PATAGONIA, AZ
RAILS TO TRAILS STUDY

The Drachman Institute

College of Architecture and Landscape Architecture

UNIVERSITY OF ARIZONA, TUCSON, ARIZONA

The Drachman Institute is a research and public service unit of The College of Architecture and Landscape Architecture at The University of Arizona dedicated to the environmentally sensitive and resource-conscious development of neighborhoods and communities

Goals and Objectives

- Making the community more accessible for pedestrians and less dependent on the automobile.
- Connecting the town with other communities in the region.
- Protecting open space and natural resources.
- Developing sustainable tourism alternatives.

Description of the Project

This project was started to find ways to connect pedestrians in the town of Patagonia, Arizona to their community and beyond. This document shows how the town itself can be improved through pedestrian networks, as well as how a regional network can become an economic and recreational boon for the community. Further focus is given to the analysis and planning for a proposed Rails-to-Trails greenway between Patagonia and Sonoita. Included with the analysis and planning are design recommendations and criteria, as well as organizational recommendations to aid the Patagonia community with making these recommendations a reality.

First Level
Second Level
Third Level
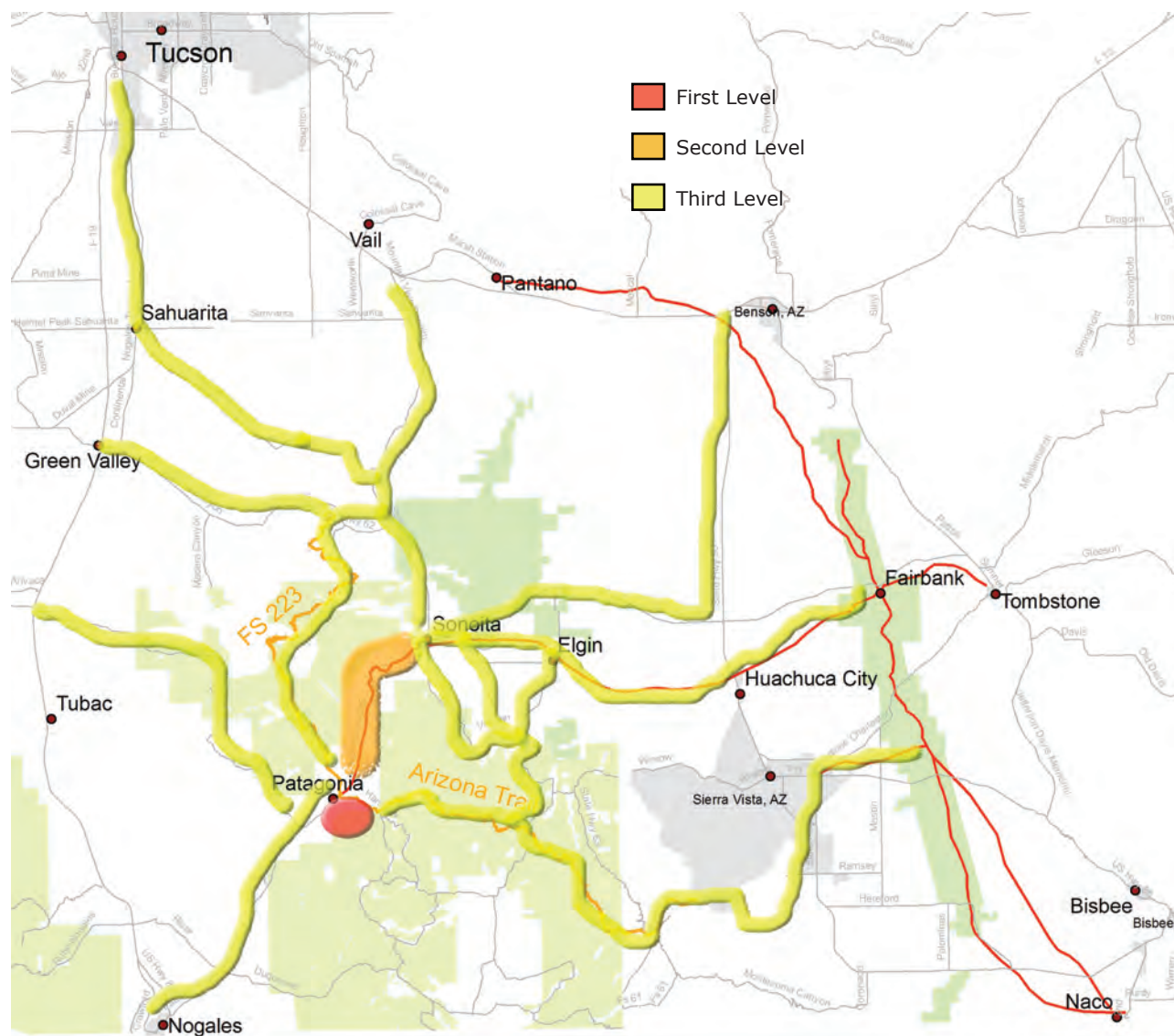
Scope

- The First Level:
A plan for a pedestrian system for the town of Patagonia. We must connect the downtown core to outlying streets, schools, parks, and amenities. Design intensive!

- The Second Level:
A rails-to-trails greenway to connect Patagonia, Sonoita, and destinations in between---design is an important part of this phase, too.

- The Third Level:
A greenway plan for the southern Arizona region, connecting Santa Cruz, Pima, and Cochise Counties.

Purpose

Organizing this project at three scales makes it possible for the Patagonia community to work in small steps. As funding becomes available, the client can pick and choose specific parts of this plan and implement them. For example, if funding came available for street signs, that particular section will guide the community. Likewise, if a neighboring county such as Cochise County decided to work with Santa Cruz County to improve regional connections, that particular section of this planning document will guide Patagonia through that process.

