwards Limestone no longer hydrogeologically connected to the Edwards Aquifer. Because of the perceived insignificance of the caves, plans for development and the development approval process continued. However, federally listed caveadapted invertebrates were found in late 1989.

The U.S. Fish and Wildlife Service notified Simon Property Group of the presence of the listed species and indicated that continued development of the mall could result in an illegal "taking" of a federally protected species. The "take" of a federally listed, threatened, or endangered species is prohibited under Section 9 of the Endangered Species Act of 1973. A "take" is defined as the killing or harassment of a protected species or the alteration of an essential habitat used by a protected species.

In early 1990, Simon Property Group initiated a long and arduous incidental permitting process. To gain the right to develop about 62.0 acres of land within the range of the protected invertebrates, Simon Property Group ultimately agreed to purchase 234.0 acres of land for a preserve, provide funds for managing those preserves, contribute funds to the regional Section 10(a) permitting process, and fund a 10year cave research program. The cost of this undertaking was very high, both in dollars and time. Finally, in 1992, Simon Property Group was issued the first 10(a) permit in the Albuquerque Region of the Fish and Wildlife Service, a full two years after the discovery of Lakeline Cave, and about six years after purchase of the property. More delays and financial losses followed the 10(a) permit due to loss of financing and economic decline, among other problems. The whole process resulted in five years of delay and a cost of several million dollars that was amplified by the unexpected discovery of federally protected species and failure to plan ahead for cave conservation. However, the mall finally opened for business in late 1996.

Buttercup Creek, Cedar Park, Texas

Buttercup Creek includes a preserve system that avoids impacts to known populations of federally protected cave-adapted invertebrates via a Section 10(a) Permit. Figure 2 shows the overall Buttercup Creek design. Figure 3 shows a photograph of one of the cave preserves. Although Buttercup Creek experienced delays and added costs, these were not as significant as those experienced at Lakeline Mall because of significant forethought with regard to cave conservation.

Buttercup Creek includes at least 12 separate cave preserve areas (totaling 132.7 acres). The preserve shape and size are based on catchment areas, topography, and subsurface extent of each cave. Additional floodplain greenbelts, totaling 33.4 acres, provide open connections between several of the cave conservation zones. The Buttercup Creek Habitat Conservation Plan focuses on complete avoidance of a take of a listed species or species of concern to the extent that is reasonable. The Plan includes the continuation of responsible development practices and karst conservation measures that are a regular practice of this developer, Lumberman's Investment Corporation. The Plan also includes plans to minimize and mitigate any potential indirect impacts on any caves or protected species. By distributing educational material, Lumberman's Investment Corporation encourages residents to help keep Buttercup Creek an environmentally aware and aesthetically pleasing place to live.

The preserve system is based on longterm monitoring and extensive geologic and hydrogeologic studies. Cave conservation zones are deeded to the City of Cedar Park for conservation management. All significant cave entrances with protected species or species of concern are gated and fenced to prevent unauthorized access or entry. Only restricted recreational use (hike or bike trails or picnic areas) is allowed except within sensitive conservation zones. No public use or access is allowed in the more sensitive zones. Urban runoff is diverted or naturally treated near cave conservation zones. Additional sandy loam soil cover is placed in yards and landscaped areas adjacent to cave conservation zones for enhanced retention and absorption of fertilizers, pesticides, and other common constituents.

A plan provided to all contractors handles issues such as construction period erosion and siltation management; additional measures and protocols for storage, use, and spill containment; and countermeasures for constructionrelated chemical and petroleum products. Natural vegetative buffers are maintained along the floodplain of Buttercup Creek. Surface water or non-point source drainage flows from streets and parking areas are diverted to treatment systems or are discharged downgradient of the cave conservation areas. Impervious cover is limited to about 30% or less.

