



September 2017

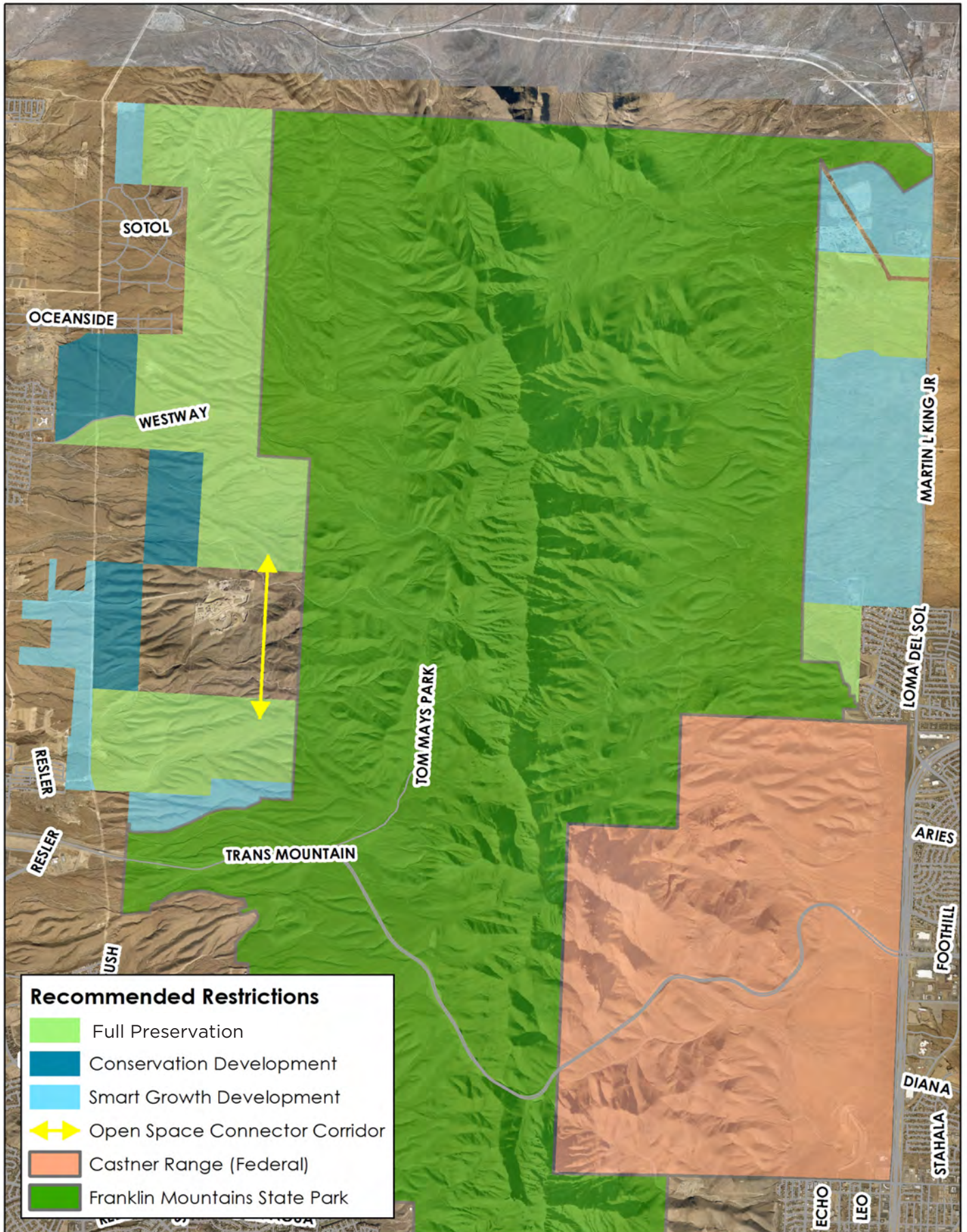
# **ENRICH, ENHANCE AND ELEVATE EL PASO**

Recommendations to Establish a  
Criteria for the Preservation of Public  
Land in El Paso, Texas

El Paso's open spaces are an integral part of our community's identity. Our natural landscapes not only provide us with places of great beauty, but they also play a critical role in providing habitat for wildlife along with clean water, fresh air and recreational opportunities. In response to a petition asking that the Public Service Board (PSB)-owned lands be preserved adjacent to the western and northeastern portions of the Franklin Mountains, a Preservation Committee was formed to establish conservation standards for development so as to ensure a high quality of life for present and future generations. This map identifies lands to be preserved with no disturbance in the form of development (Full Preservation), lands that will be lightly developed as transition lands (Conservation Development) and lands that can be developed following El Paso's existing ordinance for smart growth (Smart Growth Development).

The mapped image to the right (Figure 1) illustrates areas of undeveloped land to the east and west sides of the Franklin Mountains and this committee's proposed recommendations for development. The areas shaded in light green, light blue, and dark blue indicate the Public Service Board (PSB)-owned territory included in the "We the People" Petition presented to the PSB in 2015. These images also articulate land designated as part of the Franklin Mountains State Park and Castner Ranger as well as land that has been master planned by the City of El Paso.





**Figure 1:** Recommended restrictions applied to land outlined in the “We the People” Petition

Over 6,000 people agreed that they wanted to preserve, in its natural state and in perpetuity, all of the underdeveloped land owned by the City of El Paso on the western side of the Franklin Mountains. Given the many factors surrounding that area of land, the current expectation to sell Public Service Board (PSB)-owned land, and the “We the People” petition these 6,000 people signed, it was imperative to establish a Preservation and Conservation Planning Committee (PCPC).

On December 3, 2015, the newly-formed PCPC met and determined the purpose of the group: to develop criteria to identify which specific City owned, Public Service Board-managed lands mentioned in the petition should be preserved, which lands can be developed, and to establish conservation standards for development so as to ensure a high quality of life for present and future generations.

The PCPC has endeavored to develop criteria that will identify and classify lands that best accommodate development while also considering appropriate conservation of land. The group has utilized a collaborative approach specifically designed to create a lasting legacy in our region by:

- obtaining community input
- creating broad based + holistic preservation goals
- identifying specific development criteria
- identifying land protection critical impact areas
- identifying existing funding mechanisms that increase the feasibility of preservation and conservation goals

The purpose of the project is to provide scientific data and specific analysis to the Public Service Board (PSB) and the City of El Paso as well as other government agencies, individuals, developers and business owners regarding existing natural resources on PSB managed lands adjacent to the Franklin Mountains State Park. The data is intended to assist in land sale and development decision-making. The work of the committee has taken into consideration the recommendations presented in Plan El Paso, the Northwest Master Plan, the El Paso Livable City Sustainability Plan, the El Paso City Resilience Assessment and the El Paso Open Space Plan as well as priorities brought forward by community stakeholder groups. The key theme that emerged was to build a stronger El Paso through future development and conservation that are mutually beneficial, reinforcing and balancing people, planet, and prosperity in our region. Conservation and development should not be viewed as being in conflict with one another.

The resulting goals identified by the PCPC are to:

1. safeguard natural and cultural features
2. improve wildlife habitat and natural habitat connectivity
3. address the health of our regional watershed
4. contribute to the local economy of our communities
5. expand understanding of ecosystem services valuation

The criteria discussed in this report identifies the most appropriate locations for development while preserving areas of ecologically important habitat as well as functional wildlife corridors. These areas provide an essential conduit for movement, maintaining a fundamental ecological process that affects the distribution, persistence, and structure of biological communities as well as providing significant economic and social benefit to residents and businesses in the surrounding area.

“We the people want preserved, in its natural state and in perpetuity, all of the undeveloped land owned by the City of El Paso on the western side of the Franklin Mountains that is north of Transmountain Road, east of the EPNG Pipeline Road and south of the New Mexico/ El Paso boundary and on the eastern side of the Franklin Mountains that is north of Transmountain, west of Martin Luther King, Jr. Blvd. and south of the New Mexico/El Paso boundary” (“We the People” Petition led by Jim Tolbert, Celebration of our Mountains).

**DID YOU KNOW ?**

El Paso Water through the PSB owns and manages over 8,000 acres of undisturbed land within the city limits.





“Ecosystem goods and services are the benefits that nature provides to people. These benefits are the basis of all economic activity as they provide a clean water supply, breathable air, nourishing food, flood risk reduction, waste treatment, and a stable climate. Without natural capital, many of the services (benefits) that we generally take for granted (and receive for free) could not exist, or would need to be replaced at a very high cost” (Appendix I: Earth Economics, Ecosystem Services Valuation, El Paso 2016).

Some of the key benefits of conservation criteria for development are as follows:

- **Reduced infrastructure costs for flood control.** Protecting arroyos and other water conveyance features in their natural condition has proven economic benefits.
- **Increased ecotourism that boosts the local economy.** A defined network of natural areas that have the capacity to energize the community and strengthen local tourist related businesses.
- **A healthier community and workforce.** Safe and easy access to parks, trails, and open space are desirable amenities for a thriving economy.
- **A streamlined permitting process.** Identifying criteria for public lands suitable for development will reduce conflicts with conservation advocates, provide clarity for and structure for developers allowing for faster and more effective project processing and completion.
- **Improved quality of life.** Preserving habitat and functional wildlife corridors is an important part El Paso’s quality of life. This is an important component companies look for when considering whether or not to relocate here.

The Preservation and Conservation Planning Committee recommends the criteria presented here for adoption by the PSB in reference to lands identified in the aforementioned petition.

## **Which lands are being considered?**

The land area being considered for this analysis includes territory specifically identified in the aforementioned PSB petition (8,188 acres) (see Figure 1 on page 3).

## **How do we get there?**

The widely recognized practice of Conservation Development has the potential to preserve 50% to 70% or more of buildable land, with a much higher quality and percentage of land than other approaches such as clustered development. In order to accomplish the goals set forward in this document, all PSB lands not scheduled for 100% preservation, with conservation easement(s), but are scheduled for development would be subject to following the Conservation Development criteria outlined on pages 28-30. The benefits include cost reduction through a reduction in infrastructure costs while obtaining density neutral development, preserving land without any cost to the community, while reducing demand for future public land acquisition. It also reduces storm water run-off and treatment costs, conserves groundwater as natural areas infiltrate water, reduces flooding, and provides numerous other free ecological services. It is also believed from analyzing similar projects that the price per acre obtained at the sale of the land with these criteria would at least match previous averages or even exceed it (see page 18 for extended list of benefits).

## **Tools to determine why to preserve or develop land**

For the lands that are slated for development, an extensive ecological inventory including data on soils, steep slopes, open space, hydrology, flora, and fauna, habitat types, endangered species, threatened and vulnerable species, and archeologic/cultural significance must be done to locate the primary and secondary conservation

areas. Prior to development, the conservation areas along with existing development and disturbed lands need to be identified and mapped with overlays that will create an “open space” map identifying the habitat areas of disconnection between the designated open space areas to preserve. These areas must be connected to link natural habitats to larger areas and provide a “Connected Open Space” map between critical open space areas to facilitate the movement of wildlife and plants, and their genetic materials. The “Connected Open Space” overlay then identifies the areas to be preserved and the areas to be developed (example shown on pages 38-39).

The land identified in this report was purchased in the mid-1900s by the City of El Paso, using tax payer funds, for the sole purpose of water conservation and management of water resources. The land described within this report is currently managed by the Public Service Board (PSB).

Historically, PSB-managed lands determined inexpedient to the water system have been sold. Before March 1, 2013, all proceeds from the sale of El Paso Water (EPWU) managed property was placed in the EPWU Improvement Fund and used for capital projects. As of March 1, 2013, all proceeds from the sale of EPWU managed property are placed in the EPWU Land Sales Restricted Reserve Fund (LSRRF) for the purpose of funding future water supply projects, EPWU, under the direction of the PSB, has sold 1,423.3873 acres over the past 10 years, 658.2954 acres of which were sold to the Texas Parks and Wildlife Department. The total amount of revenue generated by these sales was \$23,922,940.44.<sup>1</sup>

In summary, the goal of this report is to uphold the message that lead 6,000 people to sign their names in favor for preservation and conservation-friendly development: “We the people want preserved, in its natural state and in perpetuity, all of the undeveloped land owned by the City of El Paso on the western side of the Franklin Mountains that is north of Transmountain Road, east of the EPNG Pipeline Road and south of the New Mexico/El Paso boundary and on the eastern side of the Franklin Mountains that is north of Transmountain, west of Martin Luther King, Jr. Blvd. and south of the New Mexico/El Paso boundary.”

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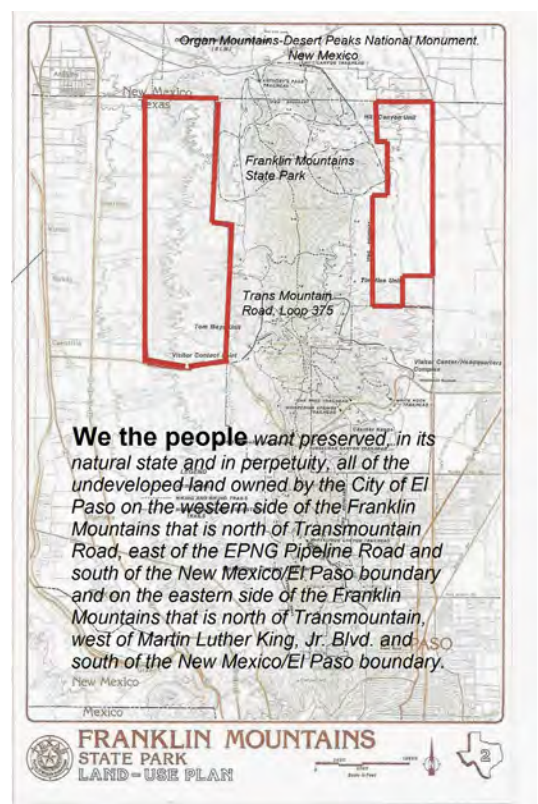
1 Amounts verified by EPWU on June 3, 2016.





**Figure 2 (above):** Infographic explaining the economic development benefits associated with designating the Organ Mountains-Desert Peaks as a National Monument

**Figure 3 (right):** The original “We the People” petition image (Courtesy of Celebration of Our Mountains)



## **Committee Members**

A sincere thank you to the following committee members for their dedication and hard working in creating this report (names are listed alphabetically by last name).

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Lupe Cuellar, El Paso Water

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Harrison Plourde, City of El Paso\*\*

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Sumner Swaner, University of Utah\*\*

Jim Tolbert, Celebration of our Mountains

James Wolff, El Paso Water

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Open space and the preservation of our natural desert environment is critical to creating a more sustainable and resilient El Paso. As a major urban center our city has both a responsibility and an opportunity to set the example for development in the desert Southwest. Based on known data regarding the impact of preservation of natural land as well as the research and recommendations presented in this report, a clear need to protect open

space in our community is evident. Through efforts to provide more parkland access, increase density in appropriate areas, limit sprawl in mountainside or other undeveloped areas and protect existing desert ecosystems, our city can improve quality of life for residents, generate increased economic opportunity, and simultaneously support the fragile natural environment around us.

Few would disagree that past models of urban development are obsolete and no longer serve the needs of our growing population and diminishing natural resources. Expanded growth of El Paso’s footprint strains both capital and environmental resources. Cost associated with both construction and maintenance of expanded infrastructure systems necessary to support the displacement of natural systems is not sustainable in the long term. These direct costs emerge in addition to the indirect costs associated with community health impacts and loss of naturally occurring quality of life amenities.

**Imagine a community where more open space is possible without restricting population and economic growth. Imagine a community with better air quality without the need to impose restrictive laws or spend excessive amounts of public dollars. Imagine a place where the life of our natural water sources can be extended. Imagine a healthier more sustainable environment for El Paso.**

All of these are possible through careful planning, public and private sector cooperation and consideration of systemic cost benefit analysis. Issues not addressed today, become the burden of future generations. Now is the time to come together to create the framework for a sustainable, prosperous and healthy future for our community.

Jim Tolbert  
Director, Celebration of Our Mountains





*“What you need to do is make sure that the place in which you live, and your people live, is as nice as the places they would dream about visiting” -Charleston Mayor Joseph Riley*

It is a rare opportunity for a city to have in their control thousands of acres of raw land whose use can be carefully planned to yield the best short-term and long-term results. It is a truly enviable position in which El Paso is in right now. Obviously, someone had the vision a few decades ago to purchase this land and we are all grateful for that today. The question is: will we have the vision today to plan the best use for this land in a way that future generations will be grateful to us for what we did with it?

In order to capitalize on this situation a true and thorough effort must be made to fully understand and exploit the incredible opportunities that lie within these parcels of land and its surrounding areas. As with anything that is worthwhile, this task will not be easy and it will require a great deal of time and resources. However, the long-term cost to El Paso will be much greater if nothing but the status quo is followed.

As a member of this community I have witnessed the growth this city has seen in the past two decades. As a member of the development community I have witnessed the way development decisions are made and actually implemented. Although there has been some progress, the way we currently develop in El Paso is not sustainable. Ignoring for now the health-related and environmental issues, simply stated, we as a city cannot financially afford to continue to grow and develop in this manner and the only way to be able to sustain the status quo is to continually raise fees, raise taxes, and borrow money through bonds to pay for the new and maintain the existing infrastructure. The good news is that there is a better way to do this and one that will not cost more.

Our design and decision making metric needs to be revised to include considerations that impact the way we live and the true cost to the city. Both can be greatly improved by taking some simple steps that would yield the same, if not better, bottom line to the developer while lessening the burden to the municipalities involved. By the way, these principals that can lead to a better way to develop and a better way to live are not theoretical ideals that only work in textbook examples. It is actually something that has been successfully applied in many parts of the country, some with similar conditions as El Paso, and around the world. After all, it borrows from the logical way that urban areas used to grow organically and, by necessity, self-sufficiently.

The purpose of this report is to increase awareness of the current situation, the great opportunity, and its potential benefits and to also serve as the catalyst for evoking the action required. This report is a great resource for better understanding the critical situation and includes a sample of what new criteria for the sale of the land might look like as well as some basic guidelines for development and preservation of the same land. It also concludes with some possible next steps of action that can be taken.

It is important to make clear that this report does not contain all the answers nor the methods and means of achieving the desired goal. It is written with the hope of obtaining the attention of the needed stakeholders and instilling a desire to take action. As you read through this report, please remember why this is important and keep in mind the impact it could have. I would also recommend that you keep in mind that this is not just about conservation and preservation. In my point of view, it is not even the priority but rather the result of good planning. When good sound principles are implemented into land planning that focus on the elements that result in the best long-term benefits, the end result is communities that are healthy and sustainable, not only in environmental, ecological, and human health ways, but also very much in an economically-sustainable way as well.

*“Sensible and Efficient land use is the single most important factor in obtaining regional self-sufficiency” (World Institute for Sustainable Habitat).* I hope this report motivates you to get involved, in some way. After all, it is our responsibility as El Pasoans and as individuals that can make a difference to make sure that this land has the best possible outcome for all El Paso and its future generations.

Joseph Nester  
Kaizen Construction Services, LLC





**Our future : #ChihuahuanDesertLandAndWater**

The City of El Paso has over 7,000 acres of open space that they own, of which they are, deciding what to sell and what, of the 7,000 acres, could be preserved and managed as open space. The City of El Paso possesses a wonderful treasure that is so unique that other cities would love to have this opportunity before them as a

way to improve their communities! This is an opportunity for the City of El Paso--the City is finalizing their area wide Strategic Plan and the 7,000 acres fits perfectly with their goals.

These lands address many of the Cities goals outlined in their strategic plan: viewsheds, quality of life, recreation, health/sustainable community and increase eco-tourism. See below bolded strategic goals listed by the City which are then followed by an explanation of how each of the City goals will benefit your family, our community, our region and our future.

1. The lands, if left undisturbed will create and improve the visual impression of the community. El Paso residents and their families, along with visitors, regardless of one's mobility and social economic status benefit directly from a view shed of the Franklin Mountains. Such views lead to a positive visual stimulus that makes people feel good, improve mental health, and let's one take pride in their community and the areas special natural features. To achieve such benefits you need to have continuous viewshed corridors that are set aside, in perpetuity.
2. Continuous lands of open space located in an urban center would provide endless outdoor recreation opportunities. The mountains offer unique hiking, biking, bird watching, sightseeing, rock-climbing, photography, geo-caching, etc. All set in an urban area that has a major airport, with a major highway that runs alongside the lands and can draw in people from adjacent states and Mexico. Preserving existing open space lands as natural areas will create numerous opportunities for people to experience nature and learn about it in real world terms. Such open space offers the opportunity for the creation of innovative recreational, educational and cultural programs to be developed. This is a unique situation that is not found anywhere else that will directly enhance El Paso's quality of life and assist drawing people to region to work, live and lay family roots.
3. Accessible natural open space promotes a healthy, sustainable community with outdoor activities for residents and visitors alike. Being outside supports a healthier mental and physical wellbeing and higher quality of life, which in turn results in lower health care expenses. Maintenance and infrastructure cost are minimal in natural settings, as opposed to developed areas which need regular maintenance. Leaving the lands as natural lands greatly reduces any future expenses that would be needed to maintain infrastructure, address flooding, and increase need for water for the growing population, resulting in reducing taxpayer expenses into the future. As these lands are already owned by the City, no bond or grant funds would need to be encumbered by the taxpayers or raised to have the open lands for public use. In addition, the lands were bought in the 50's for water conservation and as the region becomes dryer and the City is building piping over 100's of miles to bring water to the City, would be wise to keep the lands open and used for their original purposes water conservation.