Need

Recreational amenities can significantly improve quality of life. They offer a chance for people to lead active, healthy lives. If planned properly, these amenities can protect the environment and at the same time generate economic activity. Small rural communities are faced with unique problems related to economics, growth, and quality of life. Organizing the community and planning for the future are essential if positive changes are expected to occur.

Methods

We decided to take Philip Lewis's project methodology because his process applies to the kind of project we are developing for the town of Patagonia. In addition, his regional scale thinking helped us understand the type of connections we wanted to include in our project. Here is a brief description of his work and how we approach some of his thoughts.

Phil Lewis. A regional Planner with an awareness of patterns.

Philip Lewis sees the world as a "collective work of art" or as a "complex design composition" as opposed to a group of unrelated features (Tomorrow By Design, p.88). It is Lewis' search for patterns in the landscape that characterize his more than forty year contribution to landscape and regional planning.

With the Wabash River Valley Project (1958), Lewis wanted to demonstrate to other universities and governmental agencies the importance of looking at local issues regionally. To do this, he set up an ambitious, for the time, project encompassing the entire watershed of the Embarras River, which trickled through the university campus, flowed through open farmland then the city of Lawrenceville, Illinois and gained strength as it joined the Wabash River. The goal was to study the whole region and suggest development strategies, and they made recommendations that such corridors be preserved.

In 1960 he was hired by the State of Wisconsin to inventory all the state's recreational resources. Employing teams of students, local residents, governmental workers and experts in all fields, Lewis canvassed the state for every possible item that could be considered a "recreational resource" that might contribute to a "sense of place" or a "landscape personality". They identified every natural feature from waterfalls to hills and interesting trees to fishing holes. Urban architectural features, too, were listed: church steeples, bandstands, town market squares and train stations. Cultural, historic, wildlife, and local spots of potential interest to tourists were all cataloged from one end of the state to the other: blues bars, battlefields, loons and gas stations. Nothing, seemingly, was ignored.

Devising hundreds of icons to visually identify every type of resource retrieved, Lewis and his teams plotted each item on giant wall maps hung in the basement of the capitol building in Madison.

What resulted from this year-long extensive survey was the emergence of patterns, "environmental corridors" that could, because of the icons, be easily seen and understood by everyone. This process he named the "Regional Design Process".

Icons for identifying resources: Top to bottom: dentist, festival market plaza, beach, hills, steeple.
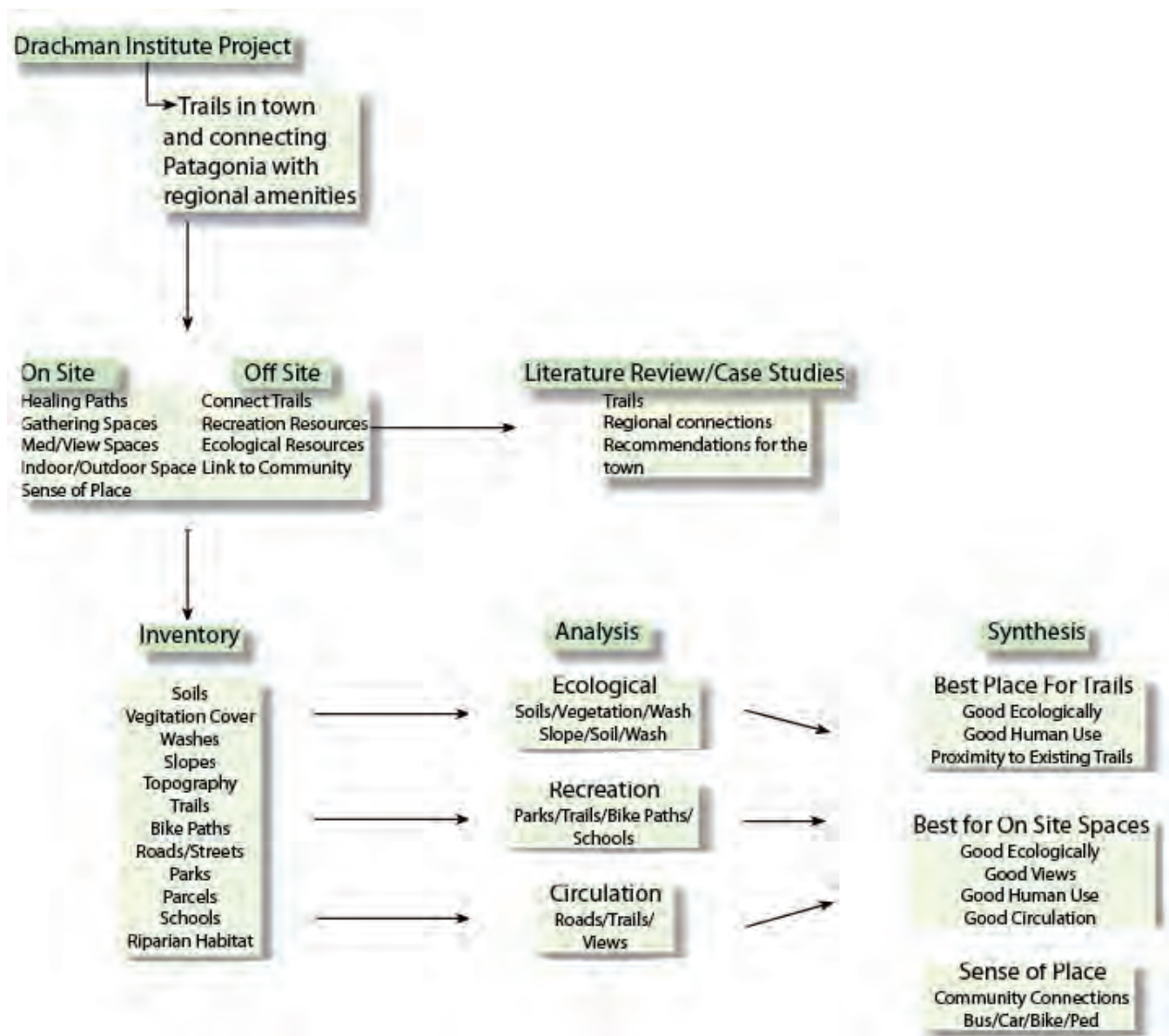
Our process diagram shows the different steps and information gathered to accomplish this study. First of all, it was important to establish our goals and objectives and they were dictated by the Drachman Institute. After that we listed various activities that might happen on site and off site and based on that we focused our Literature Review as well as the Case Studies that we wanted to focus on.