Village at Western Oaks, Austin, Texas

The Village at Western Oaks subdivision is located over the environmentally sensitive Ed-

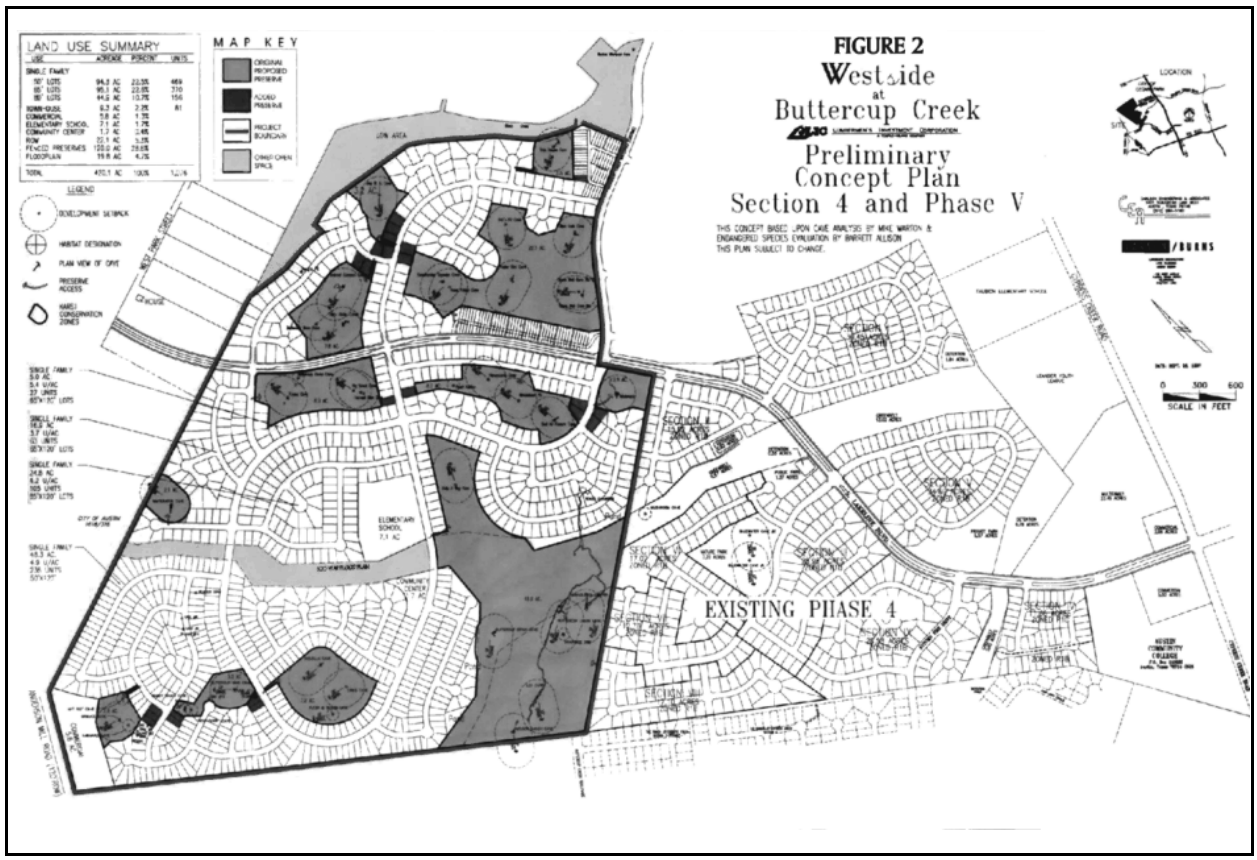

FIGURE 2

wards Aquifer Recharge Zone. Prior to development, Lumberman's Investment Corporation identified areas critical for aquifer protection, such as creeks, drainage areas, and point recharge features. Those features are protected within a generous greenbelt and park area. Lumberman's Investment Corporation put a significant amount of effort into Village at Western Oaks preserve system to avoid impacts to caves and the Edwards Aquifer. Figure 4 shows the Village at Western Oaks Open Space Plan. Village at Western Oaks experienced few delays related to cave conservation. Preplanning eliminated the need for time-consuming negotiations with state and local governments.