A partnership could be developed with the Frontera Land Alliance, FMSP, BoarderPlex and other organizations and businesses to assist in sustaining the lands for the community in a healthy way.

4. Very little infrastructure and up keep of land, would grow the local economy with a focus on Ecotourism. Such focus would have a positive income for hotel, supplies, and food industry as people visit the City lands, the state park and sounding sites. El Paso can be promoted as “the” home base for day trips to the Franklin Mountains, Hueco Tanks, Organ Mountains Desert Peak National Monument, Guadalupe Mountains, Big Bend, etc. A prime example of how recreation opportunities improve the local economy is how Organ Mountains Desert Peak National Monument has promoted ecotourism and has resulted in positive growth for Las Cruces.

We have 7,000's acres at the end of the Rocky Mountains being considered for development and preservation. The land could be left natural and be promoted for viewsheds, quality of life (clean air/water), recreation opportunities, healthy and sustainable community and promote eco-tourism. All of which are goals for the City of El Paso as stated in their Strategic Plan.

The City of El Paso has an opportunity to create a wonderful treasure. In 100 years if the lands remain open it is likely people will look back and say thank goodness the City had the foresight to protect the land as happened in 1097's to the Franklin Mountains State Park!

Janae' Reneaud Field  
Executive Director

**The Frontera Land Alliance**



A core priority for this study is the engagement of a broad range of stakeholders from a variety of industry and community backgrounds representing diverse interests. Following over a year of research and development, this report will continue to be vetted by the following stakeholders and others:

- American Institute of Architects, El Paso Chapter Board of Directors
- Border Environmental Cooperative Commission
- Borderplex Alliance, Regional Planning Task Team
- City of El Paso, Economic Development Department
- City of El Paso, Planning and Inspections Department
- County of El Paso
- Eco El Paso, Board of Directors
- El Paso Association of Home Builders
- El Paso Water
- Environmental Protection Agency Region 6
- The Frontera Land Alliance, Board of Directors
- The Greater El Paso Chamber of Commerce
- The Private Sector Development Community
- Texas Parks and Wildlife

In order to gain a balanced, objective perspective, the plan will also be vetted with the following external entities:

- 100 Resilient Cities, Pioneered by the Rockefeller Foundation
- Christine Morris, Chief Resilience Officer, City of Norfolk, Virginia
- Greg Guibert, Chief Resilience Officer, City of Boulder, Colorado
- Theresa O'Donnell, Chief Resilience Officer, City of Dallas
- Earth Economics
- Sumner Swaner, Landscape Architect and Environmental Planner, real estate developer, and Adjunct Professor in the College of Architecture and Planning at the University of Utah
- Urban Sustainability Directors Network, Texas State Peer Network (Participating Cities Include Austin, Dallas, Houston, San Antonio, Plano, Denton, and El Paso)
- US Green Building Council, Texas Chapter, Board of Directors
- Texas Society of Architects, Sustainability Committee

Each group will be contacted directly by a member of the committee, provided an electronic copy of the pre-final recommendations, then given approximately two weeks to respond with comments, questions or concerns. Additionally, an online survey has been created in order to gather broad community-based feedback.

The following section details priorities identified by committee members, supplemented by feedback from the aforementioned stakeholder groups.



Priorities identified by stakeholders reinforced the key theme identified for this report, “to build a stronger El Paso through future development and conservation that are mutually beneficial, reinforcing and balancing people, planet, and prosperity in our region.”

The views, values and goals in our community are as diverse as the groups invested in it’s future. This report attempts to address those varying concerns while aligning priorities in an effort to develop a common goal set.

Stakeholders, for the purposes of this report, include all those affected by development including:

- Those who operate businesses benefiting from job creation associated with development
- Consumers of services provided by those businesses
- People who live in the community who benefit from the ecosystem services provided by undeveloped lands
- Preservation groups interested in responsible land conservation practices
- Businesses invested in growth and development of the identified land area
- Public entities and professionals who design, plan and manage land development in the region

The committee recognizes that balance is necessary to achieve maximum benefit for the community at large. For example, by adding new roads, homes and businesses, El Pasoans gain economic development benefits and increased tax revenue (keeping in mind that infrastructure costs for these services can be greatly reduced by using conservation design). In contrast, serious consequences to our community’s quality of life and the health of the overall ecosystem exist when natural land is developed irresponsibly. **Narrowly defined economic benefits lacking consideration for quality of life, quality of place, human health and environmental stability threaten the capacity for broad-based, long-term community benefits.** For example, protecting public lands for recreation purposes adds to quality of life and protects ecosystem services important to water conservation, air quality, and wildlife habitat preservation, but may limit our economic development opportunities.

In the Ecosystem Services Valuation Report produced for El Paso by Earth Economics (Appendix G), a team of experts calculated that **“the annual value of ecosystem services within the El Paso study area (limited in this case to approx. 7.757 acres) is estimated to be between \$3.4 million and \$6.7 million.”** Further research is absolutely needed to fully understand the benefits open space provides to our community, especially in terms of ecotourism benefits. However this valuation gives us a preliminary understanding of the importance of protecting open space land in terms of air quality benefits, habitat, soil retention, and disaster risk reduction.

In the following sections, we will highlight the costs and benefits in several different areas, including infrastructure investment, resource conservation, economic development, tourism, health, wildlife, social equity, and water resources. Protecting public land can encourage ecotourism, extend the life of our natural resources, offer health benefits via outdoor recreation opportunities, provide habitat for critical species, and improve access for low-income residents to parkland. Protecting public land can occur in a density-neutral manner and does not necessarily mean fewer development options or reduced land available for new businesses.

## DID YOU KNOW ?

El Paso is ranked 75th in a Trust for Public Land Park Score ranking of 98 cities which provides a rating based on per capita parkland playgrounds, recreation centers, and other open space amenities







**Figure 4:** Aerial View of the City of El Paso (Partial)



## DID YOU KNOW ?

The City of El Paso, within the designated city limits, encompasses 256 square miles of land area.



For many years, citizens and community leaders have worked together in an effort to improve quality of life for El Pasoans. For approximately the last decade, a variety of plans, initiatives and strategies have been developed in the context of urban progress. In 2007, the “Towards a Bright Future: A Green Infrastructure Plan for El Paso,” commonly referred to as the Open Space Master Plan, was adopted as a plan for open space preservation with the goal to protect the health, safety, and general welfare of the residents of El Paso. In 2009, the Open Space Advisory Board was created to act in an advisory capacity providing recommendations to City Council in an effort to preserve and acquire open space as identified in the Open Space Master Plan. In 2009, City Council adopted The Livable City Sustainability Plan inspired by the City’s strategic goal to make El Paso **“the most livable city in the United States.”** In 2011, the city put forward a comprehensive masterplan emphasizing smart growth, transit oriented development and revitalization of existing neighborhoods from one end of the city to the other. In 2012, voters approved a \$470 million bond program targeting some of the most ambitious quality of life improvement projects in our history. In mid 2015, a new City Strategic Plan was released emphasizing a vision to, **“have safe and beautiful neighborhoods, a vibrant regional economy and exceptional recreational, cultural and educational opportunities.”** Paired with a mission to “Deliver outstanding services to support a high quality of life for residents, businesses and visitors” this plan serves as a roadmap for action and a guide for decision making across the city. That plan has since been updated to reflect the changing needs of the community further emphasizing the need to highlight El Paso’s natural and cultural assets as a driver of both economic development and overall quality of life.

These strategies are mirrored by the passion and energy El Pasoans have devoted to the preservation of our community’s natural assets. To date, over 55,000 El Pasoans have signed petitions and letters expressing their support for conserving the natural region within and immediately surrounding the Franklin Mountains.<sup>1</sup> These grassroots initiatives clearly articulate the value that the people of El Paso place on naturally occurring resources and open space. The Franklin Mountains State Park in the City of El Paso is the largest urban park in the nation lying completely within the city limits of a city. It is iconic for this community and for conservation efforts across the state.

**As our city, 256 square miles in size, continues to grow outward, natural resources are depleted while fundamental infrastructure expansion places extraordinary pressure on critical services and municipal systems.** The footprint left by this type of growth has environmental, economic and social impacts on both the community and the region. We can create opportunities for our local economies to grow by investing in land for outdoor recreation, for wildlife, and water. Such investments have a ripple effect. Active aging adults relocating in the western US are three times more likely to settle in a county with more protected public lands than one with fewer protected lands. This has led more than half a million active aging adults to relocate to the Western United States between 2000 and 2010 (The Golden Rush: How Public Lands Draw Retirees and Create Economic Growth)

Additionally, as a modern binational city, we are dependent on local and regional systems in terms of air, water, energy, economic development and trade; making it critically important to protect our natural resources: “The border region includes a

<sup>1</sup> 30,000+ signatures for Castner Range, 6,252 signatures for “We the People” petition, 1,377 signatures for “Protect Scenic Transmountain Corridor in NW El Paso (2012),” 1,571 signatures for “PSB offers compromise to stop open space election (2011),” and 15,000 signatures for a petition asking City Council to obtain State Park status for the Franklin Mountains (1979).



number of cities that share common airsheds; thus, activities in one city can directly affect the other, whether in the same country or across the border. As such, strategies and solutions to address air pollution along the border need to be developed and implemented binationally, with active engagement from the community, as well as local, state, federal, and Tribal authorities.”<sup>2</sup> Issues like population growth and migration have exacerbated challenges in terms of air quality, water quality, and peak energy demands. However, opportunity to mitigate long term impact through strategic, data driven decision making presents itself here.

Unless we work together as one region across political boundaries, we may be overwhelmed by the dramatic shifts in demographics and changes in our environment. We may find ourselves unable to achieve the quality of life and public health that we wish for ourselves and future generations. Therefore we need to create a framework which will give us the ability to improve and preserve green space critical to our needs while appropriately developing others. This framework must be based on firm science. Our community has the opportunity to set the example for the wise use of public funds to provide public services by using natural systems in addition to or instead of man-made systems specifically in an arid urban environment.

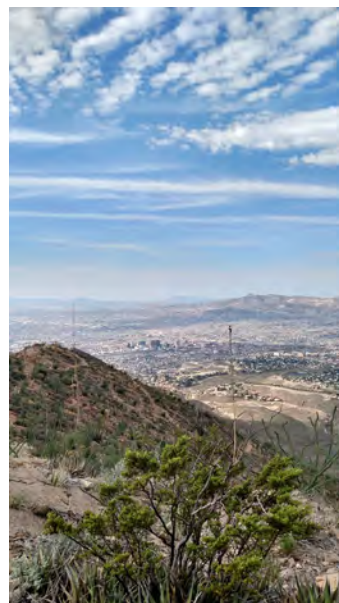
## Benefits of Strategic Conservation

### Short-Term

- Protects and maintains the values & functions of natural ecosystems;
- Sustains working land;
- Reduces opposition to development;
- Provides predictability and certainty;
- Reduces costs for built infrastructure.

### Long-Term

- Assist in Decision Making: Speed up the permitting process for developers because the jurisdictional agencies will be in agreement on the areas suitable for development.
- Accountable to Citizens: It will determine where transportation corridors will best improve the quality of life for residents and visitors to our region.
- Economic Growth: It will identify recreation and ecotourism opportunities that have the potential to increase local business revenue.
- Holistic Approach: It will improve the safety of citizens and reduce flood damage when arroyos are left as natural features that can handle the high quantities and fast speeds of water flowing to the Rio Grande, while considering the surrounding use of lands and gray infrastructure.
- Healthy Lifestyle: It will promote physical health, mental health, and quality of life by expanding recreational and outdoor experiences, potentially reducing healthcare expenses.



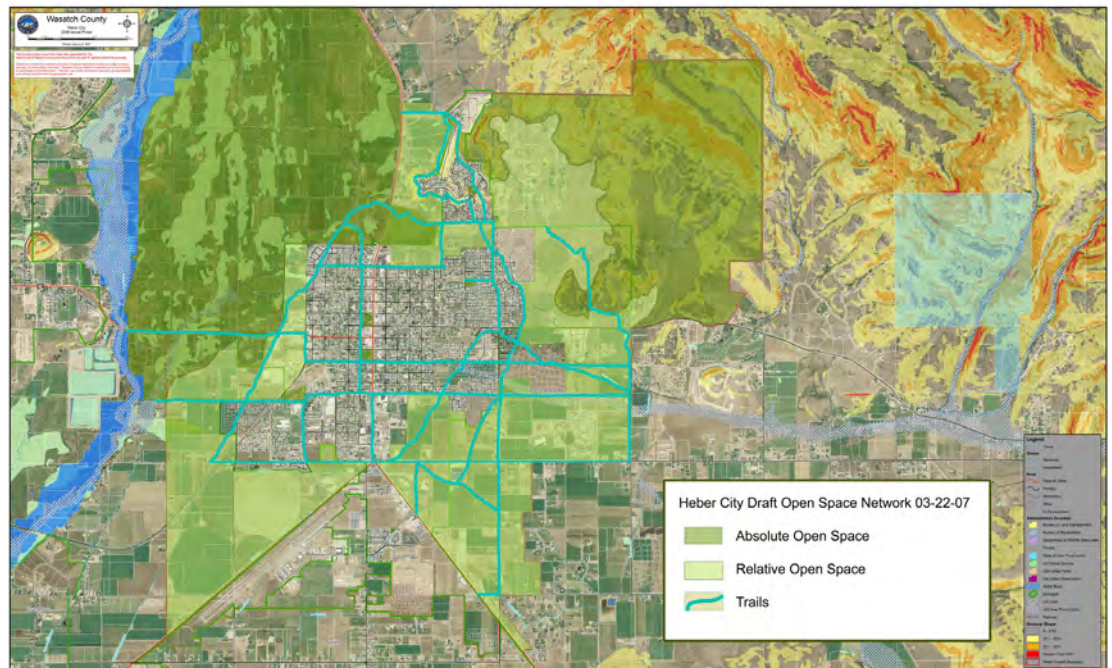
### DID YOU KNOW ?

EPWU's current available supply of water is 131,000 acre-feet per year.



Careful planning that identifies the best areas for development while preserving large patches of ecologically important environments and functional wildlife corridors are essential for providing habitat for plants and animals, delivering a conduit for movement, and maintaining fundamental ecological process that affect the distribution, persistence, and structure of biological communities. Because the greatest threats to wildlife and biodiversity are habitat destruction, degradation, and fragmentation, purchasing land outright or protecting it through the application of conservation easements ensures the protection of lands important for habitat. However, which lands are conserved and in what pattern they are conserved is equally important for maintaining habitat connectivity and minimizing the destructive effects of habitat fragmentation. Prioritizing lands for acquisition maximizes the conservation benefit of each dollar spent (Environmental Law Institute 2006).

This type of managed approach is also critical for long term development planning. Developing the land will attract more people there to boost the local economy. Development will allow for the expansion of new industrial sites as well as areas for living. With easy access to Transmountain road and to New Mexico, the area could bring in many new businesses, families, and commuters to the area. Development can provide trails for commuting to encourage biking instead of cars.



**Figure 5:** Example Open Space Network, CEDAR Planning Methodology, Sumner Swaner

The group has identified the following important expectations for the plan:

- A plan is needed that can be approved by all stakeholders and interested parties.
- The plan should identify the social, environmental and economic value of land under conditions of preservation and development.
- The benefits of the plan should address holistic cost benefit strategies aimed at enhancing quality of life under a variety of conditions.
- The plan should suggest a methodology for vetting land sale and development decisions in El Paso and the immediately surrounding territory.
- The plan provides recommendations for a clear methodology to be used for alignment of social, economic, environmental and development values across broad stakeholder groups.

To understand the power of how this decision will affect our future and the generations to come, one needs to learn why the recommendation is being made to conserve 50% of the land. Education, outdoor recreation and the maintaining of natural, open space connects each of us to an intimate knowledge of our environments and the life within. The health of our residents is one of the primary objectives that have been identified in the City's recently-developed Strategic Plan. This natural land will improve the quality of life in our communities.

We have a shared responsibility to conserve and educate the community about our natural world: to use only what we need, make smarter choices, and pass on to future generations the beauty, wildlife, water and natural resources we have today.

## **Social Impacts**

### **Social Equity and Environmental Justice**

Exemplary of a strong border culture, the majority of El Paso residents identify as Hispanic (83%) and are Spanish speakers (65%). A large portion of El Paso families earn less than their counterparts across Texas. Just over 20% of El Pasoans live below the federal poverty line with certain neighborhoods exceeding 40%. Median Household Income, at 71% of the US average, is approximately \$42,000 annually. It is no coincidence that this statistic relates to both economic and social vulnerability. Wages, educational opportunity, access to healthy lifestyle choices and social and physical mobility all reflect the barriers facing this population (City of El Paso Resilience Assessment, 2016).

A scarcity of parks and open space exacerbates an already unjust system for some El Pasoans. In a general evaluation conducted in 2013 in Northeast El Paso, findings showed that for a planning population of 110,900 there are just 4.22 acres of parkland (including non-City parks) for every 1,000 residents. In addition, there are only 1.6 acres of pocket and neighborhood parks per every 1,000 residents.<sup>1</sup> In comparison, according to the Trust for Public Land in the 2015 City Park Facts report, the median average for low-, medium- and high-density cities is 12.5 acres of parkland per 1,000 residents.<sup>2</sup> Adopting this recommended preservation criteria would help mitigate these inadequacies and would provide this underserved population with greater equality of services when compared to the rest of the state and the nation.

### **Health**

A key finding in a 2011 American Heart Association review of more than 200 research studies was that for every \$1 spent on building biking trails and walking paths an estimated \$3 in medical expenses is saved (Trust for America's Health, 2012). The City of El Paso Department of Health identified obesity, diabetes, fitness and nutrition as the number one health priority for our community in 2013.<sup>3</sup> In addition, of patients admitted to El Paso Children's Hospital, bronchitis and asthma without complications has been identified as the number one general pediatric diagnosis. These statistics are indicative of a population suffering from a high level of preventable disease directly affected by the surrounding physical environment. The 2013 Department of Health study also identified the following 4 categories of potential impact across the health continuum:

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1 El Paso Parks Facilities – General Evaluation Scorecard for Calendar Year 2013. Northeast PR Master Plan Scorecard

2 Trust for Public Land. 2015. 2015 City Park Facts. Retrieved from <[https://www.tpl.org/sites/default/files/files\\_upload/2015-City-Park-Facts-Report.pdf](https://www.tpl.org/sites/default/files/files_upload/2015-City-Park-Facts-Report.pdf)>

3 City of El Paso - Department of Public Health (2013, July 31) Community Health Assessment Final Report. Retrieved August 2, 2015 from <https://www.elpasotexas.gov/~media/files/coep/public%20health/community%20health%20assessment%20final%20report.ashx?la=en>



## DID YOU KNOW ?

In 2010, more than 500 million gallons of “reclaimed water” were returned to the Hueco Bolson

Community Prevention, Clinical Prevention, Care and Treatment and Post Discharge Follow Up. In 2015, the Healthy Eating Active Living Plan<sup>4</sup> produced by the Institute for Healthy Living noted that adults reporting “no leisure time physical activity in the past month” in 2010 (when the survey was conducted) in El Paso County was 28.7%. Increased access to outdoor public recreation space including parkland and trails can help increase the amount of physical activity in which adults engage on a monthly basis. In addition to physical health, increased access to outdoor public recreation space can also improve mental health. According to a study published in Psychological Science in 2008, performance on memory and attention tests improved by 20% after study subjects paused for a walk through an arboretum.<sup>5</sup> When these people were sent on a break to stroll down a busy street in town, no cognitive boost was detected. **A great opportunity for improvement for our community lies on the proactive, preventative healthcare end of the spectrum as a function of an improved urban condition supportive of human health and well-being.**

Nature deficit disorder research “indicates that one of the best antidotes to a stressful lifestyle is to spend time in natural settings outdoors. Children who spend time outdoors are likely to be: happier, healthier, smarter, more cooperative, better problem solvers, and more creative. Children need leisurely, unscripted, and exploratory hours to find the wonders in their own backyards and neighborhoods, from discovering the beauty of the stars in the night sky to watching lizards on a warm summer’s day.” (Cheryl Charles, Nature Deficit Disorder Special Edition, March 18, 2013)

## Environmental Impacts

### Water Resources

According to Towards a Bright Future, Mountains to River – A Green Infrastructure Plan for El Paso, it is believed that “30% of remaining arroyos connect to the edge of the Franklin Mountains State Park. These provide excellent potential corridors for trail access to the lower mountain areas, and also provide excellent corridors for natural drainage though El Paso. Many of these corridors are also longer than one mile in length...” **Arid lands, such as those found across El Paso, are associated with intense rainstorms that generate substantive rainfall impacts and locally high rates of overland flow runoff leading to flooding, hill-slope and channel erosion and high sediment concentration.**

Preservation of specific areas would allow for vegetation to remain undisturbed and would assist in reducing erosion and flooding. Alternative methods to slow down, intercept and stabilize the flow of water are varied; however, using a combination of bioengineering and natural materials often produces the most effective results.<sup>6</sup>

Due to the tremendous growth El Paso is experiencing, the natural flow of water has been altered, causing large amounts of water during rainstorms to concentrate in developed areas instead of naturally filtering into the ground or flowing to the river. The Borderplex Alliance projects the population of El Paso County to grow by 69.7% between 2000 and 2040, so we can expect our landscape to change even more over the next 20 years.<sup>7</sup>

4 Healthy Eating Active Living Strategic Plan. 2015. Paso Del Norte Health Foundation. <http://pdnihil.org/wp-content/uploads/2015/03/HEAL-strategic-plan.pdf>

5 Berman, Marc, Jonides, John, and Stephan Kaplan. 2008. Cognitive Benefits of Interacting With Nature. Psychological Science, Volume 19, Number 12.