The inventory was done through GIS information that we gathered from:
- Us Census Bureau
- Geography network.com
- ALRIS (State of Arizona)
- Pima County
- Cochise County
- Southern Arizona Data Services Program
- ESRI
- Bureau of Land Management
- US Forest Service

Some other information relevant to the regional context was gathered in a series of site visits and meetings with local citizens and stakeholders.

For the Synthesis, we developed a series of recommendations to place the trails at three different levels.
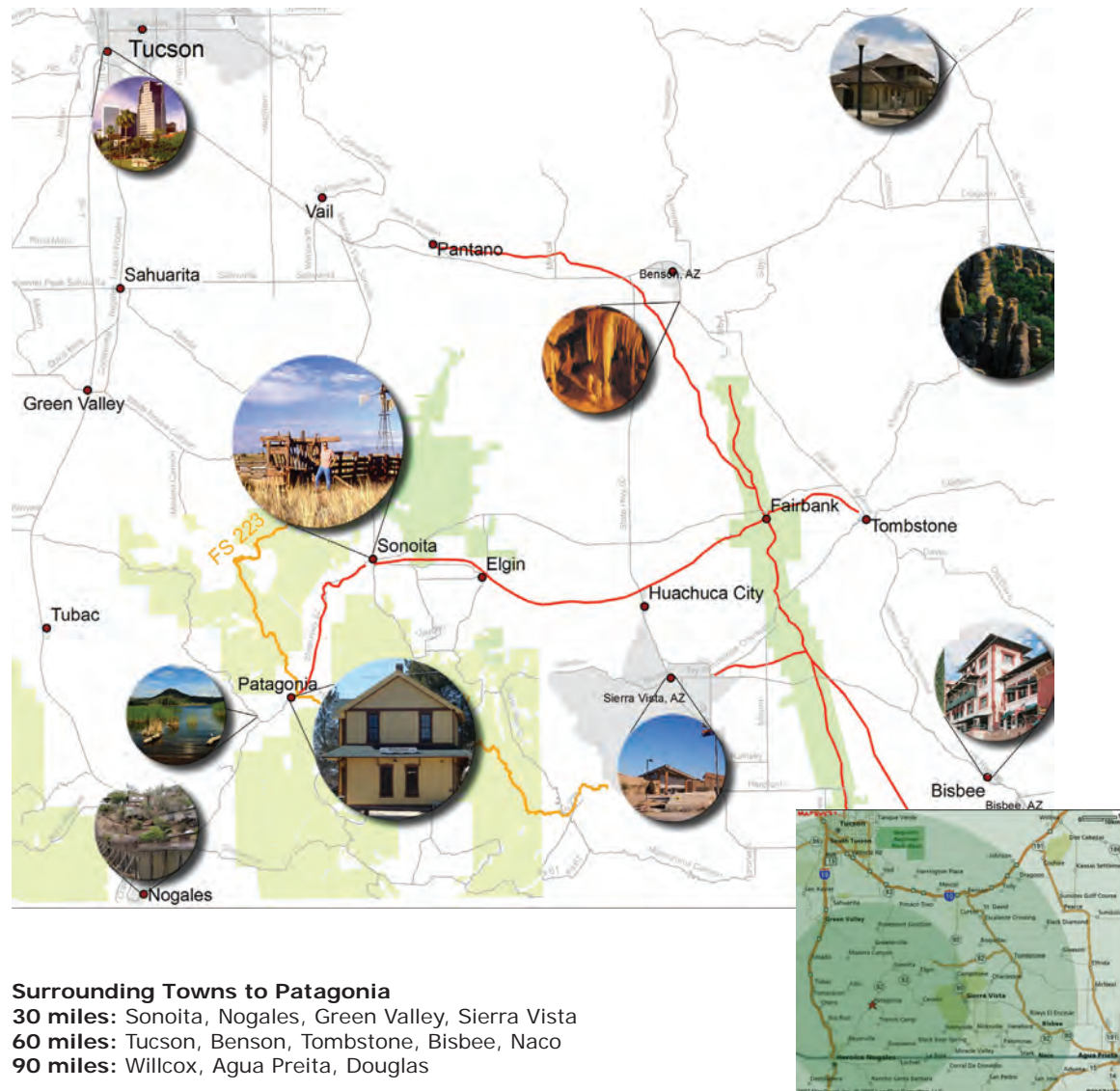
Regional Context

Surrounding Towns to Patagonia
30 miles: Sonoita, Nogales, Green Valley, Sierra Vista
60 miles: Tucson, Benson, Tombstone, Bisbee, Naco
90 miles: Willcox, Agua Preita, Douglas