Lumberman's Investment Corporation also practices prudent environmental conservation in the design and implementation of landscaping, pest management, and water conservation throughout maintained public areas of the subdivision. These practices include the use of native and xeric landscaping, minimal use of lawn chemicals, and water conservation measures including rain cutoffs for automatic sprinklers and lowevaporation loss irrigation systems. Vegetation buffers and wet ponds filter surface water runoff before it reaches caves.

When completed, Village at Western Oaks will include an educational cave preserve with four caves, an information kiosk, hiking trail, and interpretive nature signs (Figure 5). These areas will provide a common green area where neighbors can meet and interact. These parks are within walking distance of most residences, creating a more walkable environment.

The shared goals of cave management practices for Buttercup Creek and Village at Western Oaks subdivisions included cave gating and fencing, limited accessibility, and routine inspections. Recreational use (hiking trails or picnic areas) is permitted over less sensitive areas. Vegetation and habitat management plans define conservation practices for property managers. Integrated pest management plans to reduce chemical and fertilizer uses are common to these projects. Lumberman's Investment Corporation distributes educational materials to residents and homeowners to teach them about the benefits of reducing harmful constituents in yard runoff; proper storage, use, and disposal of household products; and use of native landscaping or xeriscaping to reduce the need for water and chemicals. Homeowners take a role in protecting surface water runoff that gives them an opportunity to protect nearby caves and their aquifer, while maintaining a successful lawn or garden.