6 Storm water, Arroyos, and Slope Stabilization Recommendations for Arid Lands. Austin, TX: Texas Parks and Wildlife Department, 2015. 4 pp. pamphlet. No author cited.)

7 Regional Data—Population. 2010. Borderplex Alliance. <<http://www.borderplexalliance.org/regional-data/el-paso/overview/population>>



In 2006, El Paso experienced one of the region's most severe storm events in recent memory. During that weather event, El Paso received 15 inches of rain over a four day period causing an estimated \$180 million in property damage: "Storms in a saturated atmosphere repeatedly developed and moved over mainly the northwest third of El Paso County, concentrating in an area near the Franklin Mountains. Rainfall reports varied from 4-6 inches within 15 hours, with an isolated report of about 8 inches on the western slope of the mountain range. Antecedent conditions from 4 days of heavy rains, combined with terrain effects of the mountains, led to excessive runoff and flooding not seen on such a large scale in the El Paso area in more than 100 years."<sup>8</sup> Our mountains and arroyos naturally channel water to the Rio Grande, however, development near the mountain and increasing hardscape acreage at the city core with little regard for green infrastructure, capacity for stormwater absorption is greatly diminished.

As a result of the storm of 2006, emergency funding was pulled from existing capital bond funding to commence repair and reconstruction needed throughout the city: **"In total, \$115 million of bond funding has been earmarked for the critical repair and reconstruction work needed within the City's road and storm water drainage system that is a direct result of Storm 2006."** A Presidential Disaster was declared on August 15, 2006 triggering a request for state and federal funding assistance. Retention ponds were breached, roads were destroyed, and over 69 houses were bought out as a result of irreparable damage.

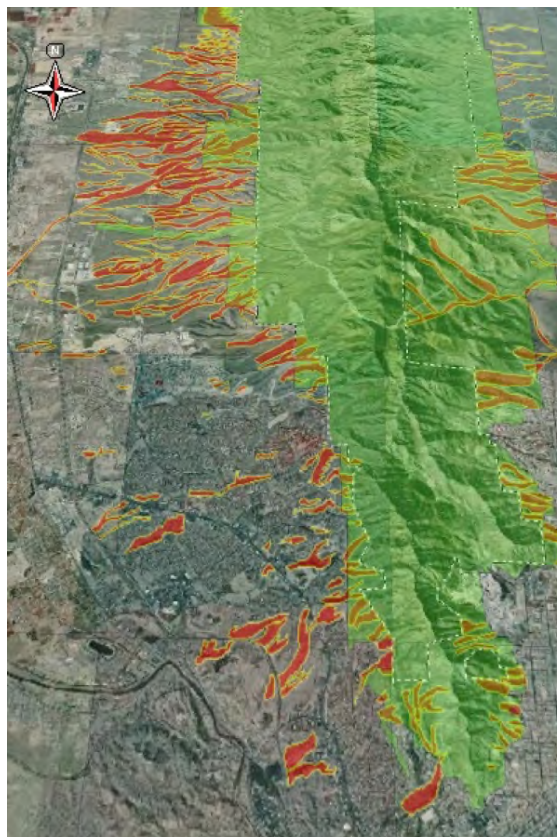
## DID YOU KNOW ?

During the Storm of 2006, El Paso received 15 inches of rain over four days and caused an estimated \$180 million in property damage



## Arroyos

Arroyos are ephemeral, unstable, and dynamic, and therefore particularly unsuitable for development. Attempts at controlling arroyos have unpredictable effects downstream, on surrounding arroyos, on flatter desert lands and on all the human structures they contain. Confining a dynamic system disrupts the natural ecological balance and creates erosion, incision, loss of habitat, habitat degradation and altered habitats. Increasing impervious areas by paving and curbing will invariably contribute to increased peak flows and will impair the storm water treatment functions that vegetated areas perform naturally. Traditional arroyo management using concrete walls, channels, and culverts, and building on floodplains creates unhealthy stream systems. Traditional methods are expensive to build and maintain and can potentially lead to more problems.



**Figure 6:** Arroyos along the Franklin Mountains (City of El Paso Planning Department, 2005)

8 Texas Almanac. Accessed on 10/3/2016. Retrieved from <<http://texasalmanac.com/topics/environment/significant-weather-2000s>>

## Wildlife

Some wildlife species, such as, prairie dogs, black-footed ferrets, and Mexican wolves, may have been extirpated from the Franklin Mountains region because of human development. Other species present, such as mountain lions, mule deer, and some bird species, may also disappear from the Franklin Mountains if development eliminates critical habitat. There is interest in future research for the Chihuahuan Desert Species of Greatest Conservation Need, as listed in the Texas Parks and Wildlife State Conservation Action Plan 2012 (see Appendix E).

## Economic Impacts

### Infrastructure Investment and Resource Conservation

In the short term, through the use of taxes, the City supports development by extending services, such as fire departments, police departments, parks and recreation centers, sidewalk and road repairs, bike lanes, right-of-way maintenance, street lamps, etc.

Considering the long-term impacts of this, taxes for long-term development cannot sustain or cover the full extent of these costs, especially as the life span of the infrastructure expires, and maintenance is needed. On the other hand, if the land is kept undeveloped, based on the ecosystems services evaluation conducted for the open space land mentioned in the petition, less development may ultimately mean more tax revenue. Open space land requires very little maintenance and actually naturally provides services, that would otherwise come as a cost to the City of El Paso and El Paso Water, such as water recharge, storm water control, and dust control. In addition, open space provides an opportunity for recreation, which can promote health and wellness benefits, further decreasing the health care cost burden for the community.

### Economic Development and Tourism

Protecting public lands also has the potential to attract significant ecotourism dollars driving a sustainable form of economic development. In 2006, Hueco Tanks brought in \$582,207 in County sales, and \$331,774 in County residents' personal income. In 2007, Hueco Tanks and Franklin Mountains State Park brought 72,644 visitors to El Paso County (Texas State Park, Natural Economic Assets). Additionally, studies show that many Americans, specifically seniors, flock to areas of the Southwest seeking homes set in the natural desert landscape and stable climate native to our region. Having access to beautiful open space adds to our quality of life and our experience economy, making El Paso an attractive area for businesses interested in relocating in our region. In addition, different habitat types are important to migrating species that stop, stage and feed on their way through El Paso. Some of these habitats are home to Southwest species that are not commonly found anywhere else in Texas, which attract birdwatchers from across the state to view species such as the Crissal Thrasher, hummingbirds, Scaled Quail and Gambel's Quail.

Furthermore, property values tend to increase when adjacent to undeveloped natural areas. The real estate market consistently demonstrates that many people are willing to pay more for property located close to parks and open space areas than for a home that does not offer this amenity. The higher value of these residences requires their owners to pay higher property taxes, termed the "proximate principle" by Compton in 2004. In effect, this denotes a "capitalization" of park land into increased property values of proximate land owners.

Studies have found the potential for an increase in property value depends upon the characteristics of the open space and the orientation of surrounding properties. Property value increases are likely to be highest near those greenways which:



**Value increase to homes located within 1,500 feet of the following types of parks:**

|                  |          |
|------------------|----------|
| Natural Areas:   | \$10,648 |
| Golf Courses:    | \$8,849  |
| Specialty Parks: | \$5,657  |
| Urban Parks:     | \$1,214  |

## DID YOU KNOW ?



- Highlight open space rather than highly developed facilities
- Have limited vehicular access, but some recreational access
- Have effective maintenance and security

Many studies have revealed increases in property values in instances where the property is located near or adjacent to open spaces. In one study conducted in Boulder, Colorado, housing prices declined an average of \$4.20 and up to \$10.20 for each foot of distance from a greenbelt (up to 3,200 feet). Additionally, in Boulder, the average value of property adjacent to the greenbelt was 32% higher than those 3,200 feet away. **Another study found that urban land adjacent to the greenbelt was worth approximately \$1,200 more per acre than urban land 1,000 feet away from the greenbelt boundary.** A study in Amherst and Concord, Massachusetts, found that clustered housing with open space appreciated at a higher rate than conventionally-designed subdivisions and their home yielded owners a higher rate of return, even though the conventional subdivisions had considerably larger lot sizes (Lacy, 1990). An analysis of property surrounding four parks in Worcester, Massachusetts, showed a house located 20 feet from a park sold for \$2,675 (1982 dollars) more than a similar house located 2,000 feet away. In the vicinity of Philadelphia's 1,300 acre Pennypack Park, property values correlate significantly with proximity to the park. Conclusions showed properties where the homes that faced the park sold for between 7 to 23 percent more than homes one block from the park (Real Property Values. Economic Impacts of Protecting Rivers, Trails, and Greenway Corridors).

In addition, the view-sheds of preserved flora and fauna are a critical economic asset to the the City of El Paso and surrounding areas. Undeveloped land is a limited resource that once developed out of its natural state cannot be easily restored therefore diminishing its value to the community.

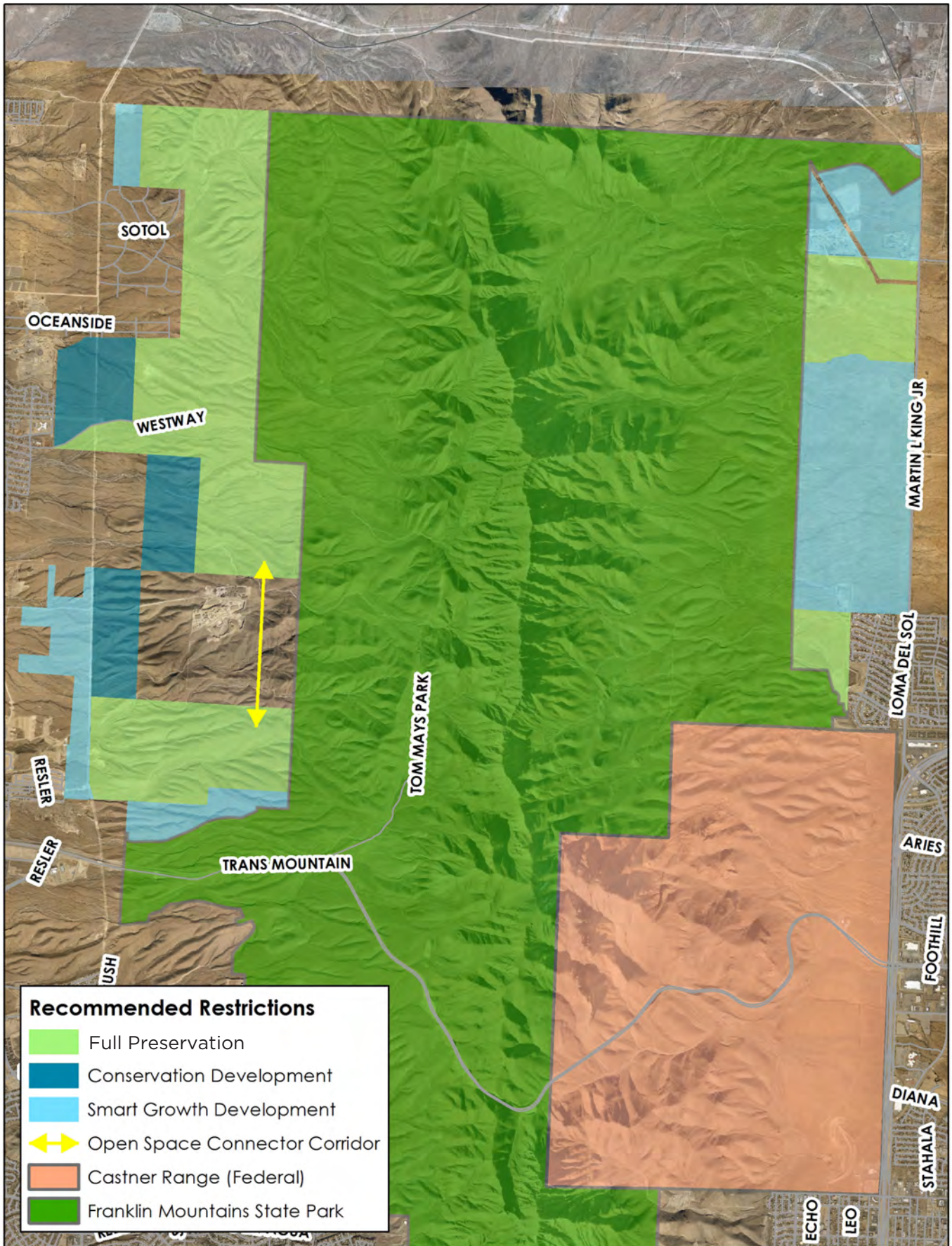


**The following section details the recommendations of this report. It is divided into different sections to guide the reader through the recommendations:**

1. Overview: Recommendations for which PSB-owned land in the petition area should be fully preserved, should follow Conservation Development as outlined, or developed according to Smart Code with the possibility for some conservation development criteria to be incorporated.
2. Recommended criteria to be used to select which sections of a recommended Conservation Development land parcel should be conserved. The remaining sections can be developed and should include the recommended zoning requirements.
3. Additional considerations and recommendations
4. Current and proposed zoning districts
5. Future zoning and ordinance recommendations
6. Visual example of how the recommended criteria can be applied to lands suited for conservation development
7. Methods for achieving conservation development







**Figure 7:** Recommended land within the petition area to be either fully preserved, lightly developed with the conservation development conditions or developed according to Smart Code (with some additional conditions as appropriate).

*Note: The area recommended for Full Preservation on the east side of the Franklin Mountains is owned by the City, but the General Land Office holds the mineral rights, which are currently leased.*



The purpose of this report is to:

1. **Develop criteria to identify which specific City-owned, Public Service Board managed lands mentioned in the petition should be preserved;**
2. **Identify which lands can be developed, and;**
3. **To establish conservation standards for this development so as to ensure a high quality of life for present and future generations.**

The Public Service Board (PSB)-owned land that is being considered for sale falls into three separate levels of development shown in green, light blue, and dark blue on the maps to the left (page 26).

The **Preservation Area (green area)** (4,037 acres) is to have no disturbance in the form of development, it may be used for passive recreation if and when needed. The green area will allow all to remain as a natural habitat. The green area has the roughest terrain, steepest slopes and is a large mass of connected land that will allow rainwater to flow downhill or be absorbed. As a reminder the original purpose for the City purchasing of these lands in the 1900s was for water conservation. To ensure that the land use does not change in the future it is being asked that a conservation easement be placed on the lands to ensure as the years go by that others do not attempt to sell and build on the Franklin Mountains. If the City lacks the capacity and expertise to manage the land we recommend that they enter into partnerships. One example is to form an Memorandum of Understanding (MOU) with the Franklin Mountain State Park (FMSP) or other Texas Parks and Wildlife Department (TPWD) divisions. This agreement will allow the City to have the ability to co-manage and share resources for cohesive oversight and give the FMSP future ability to expand trails with new access points to the state park.

The **Conservation Development Area (dark blue)** (905 acres) has been designated to assist with the transition from non-developed lands to more highly developed lands. The conservation development area will have deed restrictions on what may be developed listed in the deed before the sale of the land. To ensure the deed restrictions are followed the land will be sold with a conservation easement, also listing the restrictions. The conservation easement would be placed on the land before it is sold to a private land owner. This will provide oversight to ensure that the development follows the deed restrictions. The sites that can be developed will be shown in the conservation easement as a “building envelope/zone,” which designates where the structures will be built. The holders of the conservation easement are obligated to ensure that the land will be preserved and developed according to the terms stated in the agreement and the conservation easement, which will include regular site visits for monitoring and evaluation. In those designated building envelopes/zones, the criteria outlined on the next few pages will be used to ensure that the development is minimal and will have a low impact on the surrounding natural areas. As a future recommendation, a Conservation Development Zone that codifies the recommended criteria could be created to ensure the criteria is being followed. *Note:* The bulk of the following recommendation section will explain this conservation development criteria further.

The **Smart Growth Plus Some Criteria Area (light blue)** (2,483 acres) will follow the existing City of El Paso ordinance for smart growth. Due to the fact there are arroyos, corridors, and trails that do go through all the mountain lands some of the light blue criteria will be considered before the final development plans are to be accepted. This must be done on a case-by-case basis as the land all varies. This can be done with a site walk and discussion with the developers.

**The following sections describes recommended criteria that should be used to select which sections of a land parcel designated as “Conservation Development” on page 26 (Figure 7) should be preserved.** This criteria is recommended to be included in the agreement between the PSB and a developer during the sale of PSB-owned land within the petition area.

After identifying which parcels should be developed or preserved based on this criteria, the remaining sections of the land parcel can be developed in a way that includes the recommended zoning requirements for Conservation Development (page 29).

Additionally, and where appropriate, this criteria could also be used to identify which sections of the Smart Growth Plus Some Criteria area (dark blue) could and should be conserved to enhance the quality of life in those master planned areas.

The method for how to apply this criteria in a way that ensures these conditions are met after the sale of land can be found on pages 32-34. A visual example of how this criteria can be applied to an area designated for Conservation Development can be found on page 36-37.

***This report recommends that all Public Service Board (PSB) lands not scheduled for 100% preservation, with conservation easement(s), or considered for Smart Growth development with some conservation criteria, and are scheduled for development shall follow the principles outlined below for Conservation Development.*** This report recommends that these principles be included in the sale agreement between the PSB and a developer, until a time when these principles can be codified in the form of a new Conservation Development Zone (CDZ) as established by the City of El Paso. Technical assistance may be provided by Texas Parks and Wildlife or Frontera Land Alliance to help apply this criteria.

**Recommended criteria for identification of which sections of a land parcel designated at Conservation Development should be preserved**

1. **The PSB-owned lands included in the Open Space Plan of El Paso.** The City of El Paso adopted the Open Space Master Plan, also known as “Towards a Bright Future: Mountains to River -A Green Infrastructure Plan for El Paso” on February 27, 2006. It is now incorporated within Plan El Paso, the City’s comprehensive plan, which was adopted in 2012. Of the land listed in the Open Space Plan, the following are PSB-owned:
  - The remaining undeveloped lands in the “Mountains to River” Arroyo System north of Trans-Mountain Road, EPWU page 5-19 and 5-43.
  - Northeast Open Space - Bajadas, arroyos and canyons in buffer zones and NE Immediate to High Northeast Arroyos
  - Arroyo systems and canyons, page 5-11
2. **Lands containing any Primary Conservation Areas (PCA):** FEMA, arroyos, wetlands, steep slopes > 20%, archaeological sites, and land parcels containing habitat and species listed in the Species of Greatest Conservation Needs and Rare Communities List found in the 2012 State of Texas Conservation Action Plan and the Chihuahuan Desert and Arizona- New Mexico Mountains Ecoregions Handbook, August 2012 (full

The annual value of ecosystem services within the El Paso study area is estimated to be between \$3.4 million and \$6.7 million (Appendix I: Earth Economics, Ecosystem Services Valuation, El Paso 2016).

description is on page 45, #17 of terminology) (Texas Parks and Wildlife Conservation Action Plan 2012).

3. **Large contiguous or connected natural areas** that contain Primary Conservation Areas
4. **Land parcels abutting or connected to the Franklin Mountains** or other large natural open space areas > 100 acres (Conservation Buffers, Design Guidelines for Buffers, Corridors, and Greenways 2008, Conservation Thresholds for Land Use Planners 2003, Dale, et. al. 2000 of America).
5. **Arroyos and other functional habitat corridors that have functional connectivity** that allow movement of species or populations and their genetic makeup among habitats and populations (Conservation Thresholds for Land Use Planners 2003, Dale, et. al. 2000, Hellmund and Smith 2006).
6. **Land parcels on lands with steep slopes > 20 percent** (Arendt 1996, Arendt 1999).
7. **Land parcels containing Secondary Conservation Areas (SCAs)** having ecologically sensitive habitat, such as arroyos, natural swales and berms, talus slopes, sky islands, rock-dominated canyons or formations, and sandy dunes, or with historical significance, such as events remembered that affected people on a large scale (Texas Parks and Wildlife Conservation Action Plan 2012). (full description is on page 45, #19 of terminology)
8. **Land parcels with habitat diversity that contain plant communities that vary in plant species richness** (number of different species), plant physiognomy (external appearance of vegetation, its vertical structure and growth form of the dominant taxa) and levels of plant succession (Conservation Thresholds for Land Use Planners 2003, Dale, et. al. 2000, The Ojai Valley Land Conservancy Conservation Criteria).
9. **Land parcels with a diversity (richness, variety and variability) of wildlife species** (Dale, et. al. 2000, The Ojai Valley Land Conservancy Conservation Criteria).
10. **Land parcels accessible for passive recreation to the public** (The Ojai Valley Land Conservancy Conservation Criteria).
11. **Buffer zones or land patches in sizes capable of sustaining plant communities (5.0 - 250 acres) and animal communities (2.5 acres - 3.5 square miles)**, depending on the species or habitat of concern (Conservation Buffers, Design Guidelines for Buffers, Corridors, and Greenways 2008).
12. **Broad corridors (typically 0.7 - 1.2 miles for most of their length) to allow for trails** without compromising linkages for wildlife.
13. **Corridors > 300 feet needed for large mammals**, such as mule deer (Conservation Buffers, Design Guidelines for Buffers, Corridors, and Greenways 2008).