Within 30 miles

Patagonia State Park
The State Park is a 265 acre reservoir that offers mesquite trees, pines, two boat ramps, a dump station, a fish cleaning station and a store with groceries. It also has a visitor center and the Sonoita Creek Trail of about 1.2 miles roundtrip. The Sonoita Creek State Natural Area is located in the north-west of the Patagonia State Park. It holds about 5,000 acres of riparian, grassland, and woodland habitats.
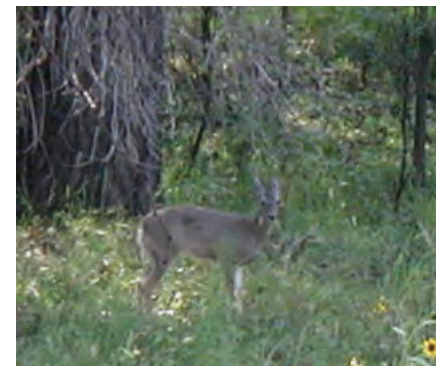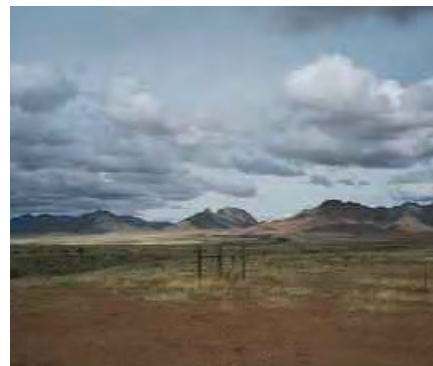
Views of Patagonia State Park.

Patagonia-Sonoita Creek Preserve

The Nature Conservancy maintains over 750 acres along Sonoita Creek as a wildlife preserve. Year-round water and a variety of habitats attract a number of birds; about 300 species have been identified. The splendid cottonwood-willow riparian forest contains Freemont cottonwoods that tower over 100 feet. About 2.5 miles of trails make loops through a variety of habitats near the Creek.

Views of Patagonia-Sonoita Creek Preserve.

Nogales

The City of Nogales is located in Santa Cruz County, Arizona, United States. As of the 2000 census, the city had a total population of 20,878. The city is the county seat of Santa Cruz County. Nogales, Arizona, borders the city of Nogales, Sonora, Mexico and is Arizona's largest international border town. Nogales is a wonderful place to experience Mexican culture and traditions. The town sits at an elevation of 3,865 feet. The climate in Nogales is delightful all year round. The Pimeria Alta Historical Society Museum is located in the old city hall building. This museum shows visitors the rich history of the area through artifacts and displays. Tumacacori National Historic Park is north of Nogales and is steeped in history. The park tells the tales of the early Spanish and Indian people.


Views of Nogales.

Coronado National Memorial

The Coronado National Forest covers 1,780,000 acres of southeastern Arizona and southwestern New Mexico. Elevations range from 3000 feet to 10,720 feet in twelve widely scattered mountain ranges or "sky islands" that rise dramatically from the desert floor, supporting plant communities as biologically diverse as those encountered on a trip from Mexico to Canada.
It offers hiking and a scenic drive, history of the area, plant materials, and wildlife. The Coronado Cave Trail is a 1.5 mile-roundtrip and a cave of 600 feet long, 70 feet wide, and up to 20 feet high. The Arizona Trail begins in this memorial.
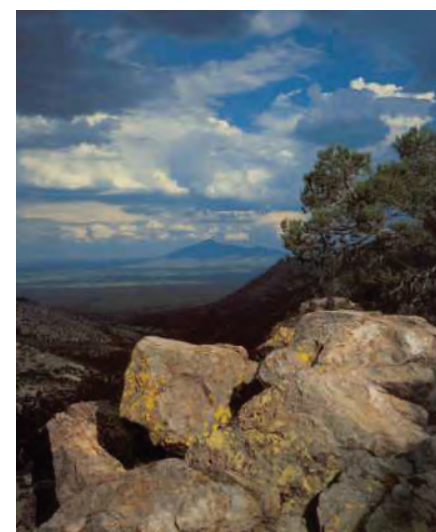
Views Coronado National Memorial.

Sierra Vista
With a population of around 40,000 people,
Sierra Vista is the largest city in Cochise County, and one of the newest. The town was established in 1956, though there had been small settlements in the area for some time. It is the fastest growing city in the region, owing its existence to the Ft. Huachuca army base. The growth of Sierra Vista has been following the sprawling pattern frequently seen in the west due to the availability of space. This sprawl results in isolated communities with little of the charm of surrounding historic communities and no sense of place. Sierra Vista has become a popular winter destination for snowbirds and a retirement destination for military personnel and people looking for a more rural lifestyle.

Views of Sierra Vista.

Huachuca Mountains
These mountains, located south of Sierra Vista, present many hiking possibilities and some very scenic drives.

Within 60 miles

Views of Huachuca.

Tucson
Forested mountains tower above the vast desert and grasslands of Southern Arizona. The Sonoran Desert with its giant saguaro and other hardy plants cover lands from Tucson west to the Colorado River Valley. Mount Lemmon, in the Santa Catalinas, has downhill ski runs. The combination of clear, dry air and the many mountain ranges provides excellent observing conditions for astronomers. Tucson has some of the finest cultural offerings in Arizona: a large university, historic sites, fine museums, and a great variety of restaurants and nightlife. Set an a elevation of 2,400 feet, Tucson ranks as the state's second largest city, with a metropolitan population of about 840,000. Some of the attractions are: Tucson Mountain Park, Old Tucson Studios, Arizona-Sonoran Desert Museum, Saguaro National Park, Biosphere 2 Center, Santa Catalina Mountains, Colossal Caves, and the Pima Air & Space Museum.

Views of Tucson.

Colossal Cave

Colossal Cave is one of the largest dry caves in the world and is listed on the National Register of Historic Places. It was discovered in 1879, though recent studies show that it was once a Hohokam shrine. Visitors can take guided tours down into the caves to see spectacular stalactites, stalagmites, columns, and draperies.