FIGURE 3
BUTTERCUP CREEK CAVE PRESERVE

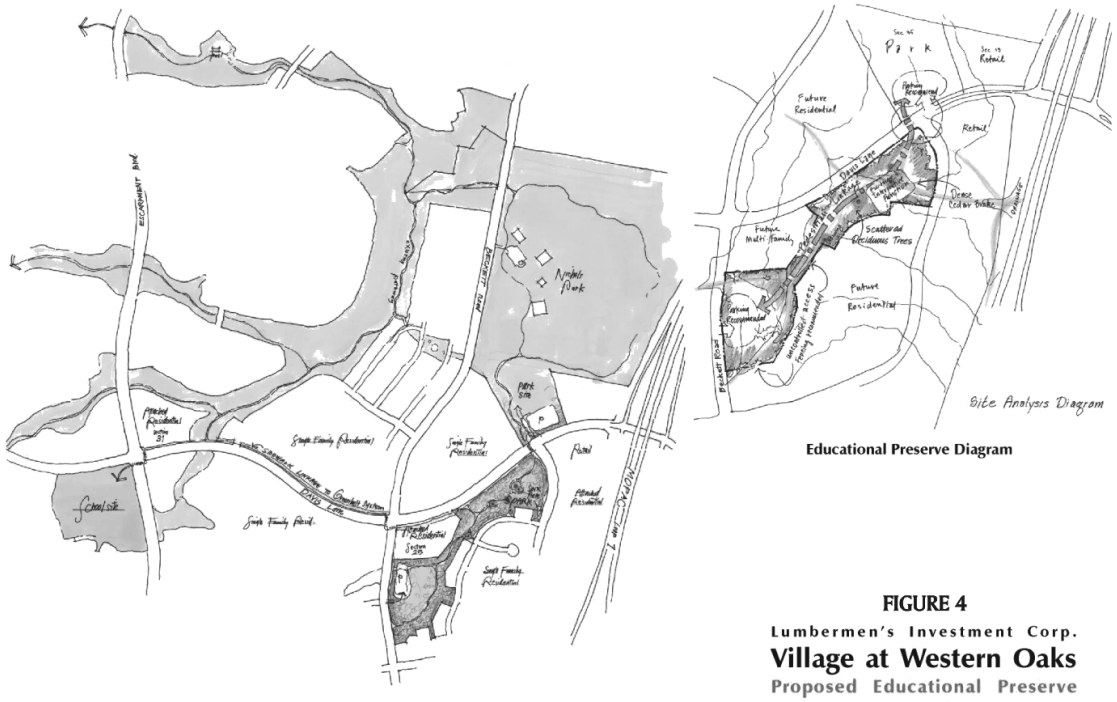

FIGURE 4

Options For Development Near Caves With Protected Species

Regional Habitat Conservation Plan Participation

Regional habitat conservation plans are regional permits that set aside land to ensure the overall survival of protected species while ensuring continued economic growth. Habitat conservation plans reduce the costs incurred by landowners by limiting the need for consultation and costly permitting. Habitat conservation plans promote a regional conservation view that is generally more effective than piecemeal conservation efforts.

The Balcones Canyonlands Conservation Plan is an example of a regional habitat conservation plan (Section 10(a) permit). The Plan was developed in Travis County, Texas, to allow landowners to participate in the countywide conservation of endangered species, while allowing them to use land that may have otherwise been undevelopable. The Plan was developed to balance economic growth and the preservation of habitats by setting aside 30,000 acres of protected habitat. Developers participate in this plan by paying fees ranging from $55 to $3,000 per acre. Participation is voluntary and is an alternative to an individual Section 10(a) permit that may take many years to complete and can be very costly.

Individual Section 10(a) Permit

A Section 10(a) permit from the U.S. Fish and Wildlife Service is required for development if all avenues for conservation have been explored and it is possible that development of the site will directly or indirectly affect a cave with federally protected species. Individual permits are often time-consuming and costly. Permits usually require mitigation or a donation of additional undeveloped land with similar species or characteristics. Individual cave management plans are usually required.

Individual Cave Management Plans

Development without impact to a cave with protected species can eliminate or reduce the need for negotiations or permits. Usually, this type of action requires a cave management