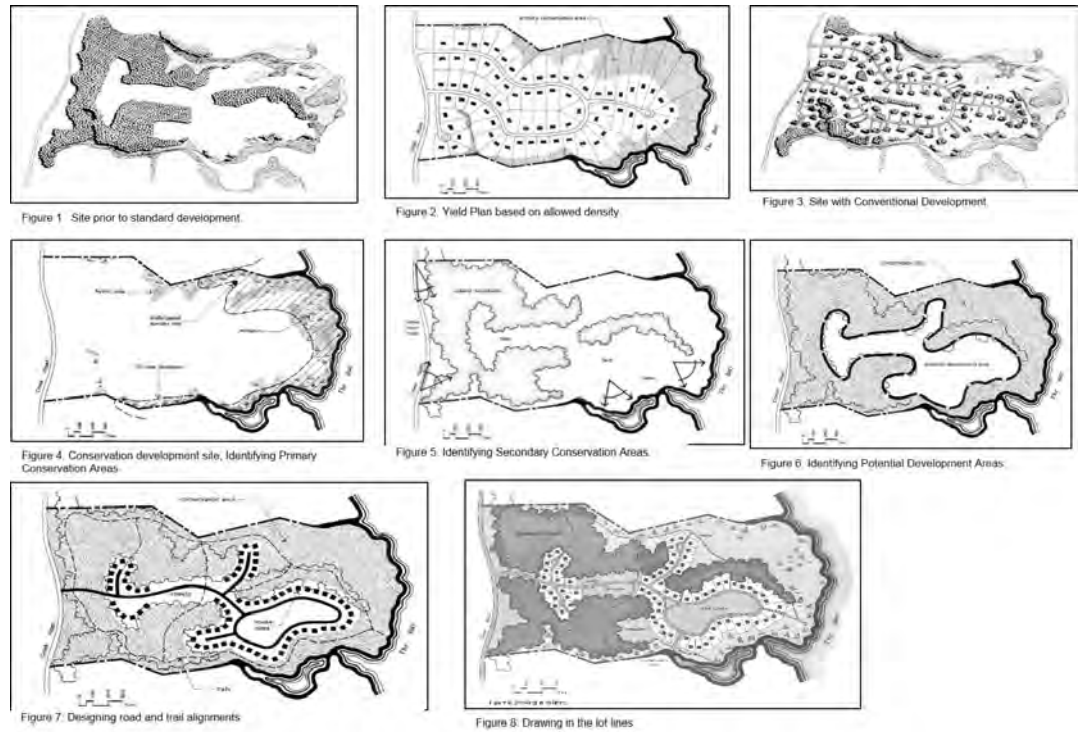
**Recommended zoning considerations or requirements for the areas designated as Conservation Development (light blue, page 26)**

1. **Density.** Zoning and density allocations are calculated for the benefit of the natural resources, where open space, not lot size, is the focus of the plan (Arendt 1999, Natural Lands Trust, Inc.). Density shall be established by City of El Paso’s Planning and Inspections Department, based on zoning codes, to allow for maximum density of remaining, non-conserved land area. It is recommended that there not be lot size minimums in the Conservation Development Zone (CDZ), once created.
2. **Landowner Compact.** This technique permits abutting landowners to plan their combined properties comprehensively, allowing them to effectively erase the boundary lines separating their properties. Areas best suited for development and conservation could be located so the benefits are maximized across the abutting properties. This planning tool shall be permitted in the Conservation Development area and shall include property contiguous with the Conservation Development area, if permitted by property owners (Arendt 1999).
3. **Density Neutral.** Conservation Development goals shall be met without reducing permitted density of homes. The CDZ, once created, will not require uniform lot size.
4. **Inventory and Site Analysis Plans.** All parcels being proposed for Conservation Development shall prepare inventory and site analysis plans, that indicate all buildable, unbuildable, primary and secondary conservation areas and all of the significantly important landscape elements identified in the aforementioned criteria. Additional criteria can be added to the CDZ, once created, from time-to-time by future amendments.
5. **Site Visit.** All parcels being proposed for Conservation Development require all involved in the process—the developer, planning staff, Parks and Recreation staff, etc.—to conduct a site walk on the property before any engineering plans are put into place in order to identify the conservation areas to be preserved (McMahon 2010). If an in-person site visit is not feasible for all parties, a flyover or virtual option may be used.
6. **Sketch Plan Required.** All parcels being proposed for Conservation Development shall have a professionally-prepared sketch plan. The sketch plan shall illustrate the required elements mentioned above and any issues arising from the site visit. The sketch plan shall comply with all City requirements. The sketch plan shall use the Four-Step Design Process (Arendt 1996), which follows here:
  - **Step 1.** Identify the Primary and Secondary Conservation Area lands (see Terminology for full definition on page 45, #17, #19) that should potentially be protected. Use landowner’s compact process as needed. 50-70% minimum open space is required.
  - **Step 2.** Locate housing sites or footprints; with minimum 80% of the dwelling units contiguous with preserved open space, the design shall attempt to have 100% of the dwelling units contiguous with the open space.

“Natural open space improves mental and physical health. Researchers hypothesize that exposure to the natural outdoors causes significant, measurable changes to the brain. These changes lead to clearer thinking, greater ability to focus and maximum cognitive ability. In short: enjoying nature makes you smarter. Recent studies have already linked spending time in nature with stress reduction and overall happiness” (Backpacker Magazine).

“Natural beauty reflects the value that people place on having a view of or access to nature. This value tends to be highest for land in close proximity to development and then decreases with distance” (Appendix I: Earth Economics, Ecosystem Services Valuation, El Paso 2016).

- **Step 3.** Design street alignments and trails, with consideration of the Planned Mountain Development code (20.10.370) which stipulates that streets in that district must prevent “undue scarring and grading,” In addition, streets and trails should incorporate conservation design elements where appropriate, such as, narrow road cross-sections, no curb and gutters, and using drainage swales and green infrastructure techniques to harvest water on site and reduce runoff to the maximum extent possible.
  - **Step 4.** Draw in lot lines, using conservancy lot design techniques as needed.
- 7. Maintenance Plans.** All parcels being proposed for Conservation Development shall prepare planting plans, restoration plans and warranty instruments as required by this zone and further specified by the City.



**Figure 8:** A comparison of standard development (Figures 1-3) versus conservation development (Figures 4-8)

**It is recommended that the following actions be considered before development occurs.**

**Ecological Considerations**

1. Examine the impacts of local decisions to understand the regional context across the landscape for species continuance and ecosystem sustainability (Conservation Thresholds for Land Use Planners 2003, Dale, et. al. 2000 of America, Kihlslinger and McElfish 2009).
2. Plan for long-term change (10-50 years) and unexpected ecological processes over lengthy and variable time scales (Conservation Thresholds for Land Use Planners 2003, Dale, et. al. 2000 of America, Kihlslinger and McElfish 2009). Biodiversity, biological resilience and integrity are directly proportional to the quantity and quality of undisturbed natural open space lands.

**Lastly, it is recommended that the following standards regarding conservation practices be included in the sale agreement between the PSB and a developer.**

**Key Conservation Standards (to be considered DURING development)**

- Avoid land uses that deplete natural resources over a broad area to prevent the irreversible disruption of ecosystems and associated processes (Dale, et. al. 2000 of America, Kihlslinger and McElfish 2009).
- Retain large contiguous or connected areas that contain critical habitats and avoid fragmenting these areas to maintain more ecosystem processes and support a greater diversity, abundance and survival of plants and animals over time (Dale, et. al. 2000 of America, Kihlslinger and McElfish 2009).
- The natural state of the land in development areas shall be preserved by eliminating mass grading, minimizing grading, and plant removal.
- The top soil which contains indigenous native plant seeds and nutrition removed by grading will be stockpiled at the site.
- Road and lot configuration shall maintain and preserve the natural topography, wildlife movement corridors, ecologically sensitive habitats, significant plant cover, as well as minimize cut and fill and preserve views on or off the subject parcel.
- Drainage plans should maintain the character of natural water flows to avoid concentrating flows and shall be designed using vegetative, or other pervious surfaces to enable water infiltration where appropriate.
- Avoid the removal or disruption of cultural features such as archaeological or historic sites.
- Structures should be oriented to maximize solar gain in the winter months and minimize solar gain in the summer months.
- Compensate for adverse effects of development on natural processes with revegetation of natural habitat and or mitigation (Dale, et.al. 2000).
- Minimize the introduction and spread of non-native species facilitated by the development of transportation infrastructure and the creation of edge environments and artificial landscapes. (Dale, et. al. 2000, Kihlslinger and McElfish 2009).

“Watersheds in the U.S.-Mexico border region are shared bi-nationally, with rivers flowing from one country to the other or forming the international boundary. Protecting and restoring watersheds and water quality in these rivers and providing adequate drinking water and basic sanitation services requires collaborative bi-national, multi-jurisdictional planning efforts.”

Environmental Protection Agency, Border 2020 Goals and Objectives



The following model code provisions are provided as examples of embedding ecologically sensitive landscape types into land use planning policies (Swaner, per. Comm. 2016). The City of El Paso has existing development regulations that are complementary to some of the recommendations made in this report.

#### **Zoning Districts which currently exist:**

The **Natural Open Space (NOS)** zoning district is intended to protect ecologically sensitive lands and to prohibit those activities that would adversely affect the environmental characteristics of the land, while still permitting passive recreational use. The NOS is also intended to preserve land that, if disturbed, may be susceptible to flooding and soil erosion due to steep slopes and significant quantities of stormwater runoff. It would be appropriate to apply the NOS zoning district to PSB land designated for full conservation.

The **Planned Mountain Development (PMD)** zoning district is intended to provide design alternatives that serve to minimize disturbance of the natural character of mountainside areas and which enhance the open space and aesthetic qualities of the land. The PMD is designed to protect, stabilize and enhance the development of environmentally sensitive lands, and to preserve them from the encroachment of highly intensive forms of development. Limitations to the PMD include its focus on mountainside land, meaning it would not be an appropriate zoning district for all PSB land. Additionally, while the PMD limits development, it does not prohibit development, even on very steeply-sloped land.

#### **Recommended Zoning Districts**

The **Conservation Development Zone (CDZ)** recommended by this report for future adoption would establish requirements that ensure that environmentally significant areas within otherwise developable lands would be protected. In turn, development on the remainder would be permitted at relatively high degrees of intensity. The CDZ is not currently a zoning district codified by the City of El Paso, and its implementation would require significant work to draft code language and calibrate regulations, however, it would be a more effective mechanism for ensuring sensitive development of PSB land. The criteria recommended by this report for conservation development would be the basis for the CDZ.

Beyond consideration of the PSB-owned lands in the petition, there are additional zoning and ordinance changes that could be made that align with the intentions of this report. These recommendations could be considered in future long-term planning conversations.

**Future Zoning and Ordinance Recommendations**

1. **Open Space Tract Size.** Remove restrictions that prevent cities from achieving interconnected open space networks that would be lost if linkages involve parcels smaller than 25 acres (Arendt 1999, Natural Lands Trust, Inc. 2001).
2. **Lot size and density**
  - Enable Lot Size Reduction: Permit reductions in lot size minimums when a developer is preserving a significant percentage of land as open space or allow for a sliding density (Arendt 1999, Natural Lands Trust, Inc.).
  - **Density Incentives.** Conservation design standard where full standard density is only allowed through the use of the CDZ where > 50% of the site as natural open space. (Arendt 1999, Natural Lands Trust, Inc. 2001).
  - **Density bonuses** given for preserving more land. *Example:* A yield plan of 18 two-acre lots (Arendt 1999).
    - Option 1 is density neutral with 18 smaller lots, with 50% open space.
    - Density bonus of 24 lots that preserves 60% open space.
    - Density bonus 36 lots (100%) and preserves 70% open space.
  - **Provide Options for Permitted Density** (net developable acreage) (Arendt 1999). This could include the application of Density Factors for different types of land subject to environmental constraints within a tract to determine the adjusted tract acreage (ATA). This could also include a Yield Plan process, in which the primary and secondary conservation areas are identified first to determine the potential development areas, instead of using the conventional layout (sprawl) of maximum lots (Figures 1-9).
3. **Requiring CDZ in Certain Situations.** Parcels proposed for development along the pre-determined conservation lands found in the El Paso Open Space Plan.
4. **Adoption of a new arroyo ordinance that protects arroyos and their surrounding buffer** and prohibits development in floodplain and arroyos without loopholes, maintains native vegetation (that are regionally appropriate and provide a suitable habitat) in the buffer zone, prohibits dumping debris, clearing, excavating, filling, alternative drainage, and impervious paving in the floodplain or within 100 feet on both sides of an arroyo's overbank (Fischer and Fischenich 2000, Spence et. al.1996).
5. **Adoption of a City of El Paso zoning ordinance with maps and overlays for an "open space" map** that outlines the basis for development density and locations considering the biological needs of the resources to be protected, and to set specific uses and densities that are designed to conserve continuous lands, protect biodiversity and key areas, and concentrate development in other places (Arendt 1997, Arendt 1999, Honachefsky 2000, Swaner 2006).

“As the region’s population dynamics are shifting, leaders must plan for the future; taking into consideration the evolving needs from the continuing rural to urban migration, changing demographics, and intensified pressure on our land, water, and wildlife resources”

(Texas Outdoor Recreation Plan, 2012, Texas Parks and Wildlife Department).

6. **Adoption of a City of El Paso development ordinance that prohibits development on steep slopes > 20%** (Arendt 1997, Arendt 1999, Lehigh Valley Planning Commission 2008, Steep Slope Development Standards 2003).<sup>1</sup> Slopes are naturally unstable yet sloping terrain serves as groundwater recharge areas and is prone to severe erosion if disturbed.
7. All subdivision, land development and planning, growth management, and infrastructure zoning ordinances should reference the City of El Paso’s “The Plan for El Paso” approved by the City Plan Commission (on April 22, 1999, and City Council on April 29, 1999), and the “Towards a Bright Future: Mountains to River -A Green Infrastructure Plan for El Paso” (Open Space Plan) approved Feb 27, 2006 to support and implement biodiversity goals.
8. Adoption of an impervious surface ordinance **that allows developers other** “soft” infrastructure. The ordinance would require developers to consider the use of vegetation, grass swales, etc., as an alternative to concrete gutters and canals.
9. **Only native plants are allowed** to be used in all developed lands including urban and suburban and public and private infrastructures (Dale, et.al 2000).
10. **Adoption of a vegetation control ordinance** that prohibit the introduction of exotic invasive plants during the development, allow developers to count protected native habitats for some or all of the landscaping requirements in zoning code, and set a standard for public owned land to prefer or require native plants in government projects and lands.
11. **Adoption of a weed control ordinance** that clearly differentiates between unkempt yards with non-native, invasive and noxious weeds and yards full of healthy native vegetation.
12. **Adoption of a stormwater management/sediment and erosion control ordinance** that encourages the use of rain gardens, bioswales, and constructed wetlands.
13. **Prohibit the feeding of wildlife, domestic and feral dogs and cats**, excluding songbirds and hummingbirds (Dauphine, et.al. 2011, Texas Parks and Wildlife Feral Cat Briefing Paper 2014, Winter et.al, 2006).
14. **Prohibit freely roaming feral dogs and cats** to minimize the impact on native fauna (Dauphine, et.al. 2011, Texas Parks and Wildlife Feral Cat Briefing Paper 2014, Winter et.al, 2006).



1 Steep Slope Development Standards, Planning and Zoning in Michigan, adapted from the ‘Shiawassee & Huron Headwaters Preservation Project’ developed by Oakland County Planning and Carlisle Wortman & Associates



## Application of Recommended Selection Criteria

The committee has identified the following seven steps necessary for application of the recommended selection criteria to proposed land area:

1. Identify and map existing development, highly disturbed lands, such as quarries, and the Primary Conservation Areas (PCAs) identified on page 45, #17 onto a base map.<sup>1</sup>
2. Identify and map the secondary conservation areas (identified on Page 45, #21) including scenic views, historically significant and natural lands with passive recreational value on to the base map (Dale, et. al. 2000, Texas Parks and Wildlife Conservation Action Plan 2012).
3. Use overlays on the map of all the defined resources on the base map (Steps 1 and 2) to form an “open space” map (Arendt 1996, Arendt 1999, Swaner 2006) (Figure 9).
4. Locate the habitat gaps on the “Open Space” map by locating the disconnections between the designated open space areas to preserve (Figure 10).

1 Kihslinger, R. and J. Jr. McElfish. 2009. Nature-Friendly Land Use Practices at Multiple Scales. Environmental Law Institute, Washington, D.C.

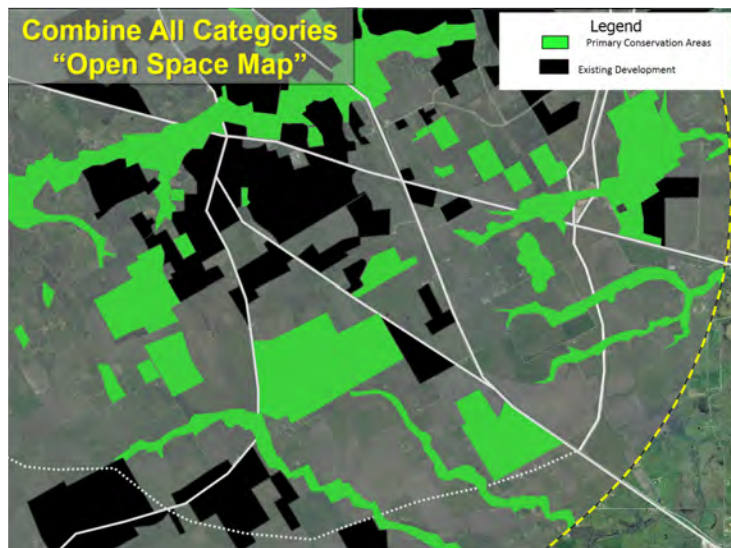


Figure 9: Example of the “Open Space Map” (steps 1-3)

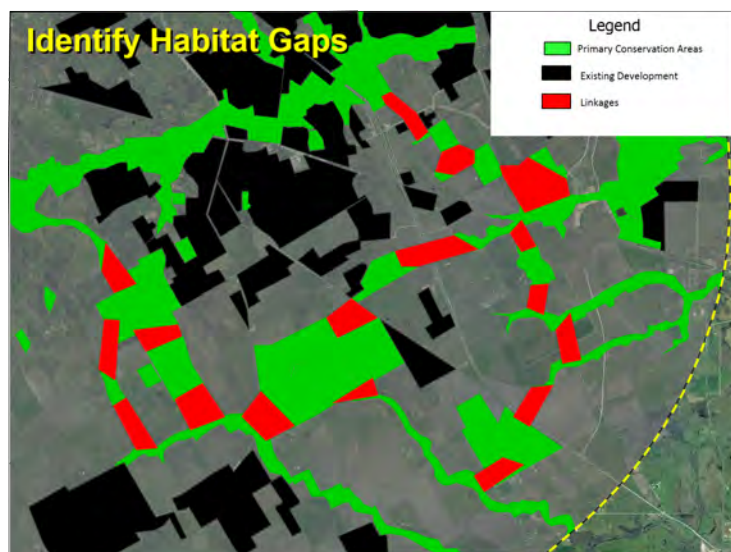


Figure 10: Example of an “Open Space Map” with habitat gaps in red (step 4)







Figure 11: Example of a “Connected Open Space” in green and existing adjacent development (steps 5-6)

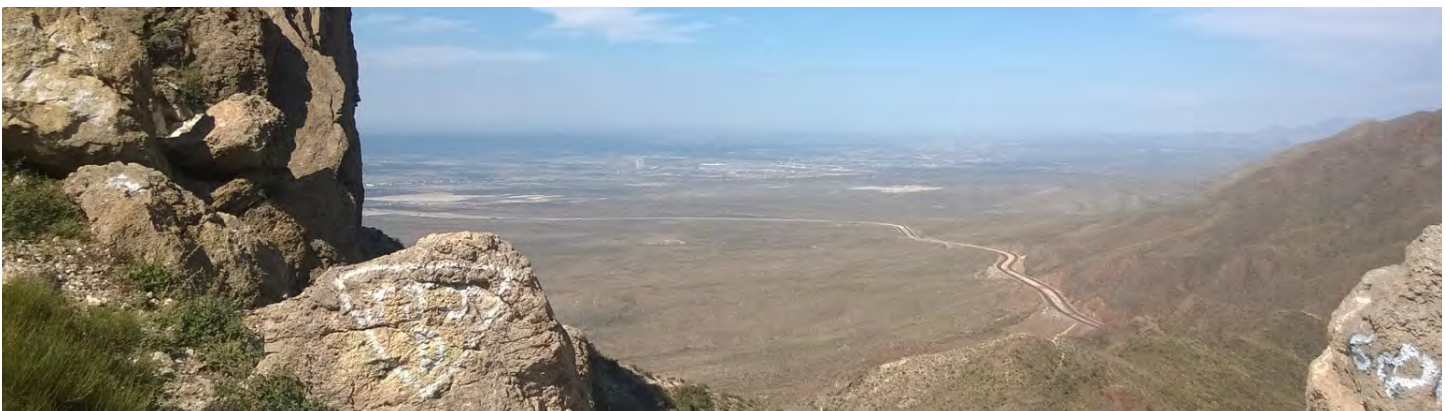
- Determine the linkages to the natural open space areas (Arendt 1996, Arendt 1999, McElfish 2004, Swaner 2006). Linkages between essential natural open space areas ensure that critical movement patterns between habitats are maintained for fauna.
- Connect the resources and linkages on another “Connected Open Space” overlay (Figure 11) with a connected network circuitry that has all corridors connected to all of the open space areas to facilitate the movement of wildlife, plants, and their genetic materials.<sup>2</sup>
- The “Connected Open Space” overlay identifies areas that should be preserved.<sup>3</sup> Development densities (low, medium, high) can now be determined for the remaining unpreserved land, based on proximity and relationship to preserved space.