Benson

Population: ~ 5,000

The town of Benson is known as the western gateway to the scenic and historic attractions of Cochise County. The town was founded in 1880 before Arizona's mining boom and was developed as a stop in the Butterfield Overland Stagecoach. The Southern Pacific Railroad came into Benson shortly after the Stagecoach and served the area until 1997 when the line was purchased by the Union Pacific Railroad. The culture of Benson is immersed in the Old West atmosphere and railroad heritage. Attractions in the city include the Benson Visitor Center and Kartchner Caverns. The Visitor Center is located in Benson's historic Downtown and is a replica railroad depot using the same architectural features as the original depot.

Kartchner Caverns

Kartchner Caverns is a unique "living" attraction. This limestone cavern system was discovered in 1974 by two amateur cavers from Tucson, Arizona. It was kept a secret for 14 years to protect the caverns from vandalism and exploitation that would damage the sensitive cavern ecosystem. These caverns, known as some of the best formations of their kind in the world, contain a wide variety of brilliantly colored formations and the longest known Soda Straw stalactite formation in the world. Because these are "living" wet caves, water is still percolating from the surface into the caverns and continuing the growth of the limestone formations. The average temperature of the caverns is 68° with a humidity of 99%.

Views of Colossal Caves.

Views of Benson.


Views of Kartchner Caverns.

Bisbee
Population: ~ 6090
The town of Bisbee is the Cochise County seat. Bisbee was founded in 1880 as a mining town with a population exceeding 30,000 at its peak. As mining operations declined the population began to decrease until the 1950's. Then Phelps Dodge began a new excavation in the vast Lavendar pit, a strip mine that produced silver and gold, as well as copper. After over 20 years and one billion tons of gold, silver, and copper were extracted, the production of the strip mine slowed until operations ceased in 1974.
Bisbee refused to become a ghost town and instead shrunk to its present size and reinvented itself as an artisan community. The town is composed of three districts: Old Bisbee, Warren and San Jose, which retain most of their original buildings in a variety of Victorian styles. The town has changed little in appearance from the high point of its mining days, and the majority of its income is now received from tourism. Dozens of annual events have been created including Brewery Daze, Chocolate Tasting, Festival of Lights, the Stair Run, and the Southwest Wings Birding Festival which attracts visitors from around the world.
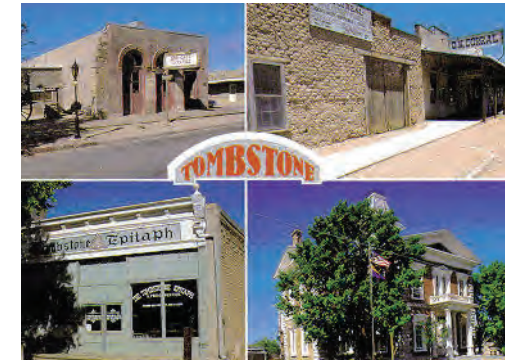
Tombstone
Population: ~ 1500
Tombstone is well known as one if the biggest tourist attractions in Arizona, although it is a small town with slow permanent population growth. It is known as "the town too tough to die," because it almost became a ghost town in the 1920's after the nearby silver mines were closed. It was never completely deserted however, and when interest was rekindled in the Old West some years later the town began to re-emerge as a tourist destination. Millions of visitors come to Tombstone every year from around the world to see the town that was once home to legendary figures like Doc Holliday and Wyatt Earp and re-enactments of events such as the gunfight at the OK Corral. The majority of the original architecture still remains, giving a sense of authenticity to the experience.

Views of Bisbee.

Views of Tombstone.

Within 90 miles

Willcox

With a population of 3,825 Willcox was a supply and shipping point for local ranchers. Agriculture is still the town's most important industry. Ostriches, apples, peaches, cherries, grapes, pecans, and pistachios now supplement the mainstays of cattle, cotton, and grains. In its surroundings there is the Willcox Playa which is a giant lakebed. The playa is usually dry, but after heavy rains it becomes a shallow lake.

Views of Willcox.

Chiricahua National Monument

This eighteen square mile area contains volcanic rocks eroded into pinnacles and spires and contains an interesting variety of vegetation and wildlife. The Chiricahua National Monument is an intersection of the Chiricahuan and Sonoran deserts, and the southern Rocky Mountains and the Northern Sierra Madres of Mexico.   There is also a wide range of habitat in the area, from canyons to grassy flat lands to sky islands reaching elevations of over 9,000 feet.

Due to the biological diversity the Chiricahuas have become a mecca for hikers and birders. A large section of the diversity of animal wildlife present in the Chiricahua Mountains is reserved for a staggering number of bird species. More hummingbird species are found in these mountainous areas than anywhere else in the United States. This is also the only area in the United States to see some interesting species from Mexico such as the Mexican Chickadee and the elegant Trogon. There is a lot of nocturnal wildlife that can be seen if one blends into the environment such as bats, foxes, bears, and larger cats such as the bobcat and mountain lion.

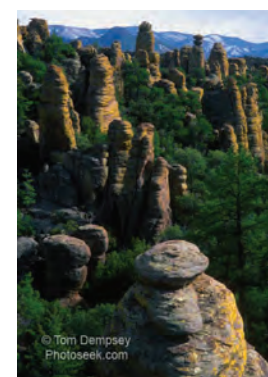Views of Chiricahua National Monument.