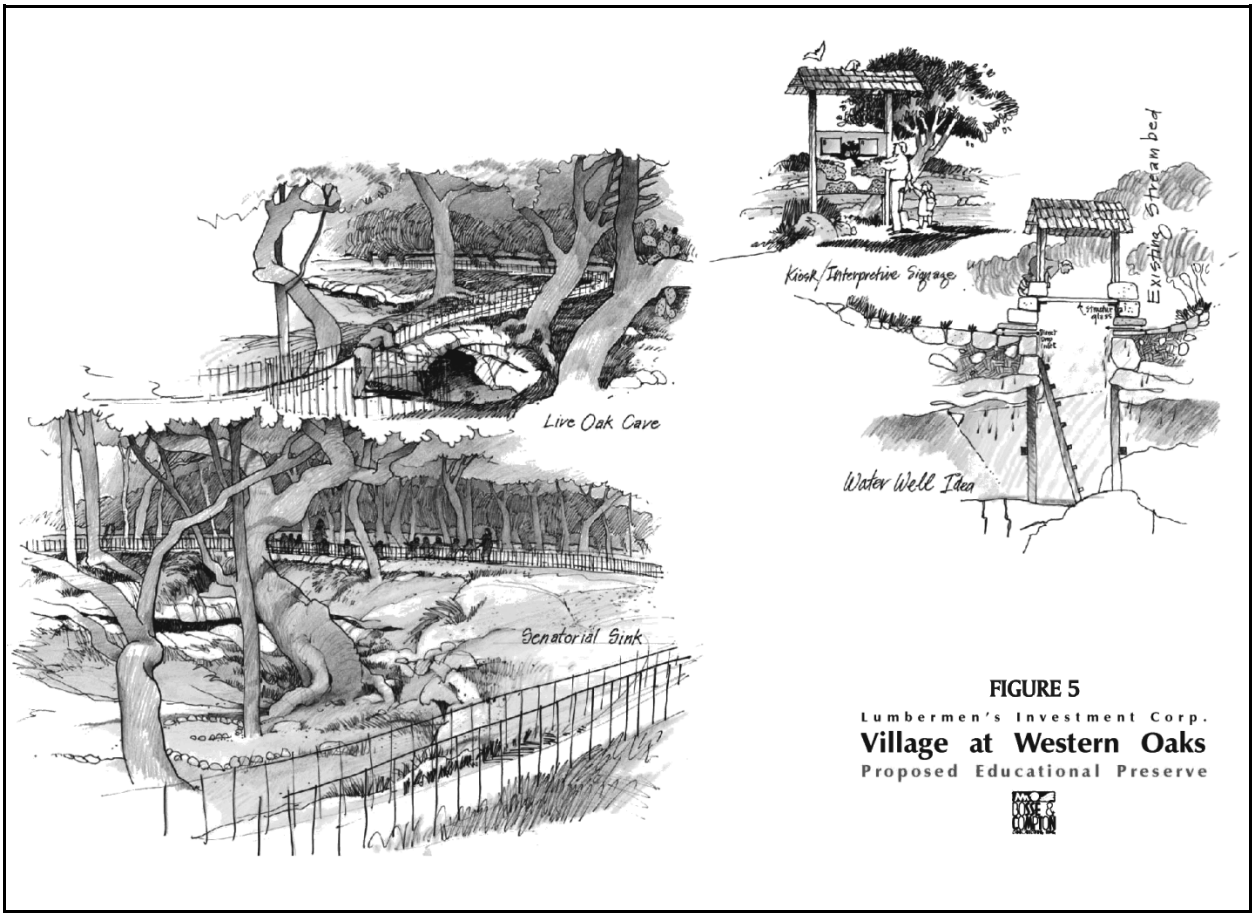

FIGURE 5
Lumbermen's Investment Corp.
Village at Western Oaks
Proposed Educational Preserve

plan. Cave management plans are used as guides to prevent possible endangered species violations and provide conservation, while incorporating setbacks into development plans from the very beginning. Section10(a) permits usually require cave management plans as well.

A landowner may elect to dedicate the conservation zone and cave to a public management entity. In Texas, cave management may be contracted out to such organizations as the Texas Cave Management Association, the Texas Cave Conservancy, or another approved management entity such as the Southeastern Cave Conservancy.

Management of a cave is ultimately the responsibility of the property owner. The environmental consultant establishes guidelines that include cave gating and fencing to protect cave contents and control cave access. Educational materials are prominently displayed so that schoolchildren, consumers, or residents know that considerations have been made to protect caves, cave species, or an aquifer.

Conclusion

Prudent environmental conservation in the design of landscaping, pest management, and water conservation throughout common areas is not only practical, but imperative for livable communities. Positive practices include mixed-use design, centralized commerce, generous parks or greenbelts, accessible public transportation, native and xeric plants, rain cutoffs for automatic sprinklers, lowevaporationloss irrigation systems, integrated pest management plans, and educational programs for new residents. Greenbelts or cave conservation areas should include educational kiosks where people can read about the extra effort put into planning the environmentally aware community. A balanced environment can support a strong economy by providing centralized commerce, attractive neighborhoods, communal green space, transportation options, and opportunities for community involvement.

Green plans are longterm environmental strategies that ensure a higher quality of life for present and future generations. There is no standard green plan; each community can adapt the basic principles of green planning to its own needs and conditions (RRI, 1999). Guidelines include: reduced lawn size, corner stores, narrow streets, eliminating culdesacs, setting limits on developed areas, increasing parks and green space, hiding the garage, mixed housing types, planting trees curbside, leaving as many existing trees as possible, planning for mass transit, linking the neighborhood to work, creating town centers, shrinking parking lots, using smaller outdoor lamps, and providing green space at the edges or center of communities (Nelessen, 1994).

A vibrant, balanced community environment can support a strong economy by providing centralized commerce, attractive neighborhoods, communal green space, transportation options, and opportunities for community involvement. Lower crime rates and higher qualities of life are found where greenbelts or parklands are within walking distance (RRI, 1999). Caring for the longterm health of the environment is a commitment to a higher standard of living. If land developers show that they are committed to the longterm health of the environment, they are showing commitment to a higher standard of living. This is the most effective form of advertising. Developers can increase the appeal of a community, save money, and prevent unnecessary delays by planning ahead for cave conservation and helping residents keep the environment and the community healthy.