Figure 12: Connected open space map and placement of densities (step 7)

2 Kihlsinger, R. and J. Jr. McElfish. 2009. Nature-Friendly Land Use Practices at Multiple Scales. Environmental Law Institute, Washington, D.C.

3 Kihlsinger, R. and J. Jr. McElfish. 2009. Nature-Friendly Land Use Practices at Multiple Scales. Environmental Law Institute, Washington, D.C.



**How to ensure the conservation development standards are followed:  
Methods to be used during the sale of land to ensure conservation**

Despite having national and state legislation to protect rare and endangered species and their habitats, the region continues to suffer significant biodiversity loss. Additional incentive mechanisms and tools are available to conserve our regional biodiversity. Incentives are necessary to supplement other conservation tools, such as regulation and land acquisition. To ensure that an incentive mechanism continues to be biologically effective, there must be outcome-based evaluation and adaptive management systems in place.

Conserving land carries with it many long-lasting benefits for our state. By preventing more land from being covered in concrete, we are ensuring that more of the precious little water that falls will soak into the ground and our aquifers, replenishing our water supply. Also, conserving land protects habitat for iconic Texas wildlife. As some may know, today we face the dilemma of how to maintain our rivers, lakes, aquifers and springs along with the working ranches and natural areas of our watershed. About 80 percent of Texas farms and ranches are now less than 500 acres. Farms and ranches between 500 and 2000 acres in size are declining. Because ninety-four percent of Texas land is privately owned, maintaining open space is ultimately up to us.

Locally, the region is facing some tough issues. For instance, there are just 1.38 acres of park space for every 1,000 persons in El Paso and in a city like Minneapolis they have 13.3 acres per 1,000 residents. We continue to experience flood damage that results from the filling or alteration of arroyos. Responding to these and other challenges requires concerted action and collaboration from all stakeholders. Unless we work together as one region across political boundaries, we may be overwhelmed by the dramatic shifts in demographics and changes in our environment.

The following section lists possible methods that may be used during the sale of City land to ensure conservation values are protected.

**Transfer of Development Rights Programs:**

Local governments undertake transfer of development rights (TDR) programs to use the market to implement and pay for development density and location decisions. TDR programs allow landowners to sever development rights from properties in government-designated low-density areas, and sell them to purchasers who want to increase the density of development in areas that local governments have selected as higher density areas. TDR programs appear to offer many advantages to local governments that want to control land use but also compensate landowners for restrictions on the development potential of their properties. TDR programs can be easier to implement than typical zoning programs; they make development more predictable and use the market to compensate landowners for lost property value. TDR programs are also more permanent than traditional zoning regulations (Jason Hanly-Forde, George Homsy, Katherine Lieberknecht, Remington Stone).

“The value of stored carbon, carbon stock, is included in the asset value. A forest provides an annual carbon sequestration service via growth that draws carbon from the atmosphere. The forest also holds a great deal of carbon within the trees, the stock. Similarly, shrublands in El Paso hold carbon in the plant material and soil... Carbon sequestration and storage is a critical, natural process that reduces the amount of carbon in the atmosphere and slows climate change. Carbon markets are now emerging around the world where land owners are paid to protect and expand forests to increase the amount of carbon removed from the atmosphere and offset fossil fuel emissions” (Appendix I: Earth Economics, Ecosystem Services Valuation, El Paso 2016).





## **Conservation Easement (Agreements):**

The City of El Paso owned land can be sold with the condition that a specific part of the land will have placed on it a conservation easement at the end of year two by the new landowners. Conservation agreements (also known as a conservation easement) offer great flexibility. If the donation benefits the public by permanently protecting important conservation resources and meets other federal tax code requirements it can qualify as a tax-deductible charitable donation. The amount of the donation is the difference between the land's value with the easement and its value without the easement. Placing an easement on your property may or may not result in property tax savings. Conservation agreements permanently limit uses of the land in order to protect its conservation values. It allows the owner to continue to own and use your land and to sell it or pass it on to heirs. Future owners will be bound by the agreement's terms. By protecting these lands, land trusts help ensure that every Texan has access to clean water, the freedom and peace granted by natural areas and the opportunity to be physically connected to our natural and cultural heritage.

Sell the land with conservation easements on the land: There are a few scenarios for how this could happen:

- The conservation easement may be placed on a specific trail, an arroyo, or acres of land, but still allows for land to be developed next to the conservation easement.
- The City of El Paso exchanges mountain land with a conservation buyer for other lands that are more suitable for development. The new owner of the land buys the land with the understanding of the criteria that accompanies the land, which may range from no development to development with limitations.
- The City of El Paso may sell the land with restrictions on how the land may be developed
- Sell (or give) to Texas Parks and Wildlife Department which will result in increased revenue from tourists for the region and improved connectivity to the Organ Mountains Desert Peak National Monument trails, and a buffer to the existing state park.
- Public Improvement District (PID): Developers or neighbors to land that are up for sale could be purchased through the use of PID. This ensures the developers and or the neighbors will know the land remains open and natural, which in turn increase the value of their development/homes.

**Tax for Land Conservation:** The City of El Paso could establish a tax to assist with land conservation. Example: Conservation-minded Georgians wanting to help preserve the state's natural resources and have the opportunity to donate to the Georgia Land Conservation Program (GLCP) through their 2015 state income tax forms. The GLCP has used the donated funds since 2005 to

permanently protect 39,229 acres of natural, agricultural and historical lands. The GLCP is part of Checkoff Georgia, a marketing and education initiative designed to educate tax filers on how their donations are used. More information can be found at [www.checkoffgeorgia.com](http://www.checkoffgeorgia.com). Individual taxpayers may donate to the GLCP by adding a dollar amount to line 29 on Georgia Form 500 or line 13 on Georgia Form 500EZ. This amount is subtracted from the overall refund or added to the overall payment. Contributions are deductible in tax year 2016. For more information on the GLCP, please visit [www.glcp.ga.gov](http://www.glcp.ga.gov).

## Chihuahuan Desert Nature Center and Drive-Through Native Wildlife Park

All across the country many communities have been very successful in helping people connect with their natural environment. Some of these ventures are private, others are municipal. All have the potential to create new revenue opportunities and jobs in our city. For example, in Austin, Texas the City created a very successful Nature and Science Center. A Chihuahuan Desert Nature Center could be developed to provide educational and discovery opportunities to complement the new Chihuahuan Desert exhibit scheduled to open at the El Paso Zoo in 2018 and the new Franklin Mountains State Park Visitor Center at Tom Mays. The Nature Center could be modeled after the Chihuahuan Desert Nature Center in Fort Davis, Texas where visitors pay an entrance fee. The idea of a drive-through Northern Chihuahuan Desert Nature Park was first proposed at the El Paso Environmental Summit in 2014. The response of the over 300 people in attendance was overwhelmingly positive. Drive-through nature parks feature wildlife species in their natural habitat. A wildlife park, with both the drive-through park and nature center located adjacent to each other, could become another new revenue source for El Paso and add to El Paso's quality of life.



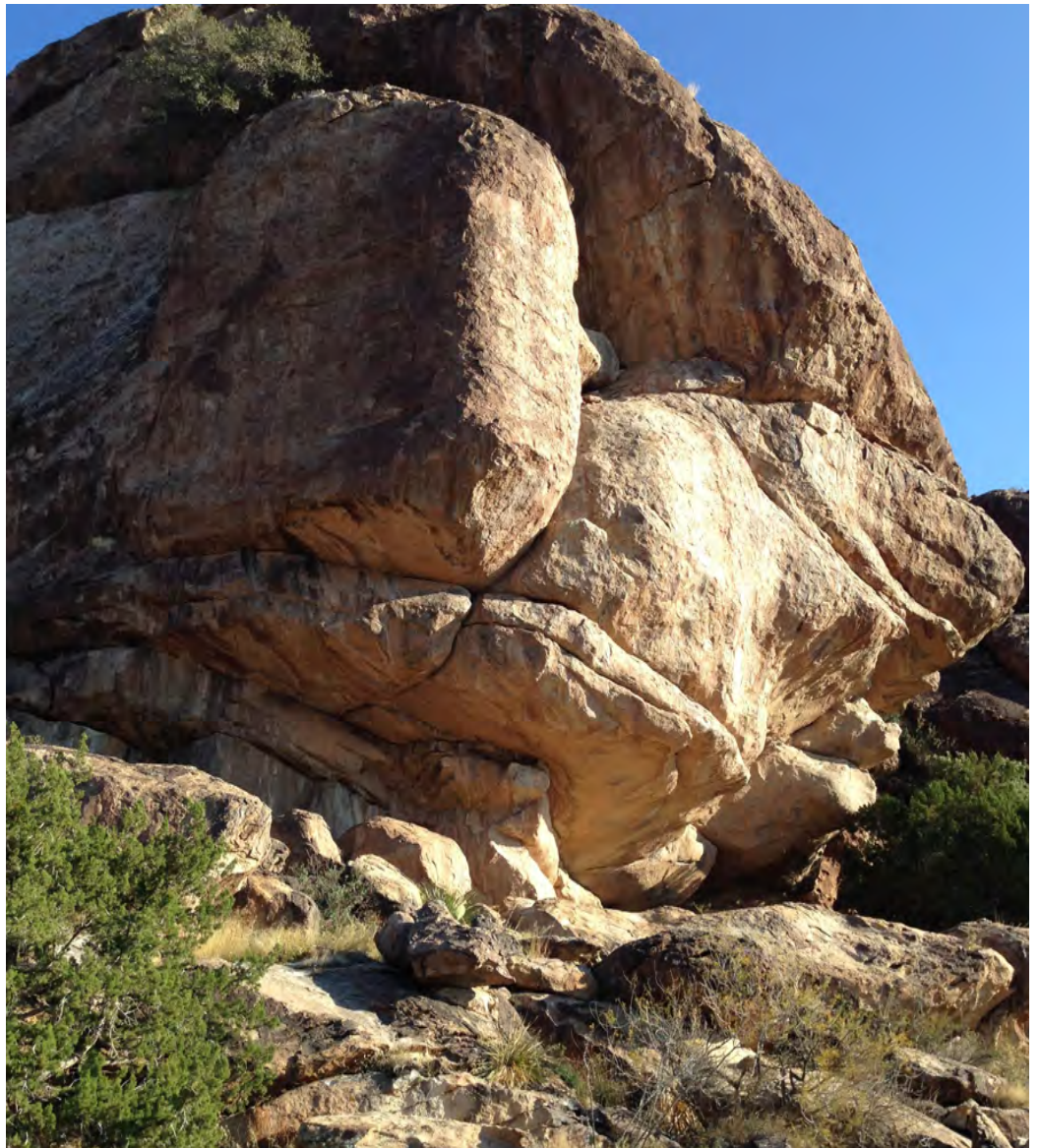
## Benefits of Development Conservation Standards

Conservation Development preserves 50% to 70% or more of the buildable land, with a much higher quality and percentage of land than clustering.

The benefits of conservation development include:

- Protection of clean water in streams, arroyos and drainages and reduced storm water run-off and treatment costs
- Conservation of groundwater: Natural areas allow water to infiltrate, leading to reduced flooding
- Cleaner air: Most trees and vegetation are left intact, helping combat climate change
- Preservation of the City's rural character, vegetation, wildlife, trails, viewing, topography, and tourism/agricultural economies
- Reduction of costs associated with the future purchasing of open space for recreational activities desired by the community money
- Equivalent number of homes: By taking advantage of these conservation development standards, the same number of home sites can be built as compared to a conventional subdivision development,
- Fairness to developers and landowners: Homes that factor in conservation development have been proven to be more profitable and faster-selling.







## CONCLUSION

This report provides sound information and materials gathered from a plethora of scientific data to support our recommendations on the tools and techniques needed to prudently determine which Public Service Board-managed lands should be preserved without development and which lands should be conserved using either light development or development with special criteria. The recommendations will have significant positive benefits to the health and welfare of the community, our precious regional natural resources, and the developers. It is the hope of the Preservation and Conservation Planning (PCPC) committee that the PSB will use this landmark report that would then be a foundation for development of natural lands for the City and County of El Paso.

This report has been produced with many diverse perspectives. The purpose of the group was to develop criteria to identify which specific City owned, Public Service Board managed lands mentioned in the petition should be preserved, which lands can be developed, and to establish conservation standards for development so as to ensure a high quality of life for present and future generations.

The PCPC believes that we are presenting well-vetted criteria that will identify and classify lands that best accommodate development while also considering appropriate conservation of land. The report has been written based on scientific data. The data is intended to assist in land sale and development decision making.

The committee has taken into consideration the recommendations presented in Plan El Paso, the Northwest Master Plan, the El Paso Livable City Sustainability Plan, the El Paso City Resilience Assessment and the El Paso Open Space Plan, as well as priorities brought forward by community stakeholder groups. The key theme that emerged was to build a stronger El Paso through future development and conservation that are mutually beneficial, reinforcing and balancing people, planet, and prosperity in our region. Conservation and development should not be viewed as being in conflict with one another.

The resulting goals identified to safeguard natural and cultural features, improve wildlife habitat and natural habitat connectivity, address the health of our regional watershed, contribute to the local economy of our communities, and expand understanding of ecosystem services valuation. More specifically this plans shows some of the key benefits of conservation criteria for development are: Reduced infrastructure costs for flood control, increased ecotourism that boosts the local economy, and a healthier community and workforce.

The PCPC recommends the criteria presented here for adoption by the PSB in reference to lands identified in the aforementioned petition. The Committee would also like to advocate for commencement of discussion with City staff regarding application of the recommended criteria for all municipally owned undeveloped land within the jurisdiction of the City of El Paso. The PCPC would like to also advocate that this criteria be applied to additional lands outside of the petition area, to include: the PSB lands included in the "Towards a Bright Future: Mountains to River -A Green Infrastructure Plan for El Paso, also known as The Open Space Plan, listed in Chapter 5, Major Arroyo System to be Preserved, page 5-19 and Upper Northwest Arroyos, pg.5-43, and lands that are either large, contiguous or connected to natural areas containing floodplains, watersheds, arroyos, steep slopes > 20%, significant wildlife habitats, species identified in the Texas Parks and Wildlife Conservation Action Plan 2012, or that are accessible for passive recreation to the public.

“When ecosystem services are lost, communities pay. Loss of natural flood protection, wildlife habitat, and clean drinking water often requires that communities build facilities to replace lost ecosystem services. Shrublands, riparian buffers, and wetlands all provide flood protection. These ecosystems are able to slow, absorb, and store large amounts of rainwater and runoff during storms. Changes in land use and the potential for more frequent storm events due to climate change make mitigation of extreme events one of the most important services for economic development” (Appendix I: Earth Economics, Ecosystem Services Valuation, El Paso 2016).



1. **Biodiversity:** The variety of life at every hierarchical level and spatial scale of biological organizations: genes within populations, populations within species, species within communities, communities within landscapes, landscapes within biomes, and biomes within the biosphere. (E. O. Wilson (1988))
2. **Biological diversity:** the variability among living organisms from all sources including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems. <http://www.biodiversitya-z.org/content/biodiversity>
3. **Biological dispersal:** The movement of individuals (animals, plants, fungi, bacteria, etc.) from their birth site to their breeding site ('natal dispersal'), as well as the movement from one breeding site to another ('breeding dispersal'). [https://en.wikipedia.org/wiki/Biological\\_dispersal](https://en.wikipedia.org/wiki/Biological_dispersal).
4. **Carrying Capacity:** (Ecology) the number of species or populations of living organisms that a region can support without environmental degradation. <http://www.merriam-webster.com/dictionary/carrying%20capacity>.
5. **Conservation:** The act of conserving; prevention of decay, waste, or loss; preservation; conservation of wildlife; official supervision of rivers, forests, and other natural resources in order to preserve and protect them through prudent management; the careful utilization of a natural resource in order to prevent depletion.
6. **Dynamic:** Always active or changing; having or showing a lot of energy; of or related to energy, motion, or physical force. <http://www.merriam-webster.com/dictionary/dynamic>
7. **Ecological:** Relating to the relations and interactions between organisms and their environment, including other organisms.
8. **Ecological services:** The important benefits for humans that arise from healthily functioning ecosystems, notably the production of oxygen, soil genesis, erosion control, infiltration of storm water, flood prevention, purification of water and air, pollination of plants and decomposition of waste. <http://www.dictionary.com/>.
9. **Ecologically Sensitive Habitat:** Lands that are slow or unable to recover from human impacts, such as deserts. Lands that support unique vegetation communities, or the habitats of rare or endangered species.
10. **Ecosystem:** 1. A dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit. Convention on Biological Diversity 1992. 2. Ecosystems are the smallest unit of a living system which is functionally independent. They have four main elements - biotic, abiotic, interactions of energy flows, and a physical space in which to operate. <http://biodiversitya-z.org/content/ecosystem>
11. **Extirpation:** (Biology) To destroy or remove completely, as a species from an particular area, region, or habitat. <http://www.ecologydictionary.org/>
12. **Extinction:** Species where it is no longer possible to recreate a breeding population. Extinction is absolute when there are no breeding males (semen), breeding females (oocytes), nor embryos remaining.
13. **Functional Connectivity:** 1. describes the ease with which individuals can move about within the landscape as a function of the organism's behavioral response to landscape elements and the spatial configuration of the entire landscape (Kindlemann & Burel 2008), 2. The extent to which a species or population can move among landscape elements in a mosaic of habitat types (Hilty et al. 2006).
14. **Historical Significance:** Events remembered that affected people on a large scale (Texas Parks and Wildlife Conservation Action Plan 2012). Historical significance is often determined by historians, authors and educators on three criteria: - how notable the event was at the time, - how widespread and lasting the consequences of the event were, and - how symbolic or representative of historical issues or trends the event were. 2014 edition of Teaching Historical Thinking
15. **Landscape Connectivity:** Landscape Connectivity can be broken down into 'structural connectivity' and 'functional connectivity.' Structural connectivity refers to the physical relationship between landscape elements whereas functional connectivity describes the degree to which landscapes



actually facilitate or impede the movement of organisms and processes. [www.wildlandsnetwork.org/sites/default/files/terminology%20CLLC.pdf](http://www.wildlandsnetwork.org/sites/default/files/terminology%20CLLC.pdf)

16. **Preservation:** To keep alive or in existence; make lasting; to keep safe from harm or injury; protect or spare; to keep up or maintain.
17. **Primary Conservation Areas:** FEMA, arroyos, wetlands, steep slopes > 20%, archeological sites archeological sites and land parcels containing habitats and species listed in The Species of Greatest Conservation Needs and Rare Communities List found in the 2012 State of Texas Conservation Action Plan [(T) State Threatened Species, (E) Federally Endangered Species]:
  - **Amphibians and Reptiles:** Woodhouse's toad, ornate box turtle, red-eared slider, Chihuahuan mud turtle (T), spiny softshell turtle, Rio Grande cooter, Texas horned lizard (T), mountain short-horned lizard (T), Dixon's whiptail, reticulated gecko (T), Chihuahuan Desert Lyre Snake (T), Western hog-nosed snake (T), Western diamondback rattlesnake, prairie rattlesnake, Massasauga.
  - **Birds:** Western burrowing owl, golden eagle, American kestrel, Aplomado falcon, peregrine falcon, Northern harrier, Harris's hawk, Swainson's hawk, long-billed curlew, yellow-billed cuckoo, Bell's vireo, Cassin's sparrow, lark sparrow, painted bunting, Eastern meadowlark, summer tanager, loggerhead shrike, scaled quail.
  - **Mammals:** desert shrew, black-tailed prairie dog, Texas antelope squirrel, gray-footed chipmunk, desert pocket gopher, banner-tailed kangaroo rat, Chihuahuan Desert pocket mouse, Nelson's pocket mouse, Mearn's grasshopper mouse, Northern rock mouse, black-footed ferret, swift fox, pronghorn, hog-nosed skunk, hooded skunk, Western spotted skunk, long-tailed weasel, big brown bat, California myotis, Western small-footed myotis, cave myotis, long-legged myotis, Yuma myotis, fringed myotis, canyon bat, tri-colored bat, mountain lion, black bear (T) and American badger.
  - **Invertebrates:** Texas hornshell (T), Salina mucket (T), Mexican fawnsfoot (T) Franklin Mountain talus snail
  - **Plants:** Sneed's pincushion cactus (E), sand prickly-pear cactus, New Mexico Vasey's bitterweed.
  - **Endangered Plants:** Sneed's pincushion cactus (E), sand prickly-pear cactus, New Mexico Vasey's bitterweed.
  - **Rare plant communities:** North American Warm Desert Wash System, Chihuahuan Mixed Salt Desert Scrub System, Chihuahuan Sandy Plains Semi-Desert Grassland System, North American Warm Desert Active and Stabilized Dune System, Apacherian-Chihuahuan Semi-Desert Grassland and Steppe System, Chihuahuan Sandy Plains Semi-Desert Grassland System, North American Warm Desert Interdunal Swale Wetland System, Southwest Plateau and Plains Dry Steppe and Shrub ([ggrasslandsdiversity/nongame/tcap/documents/chih\\_tcap\\_2012.pdf](http://ggrasslandsdiversity/nongame/tcap/documents/chih_tcap_2012.pdf))
18. **Riparian:** Relating to, or situated on the bank of a river or other body of water.
19. **Secondary Conservation Areas:** priority habitats including ecologically sensitive lands (cliff faces, talus slopes, sky islands, rock-dominated canyons, arroyo canyon shrublands, sky Island foothill slope shrublands sandy dunes, gypsum, saline evaporative basins, barren ground within semi-arid grassland matrix scenic views, culturally or historically significant, and natural lands with passive recreational value. (Arendt 1999, Swaner 2006, [https://tpwd.texas.gov/huntwild/wild/wildlife\\_diversity/nongame/tcap/documents/chih\\_tcap\\_2012.pdf](https://tpwd.texas.gov/huntwild/wild/wildlife_diversity/nongame/tcap/documents/chih_tcap_2012.pdf))).
20. **Spatiotemporal:** 1. having both spatial and temporal qualities. 2. of or relating to space-time. [www.merriam-webster.com/dictionary/spatiotemporal](http://www.merriam-webster.com/dictionary/spatiotemporal)
21. **Sky islands:** isolated mountains surrounded by radically different lowland environments. This has significant implications for natural habitats. Endemism, altitudinal migration, and relict populations are some of the natural phenomena to be found on sky islands.
22. **Talus slopes** are formed when debris from a weathering rock piles up to a certain angle of repose. These slopes usually lie at a very steep hill or under a cliff. <https://www.reference.com/science/talus-slope-a27454724fd87b60>

The following appendices provide context to the document in terms of minimum patch areas and conservation buffers which allow for animal and plant species to thrive, arroyo buffer widths, and species with the greatest conservation needs.