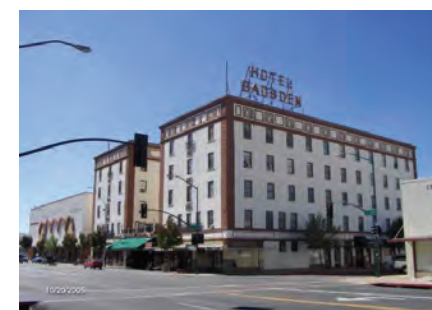**Douglas**

Population: ~ 17,000

The city of Douglas was originally known as Black Water in 1878, because of it's proximity to a dirty water hole. It was incorporated in 1905 and named after Dr. Stewart Douglas. Douglas is a border town and acts as a gateway to Mexico offering a world of interesting cross-cultural experiences. Douglas also has a number of historically registered buildings to visit, and the John Slayghter Ranch where visitors can experience the turn of the century lifestyle.

Views of Douglas.

Patagonia and Sonoita

Patagonia

Patagonia is a town in Santa Cruz County, Arizona. It was formerly a supply center for nearby mines and ranches. Presently, it is a tourist destination, retirement community, and arts and crafts center. The town has a total area of 1.2 sq. mi. and is 4,057 feet above sea level. It is located around 48.2 miles from Tucson. According to the 2000 Census there were 881 people. The average rainfall is 18 inches. Patagonia is a quaint hamlet that rests between the majestic Santa Rita Mountains and the beautiful Patagonia Mountains at the intersection of Harshaw and Sonoita Creeks.

Its population is basically composed of:
•   White (58.5%)
•   Hispanic (39.5%)
•   Other race (10.6%)
•   American Indian (1.8%)
•   Two or more races (1.6%)

Within the watershed of Sonoita Creek lies some of the richest remaining riparian (streamside) habitat in the region. The preserve protects a magnificent example of the rare Fremont cottonwood-Goodding willow riparian forest. This is one of the few remaining sites in Arizona where this once-common forest type still persists. Arizona black walnut, velvet mesquite, velvet ash, netleaf hackberry, and various willows are found in slightly different habitats throughout the preserve. The Patagonia-Sonoita Creek Preserve is best known for the 300 bird species observed here.

Arizona Trail:
Just 3 miles outside of Patagonia is the Arizona Trail. There are several places in the area to access the historic Arizona Trail, which runs from Mexico to Utah.

Patagonia Lake State Park:
Is a popular destination for water skiing, fishing, camping, picnicking, and hiking, located seven miles south of town.

Patagonia History:From Thriving Mines to Eclectic Art in a Naturalist's Paradise

Patagonia's founder was Rolling Rice Richardson, a Pennsylvanian who made money in oil investments. Rolling founded Patagonia in 1896, and named it after himself. But in 1899 when residents petitioned the post master general for a post office, they decided to also change

the town's name to Patagonia, after the mountain range that towers over the valley.

Mining was the mainstay of Patagonia residents since rich ore and other miner-als were discovered in the Patagonia and other surrounding mountain chains. The New Mexico and Arizona Railroad built a railway straight through the heart of Pata-gonia. With the railroad in place, Patago-nia was connected to the rest of America's train routes and became an important commercial center in Santa Cruz County. Hotels, boarding houses, an opera house, restaurants, and bars were built to serve the burgeoning population. The town was inhabited by Hispanic, Anglo, and Chinese residents.

Sonoita

The settlements of Sonoita and Elgin were founded when the Santa Fe Railroad built an 88-mile-long line in 1882 that ran the full length of Sonoita Creek, from Benson to Nogales. The Sonoita area is at the 4,970 foot elevation, with high rolling grasslands, surrounded by spectacular mountains and canyons. Sonoita is also home to several wineries that offer some of the best wines in the area. Filmmakers have chosen the area's old west atmosphere and beauty of the area for several films. The current population is 1,132 and the average annual rainfall is 19 inches.

Sonoita History: A Diverse and Independent Ranching Community with Strong Family Values

The Villages of Sonoita and Elgin came into being when the Benson-Nogales Railway arrived in 1882. This regular and reliable transportation made successful ranching possible. Sonoita is home to an ancient dinosaur discovered in 1994 when a University of Arizona undergraduate dug up the bones of a Sonorasaurus.

Case Studies

Several locations where rails-to-trails projects have been developed were examined to learn about the challenges and possibilities of trail design and to provide positive test cases to be used as model town of Patagonia.

Greenbrier River Trail, **West Virginia**

The Greenbrier River Trail
Level, 79-mile packed gravel rails-to-trail in West Virginia.

Background

Surrounded by the Allegheny Mountains, the Greenbrier River Trail follows the old C&O right of way through the Greenbrier River Valley in Pocahontas and Greenbrier Counties of West Virginia, passing through the Monongahela National Forest, Cass, Watoga, and Droop Mountain State Parks and the Greenbrier and Seneca State Forests. It also connects to small towns and uses 35 bridges and 2 tunnels. Drinking water, restrooms and camping are accessible along the route. Interpretive signs using text and photographs inform the users about the history of the railroad along which they pass.
Since 2000 there has been held an annual triathlon along the trail and river consisting of a 3-mile run, 4-mile canoe leg, and 10-mile bike segment to the finish line where live music, food and prizes complete the festivities.

Relevancy

As in Patagonia, this trail has direct access to National and State Parks, Forests, etc.

Design Implications

• Access to restrooms, water and camping will make trail more attractive to use
• Events such as the triathalon that use the trail will increase awareness and public involvement, and from tourists, dollars
• Highlight the history of the railroad wherever possible with interpretive signs and relics

Marlinton Depot (upper left), and river crossing (lower right).