References

(COA) City of Austin. *Traditional Neighborhood District Criteria Manual*. City of Austin, Texas. 1 August 1997.

(IUCN) International Union for Conservation of Nature and Natural Resources. *Guidelines for Cave and Karst Protection*. Gland, Switzerland and Cambridge, United Kingdom. 1996.

Katz, Peter. *The New Urbanism: Toward an Architecture of Community*. Essays by Todd Bressi; Peter Calthorpe; Andres Duany; and Elizabeth PlaterZyberk; Elizabeth Moule and Stefanos Polyzoides. 1994.

Kuntsler, James Howard, "Home from Nowhere," *The Atlantic Monthly*, Vol. 278, September 1996.

Nelessen, Anton C. *Visions for a New American Dream: Process, Principles, and an Ordinance to Plan and Design Small Communities*. Planners Press, American Planning Associates, Chicago, IL. 1994.

(RRI) Resource Renewal Institute. *Green Plan Primer*. Accessed 17 October 1999.

Wagner, Karen. *Deep in the Neotrad of Texas*. Planning magazine. American Planning Association. 1997

About the Authors

Lee Sherrod, author of the forward, is a cofounder of Horizon Environmental Services, Inc. and specializes in terrestrial and wetland ecology, endangered species, and environmental assessments. He has more than 18 years of experience in the technical applications of these fields and the regulatory aspects of project compliance procedures. He is a recognized expert in wetlands issues and is certified as a "Professional Wetland Scientist" (No. 000155) by the Society of Wetland Scientists Certification Program, Inc. He has directed hundreds of wetland assessment and permitting assistance projects throughout the southern United States that have included jurisdictional wetland delineation; aerial photographic interpretation and mapping; habitat creation, enhancement and reclamation; and shoreline stabilization and mitigation planning. Mr Sherrod has been qualified as an expert witness in federal court regarding wetlands and endangered species issues and has been regularly invited to give presentations and lectures on these issues at conferences and universities. He has been a longstanding steering committee member of a state organization comprising scientists and regulators to further endangered species research and conservation efforts. He has successfully represented private applicants in Section 10(a)(1)(B) permits (Endangered Species Act incidental take of endangered species) issued in the Albuquerque Region of the U.S. Fish and Wildlife Service. He is Habitat Evaluation Procedure certified and has participated in many Habitat Evaluation Procedure analyses, performing the computer analysis for many of these studies. He brings an enormous amount of practical experience and expertise to any project to simplify environmental assessment and regulatory permitting assistance, particularly as related to wetlands and endangered species.

Kristin Miller, author of this paper, is a Registered Professional Geologist (Mississippi Registration #0523) and Environmental Specialist. Ms Miller has more than eight years experience in consulting and seven years experience at the Texas Natural Resource Conservation Commission and Texas Water Development Board. Ms Miller has performed more than 250 geological assessments to complete Water Pollution Abatement Plans within the Edwards Aquifer Recharge Zone for review by the the Texas Natural Resource Conservation Commission. Ms Miller specializes in geologic assessments, cave studies, karst investigations, cave management plans, biological sampling, integrated pest management, endangered species habitat assessments, population surveys, project management, Phase I Environmental Site Assessments, and environmental permitting assistance. She is a member of the Geological Society of America, Austin Geological Society, and University of Texas Grotto. Ms Miller has been caving since 1982, where she began as a tour guide and part-time volunteer, surveying Inner Space Caverns in Georgetown, Texas. She is authorized to conduct biological sampling and is listed on Horizon's Scientific Collection Permits. Ms Miller is an ASTM-trained Environmental Site Assessment Professional and provides due diligence investigations regarding the potential for hazardous substance liabilities. She provides technical, biological, and geological support and on-site investigations for FERC documentation and Environmental Impact Statements throughout Texas and Louisiana.