Additionally, this section details the feedback received from community stakeholders as well as provides maps of the newly-proposed Mountain-to-River Trail.

The last appendix is a very detailed report provided by Earth Economics, which contains a detailed ecosystem services assessment conducted for the lands outlined in the petition.

- **Appendix A:** *Examples of Minimum Patch Area*
- **Appendix B:** *Minimum Patch Area for animals and plant species*
- **Appendix C:** *Corridor Width Summary*
- **Appendix D:** *Riparian (Arroyo) Buffer Width*
- **Appendix E:** *Chihuahuan Desert Species of Greatest Conservation Need*
- **Appendix F:** *Detailed Stakeholder Feedback Chart*
- **Appendix G:** *Newly-Proposed Mountain to River Trail*
- **Appendix H:** *Examples of Different Development Densities that Could Be Allowed Under the Recommended Conservation Development Area*
- **Appendix I:** *Earth Economics' Ecosystem Services Assessment for El Paso*

## APPENDIX A. Examples of Minimum Patch Area

(From Conservation Buffers, Design Guidelines for Buffers, Corridors, and Greenways. 2008).

|   | Taxa                    | Patch Area                |
|---|-------------------------|---------------------------|
|    | Plants                  | 5 to $\geq$ 250 ac        |
|    | Invertebrates           | 50 sq ft to $\geq$ 2.5 ac |
|    | Reptiles and Amphibians | 3 to $\geq$ 35 ac         |
|    | Grassland Birds         | 12 to $\geq$ 135 ac       |
|    | Waterfowl               | $\geq$ 12 ac              |
|    | Forest Birds            | 5 to $\geq$ 95 ac         |
|    | Small Mammals           | 2.5 to $\geq$ 25 ac       |
|    | Large Mammals           | 40 ac to $\geq$ 2 sq mi   |
|  | Large Predator Mammals  | 3.5 to $\geq$ 850 sq mi   |



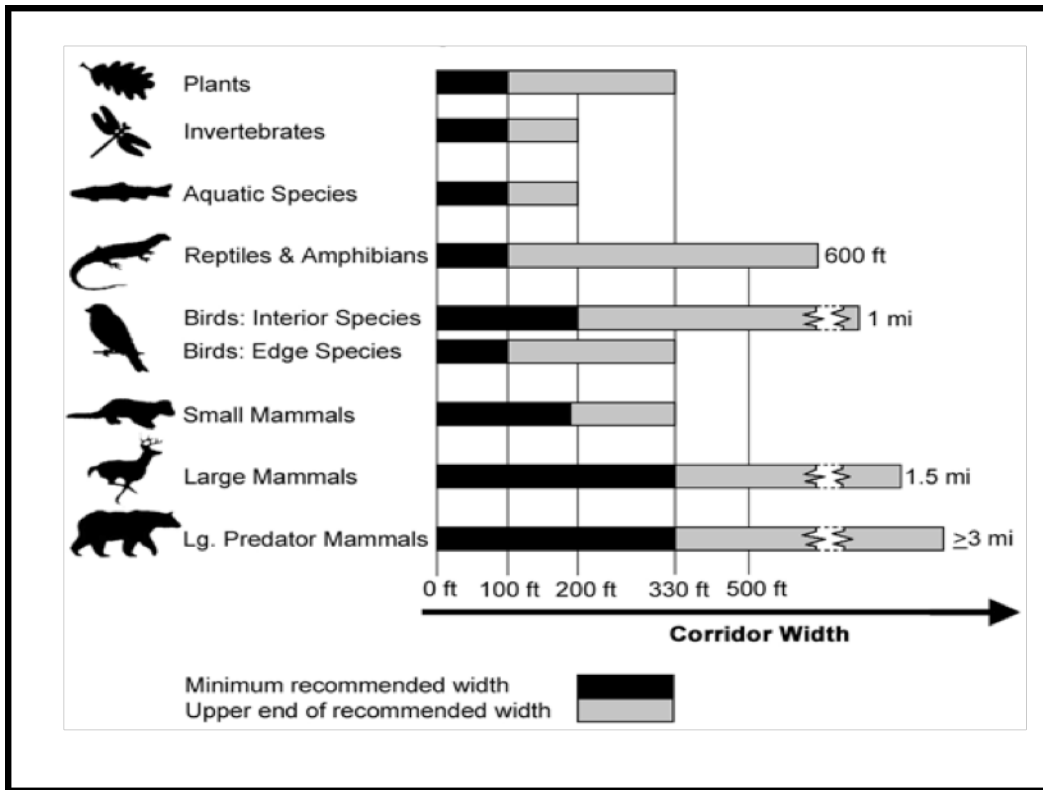
## APPENDIX B. Minimum Patch Area for Animal and Plant Species

Minimum patch area requirements found within the scientific literature (2001) to maintain populations or communities of animal or plant species in the United States. One hectare is about 2.5 acres, (condensed from Conservation Thresholds for Land Use Planners, 2003).

| TAXA                 | PATCH AREA  | FINDING  | CITATION                                |
|----------------------|---|--|---|
| <b>Birds</b>         |   |  |   |
|                      | > 1   | Five species of brush/chaparral-requiring birds were supported by census plots larger than 1 HA.   | Soulé et al. 1992                       |
|                      | > 2 ha (seed-eating birds)<br>> 40 ha (insect-eating birds) | Insect-eating birds need at least 40 HA. Seed-eating birds need 2 HA. This is interpreted as the habitat size needed to support a representative bird community. | Forman et al. 1976<br>Galli et al. 1976 |
| <b>Mammals</b>       |   |  |   |
|                      | > 1 ha  | Control plots larger than 1 HA supported most rodent species.  | Soulé et al. 1992                       |
|                      | > 5 ha  | Cottontail rabbits may be vulnerable to extinction if large patches of > 5 HA are not maintained.  | Barbour and Litvaitis 1993              |
|                      | > 10 ha   | Fragments < 10 HA did not support populations of native rodents.   | Bolger et al. 1997                      |
|                      | > 900 HA  | More than 80% of bear sightings occurred in blocks of undisturbed habitat > 900 HA.  | Mace et al. 1996                        |
|                      | > 220,000 HA  | Cougars.   | Beier 1993                              |
| <b>Invertebrates</b> |   |  |   |
|                      | > .0004 HA  | Vegetation patches > 43 ft <sup>2</sup> and open areas important to the distribution and abundance of carabid beetles.   | Crist and Ahern 1999                    |

## APPENDIX C. Corridor Width Summary

(From Conservation Buffers, Design Guidelines for Buffers, Corridors, and Greenways. 2008).



## APPENDIX D. Riparian (Arroyo) Buffer Width.

Recommended minimum riparian and wetland buffer widths to maintain water quality and wildlife functions within ecoregions of the United States, as found within the scientific literature ), (Condensed from Conservation Thresholds for Land Use Planners. 2003).

| FUNCTION                          | TAXA/ SUBJECT  | BUFFER WIDTH                                 | CITATION   |
|-----------------------------------|--|--|--|
| <b>Bank Stabilization</b>         |  |  |  |
|                                   | Bank Stabilization   | 32 - 65 ft.                                  | Fischer and Fischenich 2000  |
|                                   | Stream/channel stabilization                                     | 65 - 98 ft.                                  | Corbett and Lynch 1985   |
|                                   | Stream stabilization/sediment control                            | > 125 ft.                                    | Cederholm 1994   |
|                                   | Bank Stabilization   | > 171 ft.                                    | Spence et al. 1996   |
| <b>Flood Attenuation</b>          |  |  |  |
|                                   | Floodplain storage   | 65 - 492 ft.                                 | Fischer and Fischenich 2000  |
| <b>Sediment Removal</b>           |  |  |  |
|                                   | Sediment removal   | > 3m (sand), > 15 m (silt),<br>> 122m (clay) |  |
|                                   | Sediment removal   | 5-30 m                                       | Fischer and Fischenich 2000  |
| <b>Wildlife and Plant Species</b> |  |  |  |
|                                   | Wildlife habitat   | 328 ft.                                      | Fischer, Martin, and Fischenich 2000;<br>Fischer and Fischenich 2000 |
|                                   | General species diversity  | 133 -328 ft.                                 | Castelle et. al. 1994  |
|                                   | General bird habitat   | > 49 ft.                                     | Milligan 1985  |
|                                   | Birds  | > 49 - 656 ft.                               | Stauffer and Best 1980   |
|                                   | Birds (Willow flycatcher nesting) Species of Concern             | > 123 ft.                                    | Knutson and Naef 1997  |
|                                   | Birds (yellow-billed cuckoo breeding habitat) Species of Concern | > 328 ft.                                    | Gaines 1974  |
|                                   | Birds (diversity and assemblages)                                | > 100 ft.                                    | Hagar 1999   |
|                                   | Birds (neotropical migrants, interior species)                   | > 164 ft.                                    | Tassone 1981   |
|                                   | Birds (raptors)  | 164 ft. - 1968 ft.                           | Richardson and Miller 1997   |
|                                   | Mammals (small)  | 73 - 101 ft.                                 | Jones et al. 1985  |
|                                   | Mammals (deer)   | > 200 ft.                                    | NRCS 1995  |
|                                   | Mammals (fawning of mule deer)                                   | > 600 ft.                                    | Knutson and Naef 19973   |
|                                   | Mammals (large)  | > 328 ft.                                    | Jones et al. 1988  |
|                                   | Reptiles (Western pond turtle nesting habitat)                   | > 328 ft. (stream buffer)                    | Knutson and Naef 1997  |
|                                   | Aquatic wildlife habitat   | 65 - 492 ft.                                 | Fischer and Fischenich 2000  |
|                                   | Plants (vascular plant diversity)                                | > 99 ft.                                     | Spackman and Hughs1995   |
|                                   | Plants (to minimize non-native vegetation)                       | > 649 ft.                                    | Hennings 2013  |



## Appendix E: Chihuahuan Desert Species of Greatest Conservation Need (sourced from the Texas Parks and Wildlife State Conservation Action Plan of 2012)

Mapping and research are needed on all the remaining and potential habitats for the following:

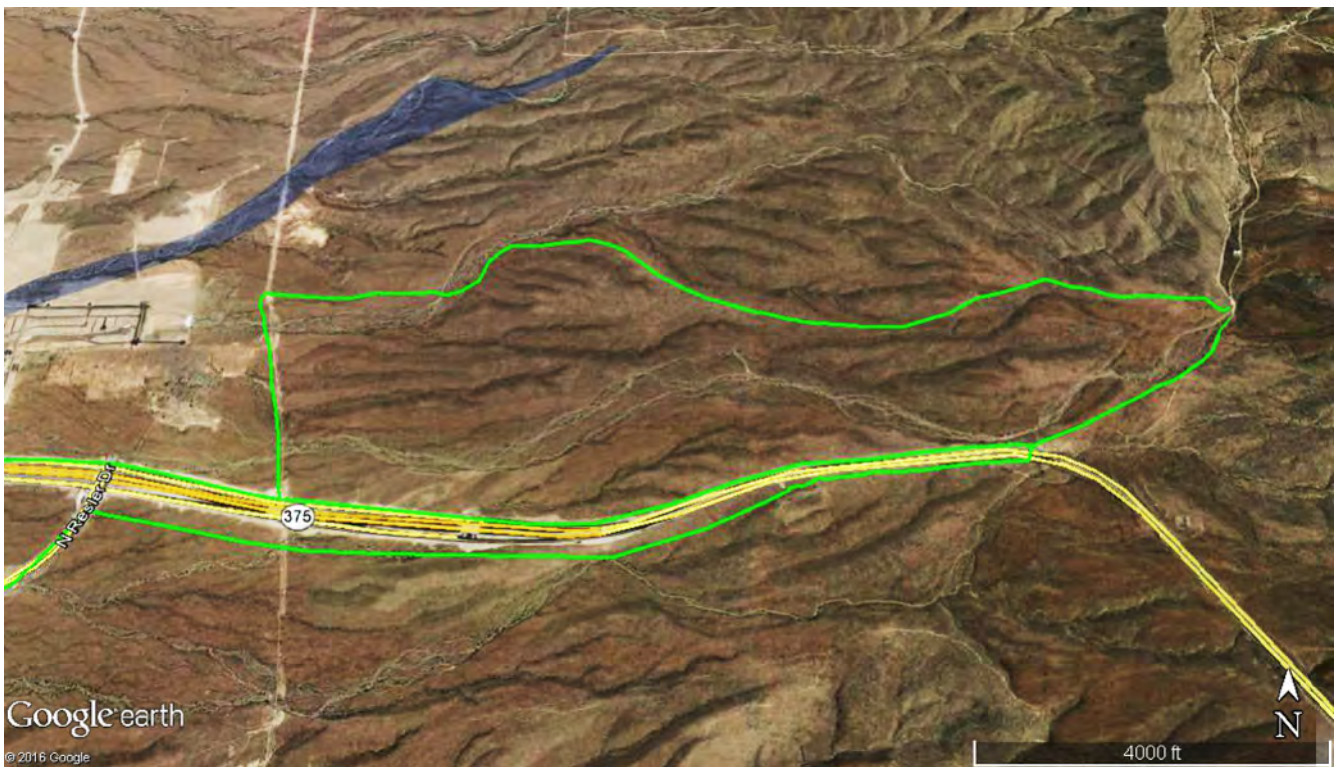
| <b>Birds</b>              |                            |                  |                         |                                 |                                |
|---------------------------|----------------------------|------------------|-------------------------|---------------------------------|--------------------------------|
| Western burrowing owl     | Golden eagle               | American kestrel | Peregrine falcon        | Long-billed curlew              | Yellow-billed cuckoo           |
| Bell's vireo              | Cassin's sparrow           | Painted bunting  | Eastern meadowlark      | Summer tanager                  | Loggerhead shrike              |
| <b>Mammals</b>            |                            |                  |                         |                                 |                                |
| Black-tailed prairie dog  | Black-footed ferret        | Swift fox        | Texas antelope squirrel | Pronghorn                       | Chihuahuan Desert pocket mouse |
| Hog-nosed skunk           | Banner-tailed kangaroo rat | Big brown bat    | Desert pocket gopher    | Hooded skunk                    | Long-tailed weasel             |
| Mearn's grasshopper mouse | Northern rock mouse        | Mountain lion    | Western spotted skunk   | Gray-footed chipmunk            | American badger                |
| Nelson's pocket mouse     | Desert shrew               | Black bear       |                         |                                 |                                |
| <b>Reptiles</b>           |                            |                  |                         |                                 |                                |
| Woodhouse's toad          | Spiny softshell turtle     | Dixon's whiptail | Reticulated gecko       | Western diamondback rattlesnake | Prairie rattlesnake            |

## **Appendix F: Detailed Stakeholder Feedback Chart**

Please note: This will be inserted after public comment period.

## Appendix G: Newly-Proposed Mountain-to-River Trail

These images were created by the Open Space Advisory Board as a newly proposed mountain to river trail initiative.





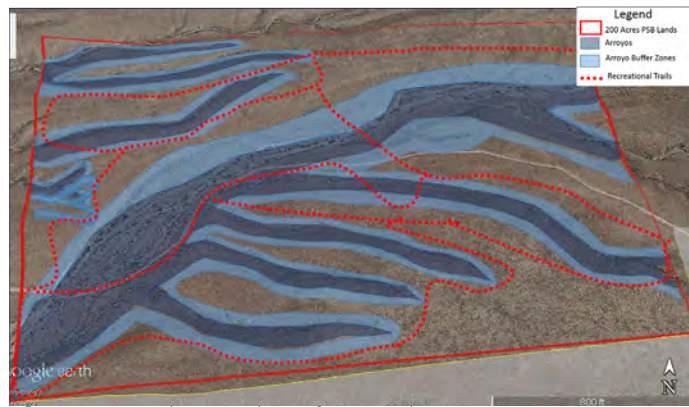
**Appendix H: Examples of different development densities that could be allowed under the recommended conservation development area**



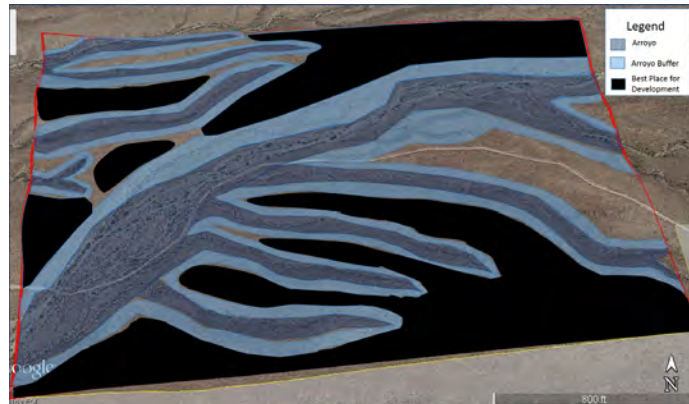
**Figure 10:** Base Map Example of the Criteria Process for Conservation of 200 Acres of PSB Land



**Figure 11:** Make overlay of primary conservation areas including wetlands, archaeology sites, arroyos and steep slopes, etc.



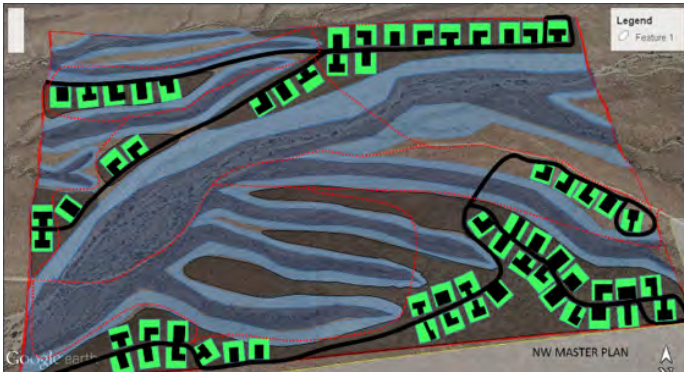
**Figure 12:** Make overlay of secondary conservation areas including buffer zones, important ecological habitats, historical, recreational, and views, etc.



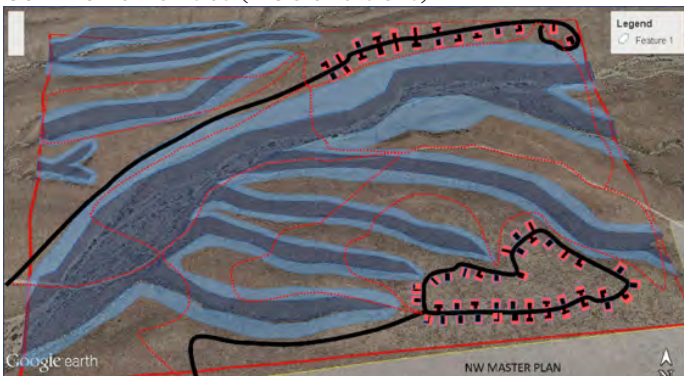
**Figure 13:** Make overlay of best areas for development (black)



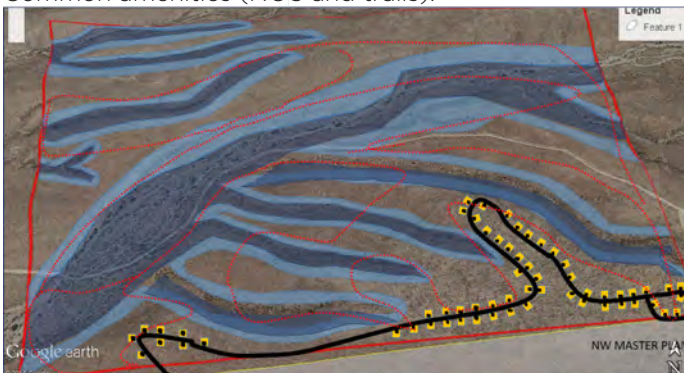
**Figure 14:** Option 1. A traditional development plan without conservation design, 60 3-acre lots, 87.5% Development' 13% NOS,



**Figure 15:** Option 2. Development with conservation design. 60 one-acre lots, 32.6% Development, 67.5% NOS, Common amenities (NOS and trails)



**Figure 16:** Option 3. Development with conservation design. 60 quarter-acre lots, 23% Development, 77% NOS, Common amenities (NOS and trails).