Ghost Town Trail

Easy 16 mile (19.5 planned) crushed limestone trail along Blacklick Creek in South Central Pennsylvania

Background

The Ghost Town Trail, (which gets its name from two once-thriving towns dismantled in the 1930s), runs from Dilltown, in Indiana County, PA to Nanty-Glo, in Cambria County on an abandoned Conrail line through old industrial and mining territory. Along with the stunning scenic beauty, this trail offers lessons in history and ecology as well. Signage erected by the Department of Environmental Protection describe efforts to correct acid mine drainage, which continues to stain the water of Blacklick Creek giving it its name. Piles of coal and the Eliza Furnace, a blast furnace once employed to produce iron between 1846 and 1849, still stands as a monument to an industrial age gone by. The most unusual feature, however, are the three holes bored into the bedrock near Vintondale to lower water in an abandoned mine. Today the holes create a fountain in the creek, multi-colored by chemicals in the leaking mine water.

Relevancy

This rails-to-trail combines family recreation with history, multi-use: hiking, mountain biking, horseback riding, and cross-country skiing. The trail connects two towns (Dilltown and Nanty-Glo) as would the Patagonia Trail (Patagonia and Sonoita).

An economic impact study completed in 1996 showed that the Ghost Town Trail was attracting dollars from outside Indiana and Cambria Counties (23% of the 66,000 visitors between May and October were non-residents who spent on average $9.28 daily compared with the $4.33 daily expenditure for residents. Total dollars generated by the trail in the study period: $362,000. A similar trail type might do the same for Patagonia.

Design Implications

• The more uses the better (greater attraction to wider range of users/tourists)
• Inclusion of historical artifacts may aid in attracting users/tourists
• Bikes, skis, horses, etc. should be rentable at either end of trail

the Eliza Furnace

Blacklick Creek (left) and fall foliage on the trail

Mass Central Rail Trail

A currently 21-mile section of a potentially 104-mile east-west corridor through Massachusetts.
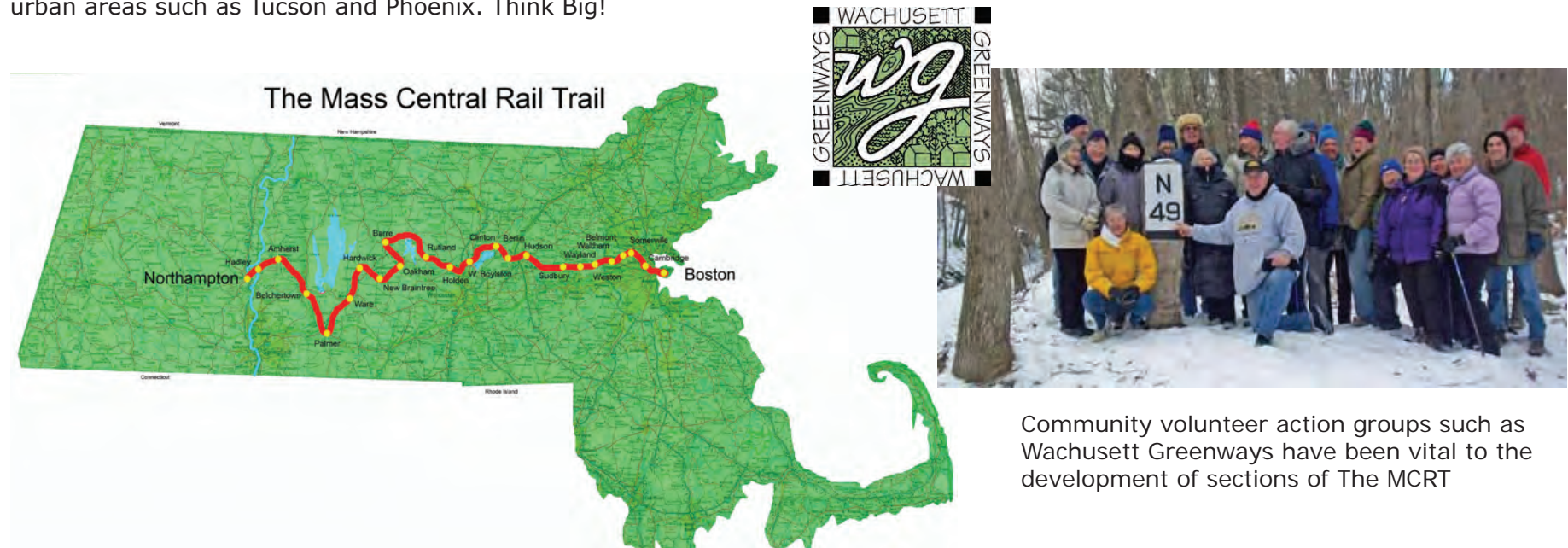
Background

The proposed trail would run along a rail line that once connected Boston with Northhampton, Massachusetts but was destroyed by the great hurricane of 1938. Much of the original rail line has been obliterated, forgotten, or acquired since then. Volunteer and government organizations as well as 24 communities are working together to bring the railroad to light. This involves land acquisition, as much of the property is now in private hands. However, the grand scheme is to connect downtown Boston with rural Western Massachusetts and to be the main state link to the East Coast Greenway which will link Maine to Florida.

Relevance

Like the proposed Patagonia trail, the MCRT has very wide regional and national connectivity. Community involvement is also very important to the actual construction and eventual maintenance of the trail.

Design Implications

•   Community involvement in the construction of the trail may contribute to use and maintenance; both Patagonia and Sonoita might be enlisted to set up volunteer organizations for these purposes   •   Bed and Breakfast Inns in Patagonia and Sonoita may attract tourists dollars from users who do not wish to camp   •   Trail should clearly and efficiently connect with other trails for regional, national and international use (e.g. Mexico-US-Canada); trail should ultimately have direct connectivity to downtown urban areas such as Tucson and Phoenix. Think Big!

Community volunteer action groups such as Wachusett Greenways have been vital to the development of sections of The MCRT

Trail and Greenway Benefits

This section will document the information we have gathered on the benefits of trail and greenway systems. We found four main categories of benefits: Economic, Environmental, Aesthetic, and Health.