**Figure 17:** Option 4. Development with conservation design. 60 eighth-acre lots, 10% Development, 90% NOS, Common amenities (NOS and trails).

NOTE: These conceptual diagrams illustrate connectivity between dwelling units and their open space network. All the dwelling units are contiguous with open space in terms of blocks of dwelling units and individual dwelling units. Individual dwelling units have open space alleys ways between the units. This level of connectivity creates the maximum opportunity for homeowners to benefit from conservation development.



# APPENDIX I: OPEN SPACE BENEFITS IN THE CITY OF EL PASO

August 2016





## Earth Economics

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Report Version 1.0

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The authors are responsible for the content of this report.

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**Cover image:** TBD

## Executive Summary

El Paso's abundant natural capital is a critical part of the regional ecosystem and the economy. The shrublands surrounding the Franklin Mountains support rich biodiversity, capture water for the Hueco Bolson aquifer, and provide many other ecosystem benefits, from erosion control to moderation of flood events. El Paso's natural capital also provides direct benefits to local residents, including increased property values and improved health via recreation. All of these benefits are called **ecosystem services**, and they represent significant, long-term contributions to the local economy. This is the first study to estimate the dollar value associated with these critical ecosystem services within El Paso.



Across the country, planners and policy makers are starting to include the value of natural capital assets (watersheds, forests, shrublands) and ecosystem services in their analyses. Though the techniques to identify, quantify, and monetize these economic contributions are still evolving, the values available today can immediately be used to gain a better understanding of the **sympiotic relationship between a healthy environment, a resilient economy, and a thriving community**. Including these values in planning and policy-making yields a more complete and accurate understanding of restoration and stewardship projects or policies and ultimately fosters more practical, cost-effective outcomes.



*Natural capital within the study area contributes \$3.3 million to \$6.5 million in ecosystem service benefits each year.*

This analysis finds that the natural capital within the study area contributes **\$3.3 million to \$6.5 million in ecosystem service benefits each year**. El Paso's shrubland can also be viewed as a natural capital asset that provides a flow of benefits over time, similar to a building or a bridge. When measured like an asset with a lifespan of 100 years and a three percent discount rate, **El Paso's natural capital has an asset value between \$106 million and \$209 million**. With sufficient stewardship to maintain the health and function of El Paso's natural capital, this economic contribution will continue in perpetuity. These are highly conservative estimates that will grow as more detailed data becomes available and economic methods are developed.

## Introduction

For many years, our natural capital (watersheds, forests, shrublands) has been treated very differently than our built assets. While constructing roads, bridges, and water conveyance systems is nearly always discussed as a vital investment with significant benefits to the economy, dollars allocated to ecosystem restoration and stewardship are often considered as costs or lost opportunities to be minimized. One reason for this disconnect is that, until relatively recently, it has not been cost-effective to identify and monetize the benefits that people receive from nature (ecosystem services). Advances in ecological economics and a rapidly growing cache of primary academic research on the value of natural systems and functions has facilitated more reliable estimates of nature's value. These values can now be combined with traditional economic data to conduct important financial analyses such as benefit-cost or return on investment calculations.



When ecosystem services are lost, communities pay. Loss of natural flood protection, wildlife habitat, and clean drinking water often requires that communities build facilities to replace lost ecosystem services. Shrublands, riparian buffers, and wetlands all provide flood protection. These ecosystems are able to slow, absorb, and store large amounts of rainwater and runoff during storms. Changes in land use and the potential for more frequent storm events due to climate change make **mitigation of extreme events one of the most important services for economic development**. Built structures in the floodplain such as houses, businesses, and wastewater treatment plants all depend on the flood protection services provided upstream. Retaining natural, permeable cover and restoring natural features

contributes to flood risk reduction in these areas. Enhanced flood and storm protection can reduce the devastating effects of floods, including property damage, lost work time, and human casualties. Real ongoing costs are incurred by the community and taxpayers to replace services that nature previously provided for free.

*Real ongoing costs are incurred by the community and taxpayers to replace services that nature previously provided for free.*



## Site Overview

El Paso is located in the corner of west Texas between New Mexico and Mexico (Figure 1 and **Error! Reference source not found.**). The city has a rapidly growing population of 680,000 residents that is expected to increase to 1.1 million by 2040.<sup>1,2,3</sup> The City of El Paso has been selected to participate in the 100 Resilient Cities (100RC) Initiative, which helps participating cities build resilience and mitigate future shocks and stresses.<sup>4</sup> El Paso's challenges are drought, flooding, poor health infrastructure, and social inequity. Over the coming years, El Paso will work with local stakeholders and 100RC partners to design solutions to these challenges.

The area evaluated in this report includes a series of parcels owned by the El Paso Public Service Board (PSB) that total 7,756 acres (7,711 which provide ecosystem services) to the east and west of the Franklin Mountains, all within an hour to the north of downtown El Paso. The study area is near Franklin Mountains State Park (27,000 acres), the largest urban park in the nation.<sup>5</sup> Also of interest is the neighboring Castner Range (7,081 acres), a U.S. Army-owned area which is currently being petitioned to be converted into a National Monument to preserve the nearly pristine ecosystems within the protected area.<sup>6</sup>

The Franklin Mountains and surrounding open space provide opportunities for hiking, mountain biking, and rock climbing. The region is also a popular destination for birdwatchers as it provides extensive bird habitat for birds, including a variety of endangered and threatened species such as the southwestern willow flycatcher, the wood stork, and the white-faced ibis.<sup>7</sup> The study area also sits atop the Hueco Bolson aquifer, which provides a third of El Paso's water supply.<sup>8</sup>



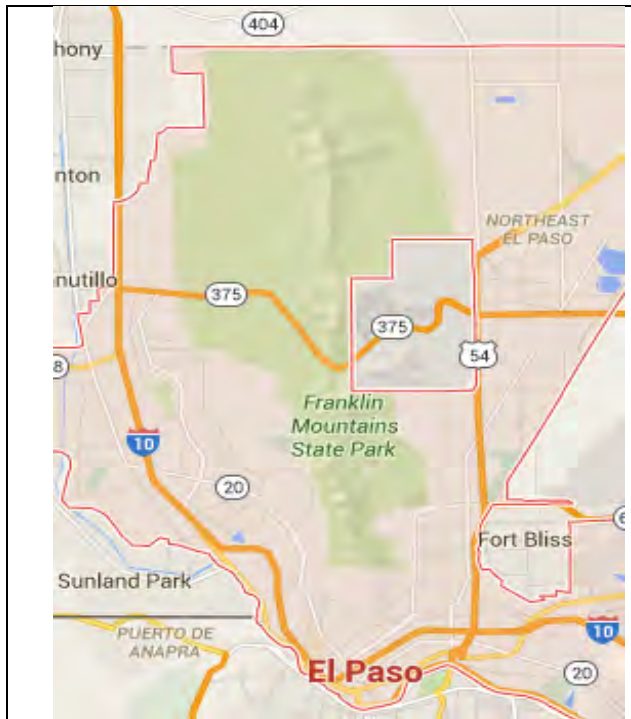


Figure 1 - El Paso / Franklin Mountain Region (Google Maps)



Figure 2. El Paso / Franklin Mountain Region (Google Earth)

### Study Objectives

The *Open Space Benefits in the City of El Paso* study was conducted by Earth Economics, a 100RC Platform Partner, in collaboration with the City of El Paso. The study’s purpose was to estimate natural capital and ecosystem service values in parcels of publicly held land to better inform preservation and development decisions. The study also provides a conceptual model for how El Paso’s open space and economy are connected.

### Valuation Approach

The study involved four major steps:

**Step 1. Identification and Quantification of Land Cover Classes:** Geographic Information Systems (GIS) data, including the National Land Cover Database (NLCD-2011), was used to calculate the number of acres of each land cover type (e.g. shrubland, grassland, and developed open space) within the study area.

**Step 2. Identification and Valuation of Ecosystem Services:** The value of each ecosystem service/land cover combination (e.g. water storage/shrubland) was estimated using the benefit transfer method

(described in detail below) to find and apply appropriate values. In many cases, low and high values are provided if included in the original study. In cases where no published studies were available for a particular ecosystem service/land cover combination, no value is provided in this report.

**Step 3. Annual Value of Ecosystem Services:** The total high and total low annual values of ecosystem services for a particular land cover class were multiplied by the acreage of that land cover class found in the study area to calculate total annual values. The total high and low values of all land cover classes were then summed to generate a total annual value that represents the annual contribution of these lands to the local economy.

**Step 4. Net Present Value Calculations:** Net present values were calculated for the study site over 100 years at two discount rates: zero percent and three percent. The net present value calculation and application of a discount rate allows benefits accrued over many years to be compared in current dollars.

### Ecosystem Services Framework and Valuation Methods

Like other forms of capital, natural capital provides a flow of goods and services. Ecosystem goods and services are the benefits that nature provides to people. These benefits are the basis of all economic activity as they provide a clean water supply, breathable air, nourishing food, flood risk reduction, waste treatment, and a stable climate. Without natural capital, many of the services (benefits) that we generally take for granted (and receive for free) could not exist, or would need to be replaced at a very high cost. Figure 3 illustrates the relationship between natural capital assets, ecosystem functions, and the production of ecosystem goods and services. The natural capital assets in a watershed serve many functions. A watershed collects, stores, and transports water that ultimately provides people with a valuable water supply benefit.



## Ecosystem Services

The benefits people derive from nature



Figure 3 - Ecosystem Services Example

Some of these ecosystem services can be valued in dollars when economists and ecologists work together to identify the presence, quantity, and economic value of a service in a particular location. A variety of valuation techniques can be employed depending on the specific circumstances, including:

- **Market Pricing:** The current market value of items produced in the ecosystem (e.g., water, fish, and wood).
- **Replacement Cost:** The cost of replacing a functioning natural system with man-made infrastructure (e.g. natural water filtration versus a water treatment plant).
- **Avoided Cost:** Services allow society to avoid costs that would have been incurred in the absence of those services (e.g. reduction in flood damage due to natural water storage and flood mitigation provided by wetlands and riparian buffers).
- **Production Approaches:** Services that enhance incomes (e.g. productivity of crops after irrigation in agricultural systems).
- **Travel Cost:** Service demands may require travel, which have costs that can reflect the implied value of the service; a recreation area can be valued at least by what visitors are willing to pay to travel to it, including the imputed value of their time (e.g. tourists driving long distances to visit national parks).

- **Hedonic Pricing:** The change in property value by virtue of being within proximity of a service (e.g., a beautiful grassland or a mountain view typically increases the value of neighboring homes).
- **Contingent Valuation:** Value estimates based on surveys of individual preferences and the value assigned to activities (e.g., people’s willingness to pay to protect watersheds).

Valuation of some ecosystem services can be quite straightforward using these methods, while others are still lacking accepted methodology and can only be described subjectively. The service descriptions and categorizations used in this report, shown in Table 1, were derived from work by DeGroot et al. (2002) and Sukhdev et al. (2010).<sup>9,10</sup>

**Table 1 - Ecosystem Services Definitions**

| Provisioning Services                    |  |
|--|--|
| <b>Food</b>                              | Producing crops, fish, game, and fruits  |
| <b>Medicinal Resources</b>               | Providing traditional medicines, pharmaceuticals, and assay organisms  |
| <b>Ornamental Resources</b>              | Providing resources for clothing, jewelry, handicraft, worship, and decoration                               |
| <b>Energy and Raw Materials</b>          | Providing fuel, fiber, fertilizer, minerals, and energy  |
| <b>Water Supply</b>                      | Provisioning of surface and groundwater for drinking water, irrigation, and industrial use                   |
| Regulating Services                      |  |
| <b>Biological Control</b>                | Providing pest and disease control   |
| <b>Climate Stability</b>                 | Supporting a stable climate at global and local levels through carbon sequestration and other processes      |
| <b>Air Quality</b>                       | Providing clean, breathable air  |
| <b>Moderation of Extreme Events</b>      | Preventing and mitigating natural hazards such as floods, hurricanes, fires, and droughts                    |
| <b>Pollination</b>                       | Pollination of wild and domestic plant species   |
| <b>Soil Formation</b>                    | Creating soils for agricultural and ecosystems integrity; maintenance of soil fertility                      |
| <b>Soil Retention</b>                    | Retaining arable land, slope stability, and coastal integrity  |
| <b>Waste Treatment</b>                   | Improving soil, water, and air quality by decomposing human and animal waste and removing pollutants         |
| <b>Water Regulation</b>                  | Providing natural irrigation, drainage, groundwater recharge, river flows, and navigation                    |
| Supporting Services                      |  |
| <b>Habitat and Nursery</b>               | Maintaining genetic and biological diversity, the basis for most other ecosystem functions; promoting growth |
| <b>Genetic Resources</b>                 | Improving crop and livestock resistance to pathogens and pests   |
| Cultural Services                        |  |
| <b>Natural Beauty</b>                    | Enjoying and appreciating the scenery, sounds, and smells of nature  |
| <b>Cultural and Artistic Inspiration</b> | Using nature as motifs in art, film, folklore, books, cultural symbols, architecture, and media              |
| <b>Recreation and Tourism</b>            | Experiencing the natural world and enjoying outdoor activities   |
| <b>Science and Education</b>             | Using natural systems for education and scientific research  |
| <b>Spiritual and Historical</b>          | Using nature for religious and spiritual purposes  |



### Benefit Transfer Method

The benefit transfer method (BTM) is broadly defined as “...the use of existing data or information in settings other than for what it was originally collected”.<sup>11</sup> This method is used to indirectly estimate the value of ecological goods or services, especially as it can generate reasonable ecosystem services estimates quickly and at a fraction of the cost of conducting local, primary studies, which may require more than \$50,000 per service/land cover combination. BTM plays an important role in the field of ecosystem services valuation, as it is often the most practical option available for producing reasonable estimates.<sup>12</sup>

The BTM process involves taking ecosystem service values from comparable ecosystems as found in peer-reviewed journals and transferring them to a study site, in this case, the open space bordering El Paso’s Franklin Mountains.<sup>13</sup> The BTM process is similar to a home appraisal, in which the value and features of comparable, neighboring homes (two bedrooms, a garage, one acre, recently remodeled) are used to estimate the value of another home. As with home appraisals, BTM results can be somewhat rough, yet the process quickly generates reasonable values appropriate for policy and project analysis.

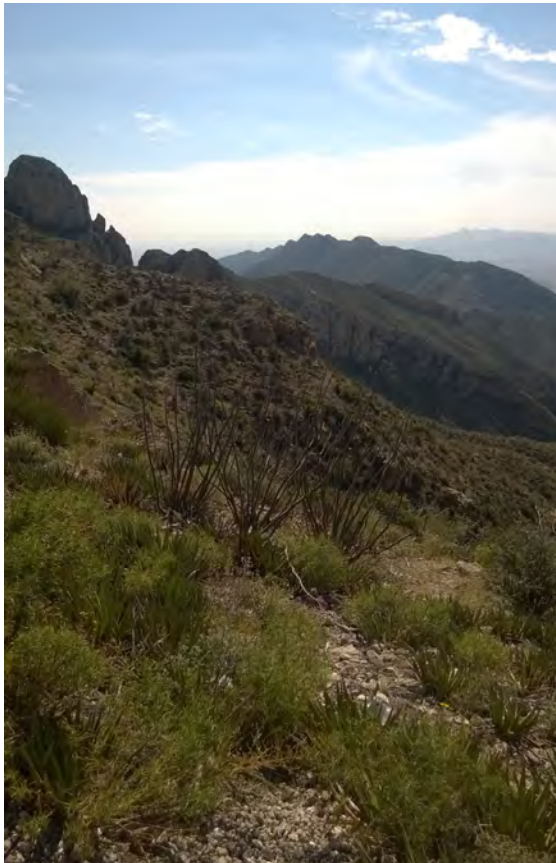
The process begins by finding published, peer-reviewed primary studies with comparable climate and land cover classifications as those within the study area. Any primary studies deemed to have incompatible assumptions or land cover types are excluded from further analysis. Individual primary study values are adjusted and standardized for units of measure, inflation, and land cover classification to ensure an “apples-to-apples” comparison. Frequently, primary studies offer a range of values that reflect the uncertainty or variability within the research area. As such, high and low dollars per acre values are included for each estimate provided in this report.

In some cases, the published values can be adjusted to more accurately reflect conditions in the study area. Income is one factor that greatly affects people’s ability and willingness to pay for ecosystem services.<sup>14</sup> Adjusting ecosystem services for differences in income between study sites improves estimates. For this analysis, the median household income from El Paso (\$42,037) and the average per capita income (\$20,050) were used.<sup>15</sup> Incomes of beneficiaries in the primary studies were derived directly from each study itself or gathered from the U.S. Census Bureau.

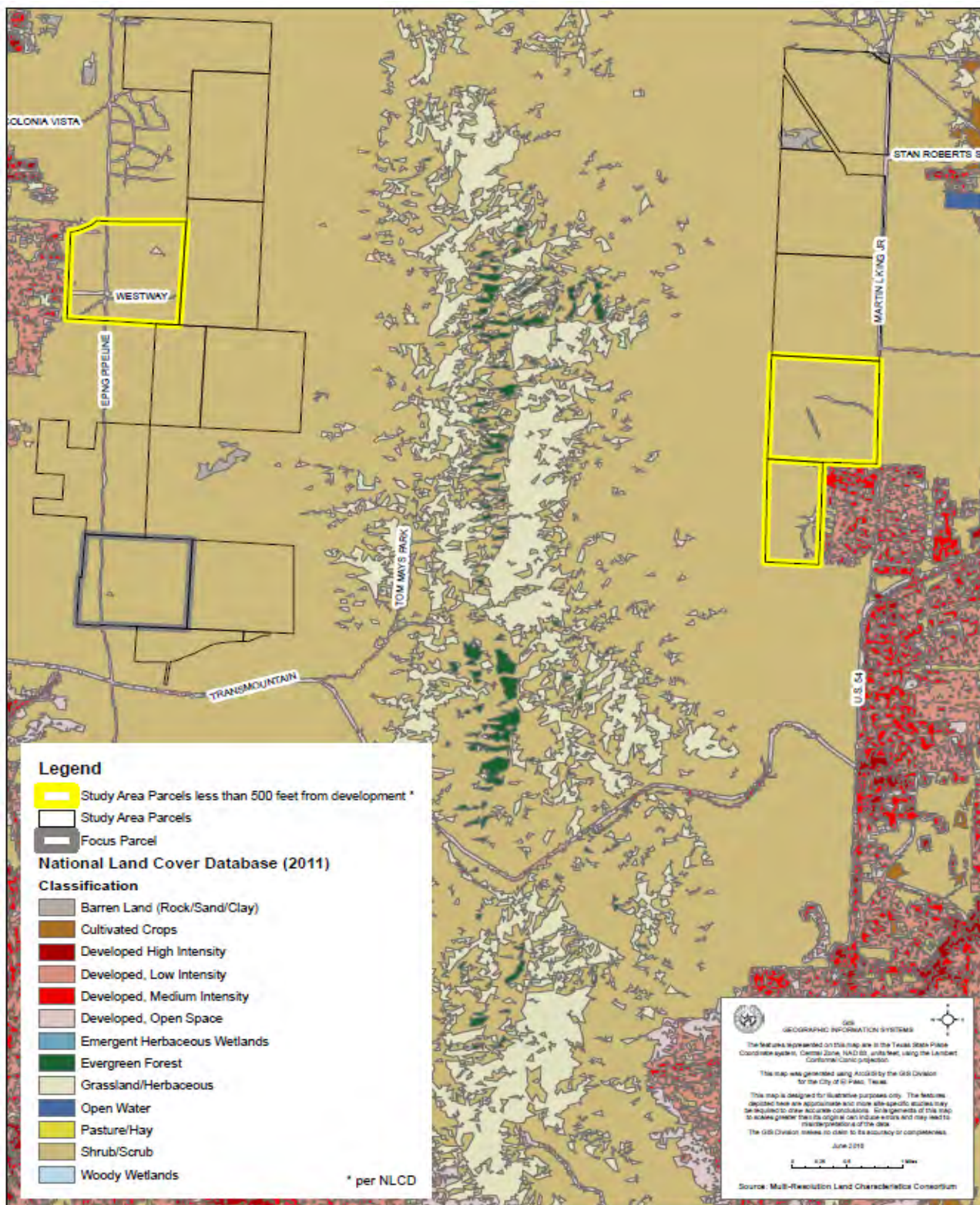
## Study Findings

### Identification and Quantification of Land Cover Classes

The study area comprises several parcels bordering the Franklin Mountains that total 7,757 acres (7,711 acres provide ecosystem services), as shown below in Figure 4. Within the study area, the project team identified six different land covers with the vast majority (97%+) of land characterized as shrubland.







**Figure 4: El Paso Study Area and Parcels within 500 feet of development**



**Table 2: Acres by Land Cover Type**

| Land Cover Description   | Proximity to Development |                         | Total        | %     |
|--|--------------------------|-------------------------|--------------|-------|
|  | w/1 500'<br>(Acres)      | Outside 500'<br>(Acres) |              |       |
| Grassland  | 0.25                     | 18                      | 18           | 0.2%  |
| Shrubland  | 106                      | 7,449                   | 7,555        | 97.4% |
| Developed: Open Space  |                          | 138                     | 138          | 1.8%  |
| Developed: Low, Medium, High Intensity                         |                          | 9                       | 9            | 0.1%  |
| Barren Land (Rock, Sand, Clay)                                 |                          | 37                      | 37           | 0.5%  |
| <b>TOTAL ACREAGE</b>   | 106                      | 7,650                   | 7,756        | 100%  |
| <b>TOTAL STUDY AREA<br/>(Excluding Developed &amp; Barren)</b> | <b>106</b>               | <b>7,559</b>            | <b>7,711</b> |       |

**Table 3 - Land Cover Definitions**

|                                      |   |
|--------------------------------------|---|
| Grassland                            | Dominated by grammanoid or herbaceous vegetation  |
| Shrubland                            | Dominated by shrubs; less than 5 meters tall. Includes true shrubs, young trees in an early successional stage  |
| Developed Open Space                 | A mixture of some constructed materials, but mostly vegetation in the form of lawn grasses  |
| Developed (low, med, high Intensity) | A mixture of constructed materials (21-79% cover) and vegetation, such as single-family housing units<br><br>Highly developed areas where people reside or work in high numbers such as apartment complexes, row houses and commercial/industrial |
| Barren land                          | Characterized by bare rock, gravel, sand, silt, clay, or other earthen material, with little or no "green" vegetation   |

### Valuation of Ecosystem Services Across Land Cover Classes

Although there are a total of 21 ecosystem services in existence (see Table 1 on page 7), this section focuses solely on those services for which values are available in the literature. Table 3 shows the annual ecosystem services by land cover for the study area. Shaded table cells indicate that a service is likely present in a land cover area, but could not be valued in dollars. Clearly, filling in these knowledge gaps would significantly increase the overall values. Several features of the analysis require additional explanation:

**Natural Beauty:** Also referred to as “aesthetic information,” natural beauty reflects the value that people place on having a view of or access to nature. This value tends to be highest for land in close proximity to development and then decreases with distance. In this study, a \$13,000 value for natural beauty was applied to each acre of undeveloped land within 500 feet of development. A significantly lower value, \$0.20 - \$59, was applied to land outside of this buffer. In reality, the natural beauty of shrubland does not end abruptly at the 500-foot mark but these were criteria used in the original study. With additional analysis, a more nuanced application of this value may be possible.

**Grassland and Shrubland:** The same per acre values were used for both shrubland and grassland for both disaster risk reduction and recreation. The disaster risk reduction value of \$39 - \$54 per acre/per year comes from a study that was originally based upon the flood mitigation capacity of shrubland. Given the increased vegetation density and root structure of grassland relative to shrubland, it is assumed that the water absorption (and flood protection) capacity offered by grassland is at least equal to that of shrubland. Similarly, the \$30 per acre recreation value comes from research on hiking in shrublands. It is assumed that encountering “grassland” on a hike through what is primarily shrubland would be equally enjoyable, and thus was given the same value.

**Table 4 - Annual Ecosystem Service Values by Land Cover (\$/Acre/Year)**

| Ecosystem Service<br>(\$/Acre/Year)      | Grasslands       |                  | Shrublands       |                  | Open Space (Developed) |               |
|--|------------------|------------------|------------------|------------------|------------------------|---------------|
|  | Low              | High             | Low              | High             | Low                    | High          |
| Air Quality                              |                  |                  | \$ 1             | \$ 1             |                        |               |
| Climate Stability                        | \$ 134           | \$ 150           | \$ 15            | \$ 24            |                        |               |
| Disaster Risk Reduction                  | \$ 39            | \$ 54            | \$ 39            | \$ 54            |                        |               |
| Food                                     | \$ 12            | \$ 85            |                  |                  |                        |               |
| Habitat                                  | \$ 35            | \$ 35            | \$ 2             | \$ 2             |                        |               |
| Natural Beauty                           | \$ 0.2           | \$ 59            | \$ 36            | \$ 59            |                        |               |
| Natural Beauty (w/1 500 ft of Developed) | \$ 13,710        | \$ 13,710        | \$ 13,710        | \$ 13,710        |                        |               |
| Recreation                               | \$ 30            | \$ 30            | \$ 30            | \$ 30            | \$ 738                 | \$ 738        |
| Soil Retention                           | \$ 6             | \$ 6             | \$ 9             | \$ 9             |                        |               |
| Water Storage                            |                  |                  | \$ 106           | \$ 494           |                        |               |
| <b>TOTAL</b>                             | <b>\$ 13,967</b> | <b>\$ 14,129</b> | <b>\$ 13,948</b> | <b>\$ 14,383</b> | <b>\$ 738</b>          | <b>\$ 738</b> |



**Annual Value of the El Paso Study Area**

Using the values identified in Table 4, a summation of all ecosystem services present for each land cover type is provided in Table 5 and Table 6. The total low and high values for each land cover was multiplied by the acreage associated with that combination to calculate the total low and high values in dollars per year. Results are given in both dollars per-acre per-year and the total dollar value of the annual flow of ecosystem services for each land cover type and ecosystem service, respectively. **The annual value of ecosystem services within the El Paso study area is estimated to be between \$3.3 million and \$6.5 million.**

**Table 5 - Ecosystem Services in the Study Area by Land Cover**

|                                       | Acres        | (\$/Acre/Year) |           | (\$/Year)           |                     |
|---------------------------------------|--------------|----------------|-----------|---------------------|---------------------|
|                                       |              | Low            | High      | Low                 | High                |
| Grasslands                            | 18           | \$ 257         | \$ 419    | \$ 4,631            | \$ 7,547            |
| Grasslands (w/i 500 ft. of Developed) | 0.25         | \$ 13,710      | \$ 13,710 | \$ 3,428            | \$ 3,428            |
| Shrublands                            | 7,449        | \$ 238         | \$ 673    | \$ 1,772,435        | \$ 5,014,860        |
| Shrublands (w/i 500 ft. of Developed) | 106          | \$ 13,710      | \$ 13,710 | \$ 1,453,260        | \$ 1,453,260        |
| Open Space: Developed                 | 138          | \$ 738         | \$ 738    | \$ 101,814          | \$ 101,814          |
| <b>TOTAL</b>                          | <b>7,711</b> |                |           | <b>\$ 3,335,569</b> | <b>\$ 6,580,909</b> |

**Table 6 - Ecosystem Services in the Study Area by Service**

| Ecosystem Service                        |                    |                    |
|--|--------------------|--------------------|
| (\$/Year)                                | Low                | High               |
| Air Quality                              | \$6,912            | \$6,912            |
| Climate Stability                        | \$117,867          | \$180,095          |
| Disaster Risk Reduction                  | \$293,174          | \$405,423          |
| Food                                     | \$219              | \$1,535            |
| Habitat                                  | \$15,068           | \$15,068           |
| Natural Beauty                           | \$264,883          | \$443,941          |
| Natural Beauty (w/I 500 ft of Developed) | \$1,456,688        | \$1,456,688        |
| Recreation                               | \$327,345          | \$327,345          |
| Soil Retention                           | \$67,151           | \$67,151           |
| Water Storage                            | \$786,262          | \$3,676,752        |
| <b>TOTAL</b>                             | <b>\$3,335,569</b> | <b>\$6,580,909</b> |

### Net Present Value Calculations

In addition to the annual flow of ecosystem service benefits detailed in **Error! Reference source not found.** and Table 6, these economic data were used to calculate an “asset value” for the study site’s natural capital. Specifically, the value was calculated as the net present value of its expected future benefits (or future flows of ecosystem services). The asset value provides policy makers with a sense of the total worth of an asset over time and helps to plan investment and stewardship activities at an appropriate scale.

The value of stored carbon, carbon stock, is included in the asset value. A forest provides an annual carbon sequestration service via growth that draws carbon from the atmosphere. The forest also holds a great deal of carbon within the trees, the stock. Similarly, shrublands in El Paso hold carbon in the plant material and soil. Table 7 shows this carbon stock value. Carbon sequestration and storage is a critical, natural process that reduces the amount of carbon in the atmosphere and slows climate

change. Carbon markets are now emerging around the world where land owners are paid to protect and expand forests to increase the amount of carbon removed from the atmosphere and offset fossil fuel emissions.<sup>16</sup>

**Table 7. Value of Carbon Stored in the Study Area**

| Carbon Storage | Acres        | Per Acre Value |          | Total Value       |                   |
|----------------|--------------|----------------|----------|-------------------|-------------------|
|                |              | Low            | High     | Low               | High              |
| Grasslands     | 18           | \$ 696         | \$ 1,532 | \$ 12,533         | \$ 27,578         |
| Shrublands     | 7,555        | \$ 126         | \$ 126   | \$ 952,794        | \$ 952,794        |
| <b>TOTAL</b>   | <b>7,573</b> | -              | -        | <b>\$ 965,327</b> | <b>\$ 980,372</b> |

The asset value of the of natural capital in the study area (Table 8) is between **\$106 million and \$209 million when valued at a three percent discount rate over the next 100 years. At a zero percent discount rate, El Paso’s asset value is estimated between \$335 million and \$659 million.**

The discount rate represents what economists call the “time preference for money”. In short, this preference reflects the fact that a person would typically prefer to have a dollar in-hand today rather than a dollar promised at a later time. A stronger preference for today’s dollars suggests a higher discount rate. On the other hand, a zero percent discount rate indicates that a benefit today would be equally valued as a future dollar. A three percent discount rate used here is in the range proposed by many economists for valuation of natural capital. The purpose and application of discount rates is a topic of much debate in the field and further discussion is beyond the scope of this study.

**Table 8: Total Asset Value of the Study Area’s Natural Capital**

| Discount Rate | Asset Value (\$) |         |
|---------------|------------------|---------|
|               | Low              | High    |
| 0%            | \$335 M          | \$659 M |
| 3%            | \$106 M          | \$209 M |

Natural capital assets within the study area, such as shrublands and grasslands, provide enormous value to the regional economy and the local community. Importantly, these values are highly conservative estimates due to the many data gaps. Furthermore, while this asset value analysis considers a 100-year analysis period, this ecosystem should, with appropriate stewardship, continue to provide benefits far into the future.



## Valuation Discussion

The findings of this study can be considered a starting point for further discussion and research on the connection between El Paso's natural capital and the local economy. The following observations should be considered as these numbers are put into practice and future research is planned:

- **Natural Capital in El Paso Provides Significant Value to the Local Economy:** Even though shrubland is less valuable than land covers like forests and wetlands, El Paso's vast shrubland landscape nevertheless contributes substantial economic value to the regional economy. This study only touches on this broader value.
- **These Values are Highly Conservative:** As indicated in **Error! Reference source not found.**, many land cover/ecosystem service combinations cannot yet be valued due to a lack of values appropriate to the arid southwest. Primary research and values related to arid shrubland are especially sparse. As new data for the region emerges, these values will continue to improve, and the total recognized value will increase.
- **Population Growth Increases Ecosystem Service Values:** As the population of El Paso grows, more people will benefit from the ecosystem services within the study area. As urban areas expand and suburban sprawl increases, access to open space will become more precious. A small riparian park near the city center provides more access to recreation, more aesthetic value, and most likely more valuable flood protection than a similar tract of land in a remote area.
- **Contiguous Habitat and Habitat Corridors Provide Many Co-Benefits:** Much research has been done on the value of contiguous habitat and the preservation of corridors that allow birds, animals, and even plants to migrate to obtain resources, mix populations, and mitigate climate change.<sup>17,18</sup> Functional, regional ecosystems are especially important as climate and precipitation patterns change. The dollar value of these features is highly dependent on the complex interactions of many local variables, and monetization via benefit transfer is difficult.
- **A Strong Link Between the Economy, the Community, and the Natural Environment Builds Long-term Resilience:** As temperatures rise, rainfall intensifies, and droughts deepen, ecosystem services become an even more vital tool for adaptation. Without the services nature provides, an increasing percentage of taxpayer dollars will be required to replace lost services with built infrastructure, which is often costlier and less resilient.
- **The Impact of Development on Water Supply and Aquifer Health is Challenging to Value.** The complex physical nature of aquifers and their relationship to surface waters makes valuation using benefit transfer difficult. Conversion of shrubland to impervious surfaces will most likely reduce infiltration and overall water supply from the aquifer. Localized research will be needed to estimate the cost of lost shrubland in terms of water supply and ecological health of riparian areas and other water-dependent ecosystems.

## Opportunities for Additional Economic Analysis

This analysis provides a framework for discussing ecosystem services and valuation data available through published studies by applying the benefit transfer method. Further economic analysis may enable policy makers to build a more detailed and holistic picture of the shrublands' value and connection to the local economy.

### Generate More Values Using Function Transfer

One way to compensate for the lack of primary data applicable to El Paso's shrubland is to identify opportunities to transfer values from published work using function transfer. Function transfer is an approach that combines a function defined in a published study with local information about the new study site to estimate the value of an ecosystem service at the new site. A function transfer involves analysis that is more detailed, but it can fill in important holes in existing data.

### Economic Impact Analysis of Recreation

Formal recreation areas such as Franklin Mountains State Park and informal recreation such as walking and birding throughout the surrounding shrublands play a significant role in the local economy. User-day recreation data and specialized economic impact models can be used to model the flow of direct and indirect dollars from recreation opportunities. For example, a family visiting El Paso for bird watching may buy lunch, gas, and perhaps a hotel room. These investments will have a trickle-down benefit to local businesses and residents in the form of increased business sales and employee earnings. This type of study can be very helpful to illustrate how preservation and stewardship of open space can have wide-ranging benefits in different economic sectors. This is especially true as a region becomes a destination recreation area with visitors and dollars flowing into the region.

### Holistic Benefit-Cost Analysis (BCA) of Development Options

Traditional BCAs have often had a narrow scope, only including items such as home construction costs, sale prices, tax revenue, and other common project measures. A holistic BCA attempts to capture a much wider range of project or land use policy implications, and it can help in comparing the benefits and costs of different options.

In addition to the ecosystem services described in this study, other benefits of open space may include reduced healthcare costs via better access to outdoor recreation, reduced stormwater management costs, reduced heat island impacts, and increased home values. Amenities like trails can even provide better employment opportunities by easing the cost and time of commuting, especially

for low income residents. Some of these benefits can be monetized and others can be described qualitatively.

A holistic benefit-cost analysis gives decision makers more complete data to inform their project and policy options. In 2015, the Department of Housing and Urban Development (HUD) pioneered this type of analysis with their \$1 billion National Disaster Resilience Competition that required holistic BCA analyses from all applicants.

### Health Benefit of Open Space Analysis

Substantial data is available that correlates access to open space with physical and mental health. Economically, these benefits translate into lower healthcare costs for individuals and the community as a whole. Economic methods are now becoming available to put dollar values, often substantial, to these benefits.

### Analysis of Open Space for Groundwater Recharge

Pioneering work in Santa Cruz County, California has shown that carefully constructed rapid infiltration zones and open space preservation can provide a high return on investment (ROI) for utilities in the form of increased water supply. This analysis captures both the value of water added to the aquifer for water supply and the reduction in flooding and runoff from severe weather events.

## Better Data Yields Better Long-term Decisions

For many decades, decision makers have been missing critical data: the contribution of their natural capital and ecosystem services to the local economy. When natural capital is undervalued, BCA and ROI calculations show natural capital restoration and stewardship projects to be relatively less worthy of investment. Insufficient investment begins a long cycle of natural system decline that, in turn, compromises local economic and social function and productivity. For example, when natural systems are compromised, communities must pay a larger proportion of their tax revenue to compensate for the services that nature no longer provides for free. Building levees and stormwater controls and paying an increasing amount for flood damages mirrors the loss of function along the riparian corridor due to impervious development, floodplain disconnection, and vegetation loss.

Communities throughout the nation are seeking the best ways to restore balance and save tax dollars over the long term. In many instances, the solution is to restore the environment to the state it was in 50 or 100 years prior. Within riparian areas, this often means restoring river flow, rebuilding riparian vegetation, and reconnecting floodplains to mitigate the damage due to increased frequency of extreme precipitation events. In many cases, this return to fully functional natural systems offers the most cost-effective, resilient, and durable solution to these critical problems. Anecdotal evidence

indicates that healthy natural capital is good for business and helps to attract and maintain a highly skilled, engaged workforce. Work to protect and steward open space requires ingenuity, persistence, access to emerging data and techniques, and collaboration amongst partners that have not typically worked together.

The values included in this report are highly conservative, but still demonstrate the substantial value of El Paso's natural capital and the interconnection between the undisturbed land and the region's economy. These values can immediately be integrated into a variety of policy and planning efforts to provide decision makers with the most comprehensive data available to inform the best long-term choices for El Paso.



## Appendix A - Study Limitations

Valuation exercises have limitations, although these limitations should not detract from the core finding that ecosystems produce significant economic value for society. Like any economic analysis, the benefit transfer method (BTM) has strengths and weaknesses. Some arguments against benefit transfer include:

- Every ecosystem is unique; per-acre values derived from another location may be of limited relevance to the ecosystems under analysis.
- Even within a single ecosystem, the value per acre depends on the size of the ecosystem; in most cases, as the size decreases, the per-acre value is expected to increase and vice versa. (In technical terms, the marginal cost per acre is generally expected to increase as the quantity supplied decreases; a single average value is not the same as a range of marginal values).
- Gathering all the information needed to estimate the specific value for every ecosystem within the study area is not currently feasible. Therefore, the full value of all of the shrubland, grassland, et cetera in a large geographic area cannot yet be ascertained. In technical terms, far too few data points are available to construct a realistic demand curve or estimate a demand function.
- The prior studies upon which calculations are based encompass a wide variety of time periods, geographic areas, investigators, and analytic methods. Many of them provide a range of estimated values rather than single-point estimates. The present study preserves this variance; no studies were removed from the database because their estimated values were deemed too high or too low. In addition, only limited sensitivity analyses were performed. This approach is similar to determining an asking price for a piece of land based on the prices of comparable parcels (“comps”): Even though the property being sold is unique, realtors and lenders feel justified in following this procedure to the extent of publicizing a single asking price rather than a price range.
- The objection to the absence of even an imaginary exchange transaction was made in response to the study by Costanza et al. (1997) of the value of all of the world’s ecosystems. Even this is not necessary if one recognizes the different purpose of valuation at this scale—a purpose that is more analogous to national income accounting than to estimating exchange values.<sup>19</sup>

This report displays study results in a way that allows one to appreciate the range of values and their distribution. It is clear from inspection of the tables that the final estimates are not precise. However, they are much better estimates than the alternative of assuming that ecosystem services have zero value, or, alternatively, of assuming they have infinite value. Pragmatically, in estimating the value of ecosystem services, it would be better to be approximately right than precisely wrong.

## Appendix B - Valuation Data Sources

| Land Cover Type | Ecosystem Service       | Reference                     | Low Value | High Value |
|-----------------|-------------------------|-------------------------------|-----------|------------|
| Grasslands      | Natural Beauty          | Sengupta and Osgood 2003      | \$ 55     | \$ 55      |
| Grasslands      | Natural Beauty          | Mast 2002                     | \$ 0.2    | \$ 0.5     |
| Grasslands      | Climate Stability       | DeLonge et al. 2013           | \$ 134    | \$ 150     |
| Grasslands      | Climate Stability       | Liu et al. 2012 (Asset Value) | \$ 696    | \$ 1,532   |
| Grasslands      | Food                    | Shaw et al. 2009              | \$ 12     | \$ 85      |
| Grasslands      | Soil Retention          | Gascoigne et al. 2011         | \$ 6      | \$ 6       |
| Grasslands      | Habitat                 | Gascoigne et al. 2011         | \$ 35     | \$ 35      |
| Grasslands      | Recreation and Tourism  | Breffle et al. 1997           | \$ 13,710 | \$ 13,710  |
| Shrublands      | Air Quality             | Delfino et al. 2007           | \$ 1      | \$ 1       |
| Shrublands      | Climate Stability       | Liu et al. 2012               | \$ 15     | \$ 24      |
| Shrublands      | Disaster Risk Reduction | Zavaleta 2000                 | \$ 39     | \$ 54      |
| Shrublands      | Water Storage           | Zavaleta 2000                 | \$ 106    | \$ 494     |
| Shrublands      | Recreation & Tourism    | Richer 1995                   | \$ 61     | \$ 61      |
| Shrublands      | Recreation & Tourism    | Weber 2007                    | \$ 30     | \$ 30      |
| Shrublands      | Soil Retention          | Richardson 2005               | \$ 9      | \$ 9       |
| Shrublands      | Water Storage           | Zavaleta 2000                 | \$ 106    | \$ 494     |
| Shrublands      | Climate Stability       | Wilson 2008                   | \$ 126    | \$ 126     |
| Shrublands      | Natural Beauty          | Rosenberger & Walsh 1997      | \$ 36     | \$ 59      |
| Shrubland       | Habitat                 | Sala et al. 1998              | \$ 2      | \$ 2       |
| Open Space      | Recreation & Tourism    | Brander and Koetse 2011       | \$ 738    | \$ 738     |

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- <sup>4</sup> [http://www.100resilientcities.org/cities/entry/el-pasos-resilience-challenge#/-/\\_/](http://www.100resilientcities.org/cities/entry/el-pasos-resilience-challenge#/-/_/)
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