First in the economic cathegory is job growth resulting from maintenance and management requirements and tourism related businesses. Trail and greenway development has also resulted in lowered costs of pollution and flood control through use of buffer zones and filtration systems. The buffer zone created in Tulsa, OK after devastating flooding, actually produced a 25% drop of flood insurance rates. Property values are also positively influenced by close proximity to trails. Many new developments in the United States are including connections to surrounding trails as a way to boost property values.

Another economic benefit for creating trail and greenway corridors is a multi-use factor. The corridors necessary for trails can be seen as linear space for future infrastructure needs. Utilities companies who want to use the corridor to run their lines can help defray trail costs in several ways including donations of land, in-kind services, or annual fees. An example of this type of reltionship is found in Wisconsin where a utility company paved a 48 mile stretch of trail in exchange for using the corridor to lay their telephone lines.

Developing a trail and greenway system is also attractive to companies that are looking to relocate or establish corporate headquarters. Maryville, Tenessee experienced this benefit when Ruby Tuesday, Inc. moved one of their offices there. The CEO stated that the greenway system was one of the factors which helped them make the decision.

Above all, trails and greenways turn the geographic and historic resources of a town into community landmarks, which draws visitors. Visitors to the Little Miami Scenic Trail in Ohio spend an average of $13.54 per visit while enjoying the historic sites of the trail. Another successful trail can be found in Lead-ville, Colorado. There the construction of the Mineral Belt Trail produced a 19% increase in sales tax revenues.

Top left and right: Images of destruction caused by flooding. These events convinced the town leaders that something needed to be done to aleviate the flooding.

Bottom left and right: Images of the parks created in the floodplan areas after housing and industry had been moved to other parts of Tulsa.

Top left and right: Iron Horse Regional Trail in California provides alternative transportation for the many commuters of the area.

Bottom left and right: The black bear and the Florida Sandhill crane both benefit from the preservation of the Pinhook Swamp in Florida.

Environmental benefits fall under one of the most sensitive topics. If development is planned that will cause unnecessary damage to the environmental system of an area then it really isn't worth doing. When establishing an urban trail system, it is important to take environmental consequences into consideration. More often than not, the environment will benefit in several ways.

First the corridors established for trails and greenways improve water and air quality. A 1997 trail use study of the Iron Horse Regional Trail in California showed that one third of those surveyed used the trail for transportation to work, school, shopping, and restaurants. This means fewer vehicles on the road polluting the air. Trails and greenways also provide buffers along streams, rivers, and lakes, preventing erosion and pollution. This can be seen in Georgia along a three-mile stretch of the Alchoy River where the estimated value of the water filtrations attributed to wetlands is $3 million dollars.

Wildlife also benefits from trail and greenway systems. The corridors protect important habitat and provide a safe route for people and wildlife movement. The preserved Pinhook Swamp between Florida's Osceola National Forest and Georgia's Okefenokee National Wildlife Refuge protects a vital wildlife species including the Florida black bear, timber rattlesnake and the Florida sandhill crane.

The aesthetic benefits for communities with trails and greenways are fairly obvious. Trails and greenways increase the beauty of neighborhoods and communities, raising the quality of life for residents. They provide an attractive and safe network, linking all of the valued places in the area including commercial/retail, historical, cultural, civic, and recreational sites.

Perhaps the most overlooked benefits are included in the health category. Locating trails and greenways near neighborhoods helps people of all ages incorporate exercise into their daily routines. Communities can make the choise to exercise easier by connecting residents with places they commonly need to go to and by providing attractive safe networks of sidewalks, bikeways, and trails.
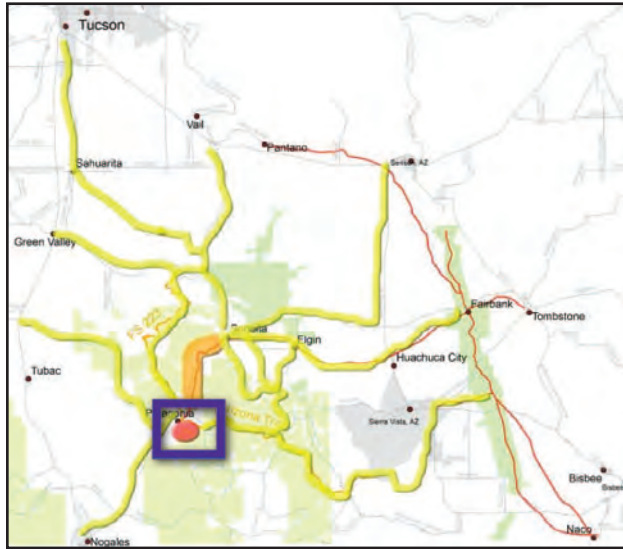
Patagonia Trail System

Scope Level One:
A plan for a pedestrian system for the town of Patagonia. We must connect the downtown core to outlying streets, schools, parks, and amenities.

Goal:
   Making the community more accessible for pedestrians and less dependent on the automobile by developing a plan for a pedestrian system for the town of Patagonia. We must connect the downtown core to outlying streets, schools, parks, and amenities.

Equestrian Users Following Sonoita Creek

Users:
   There are several user groups that could be positively affected by the development of a trail system within the the town of Patagonia. Among them are Equestrians, Bicyclists, Children, Families, Elderly, Retirees, etc. All of these groups have specific recreational needs that can be met by a system of multi-use trails in and around Patagonia.
   Once the inital planning stages are complete it will be beneficial to include representatives from all of these user groups in design decisions. This collaboration will ensure that the trail system becomes an amenty that the entire community will treasure.
   More detailed multi-use trail specifications are discussed in Chapter 4.

Bicycle Users along State Route 82

Children User Group at Playground
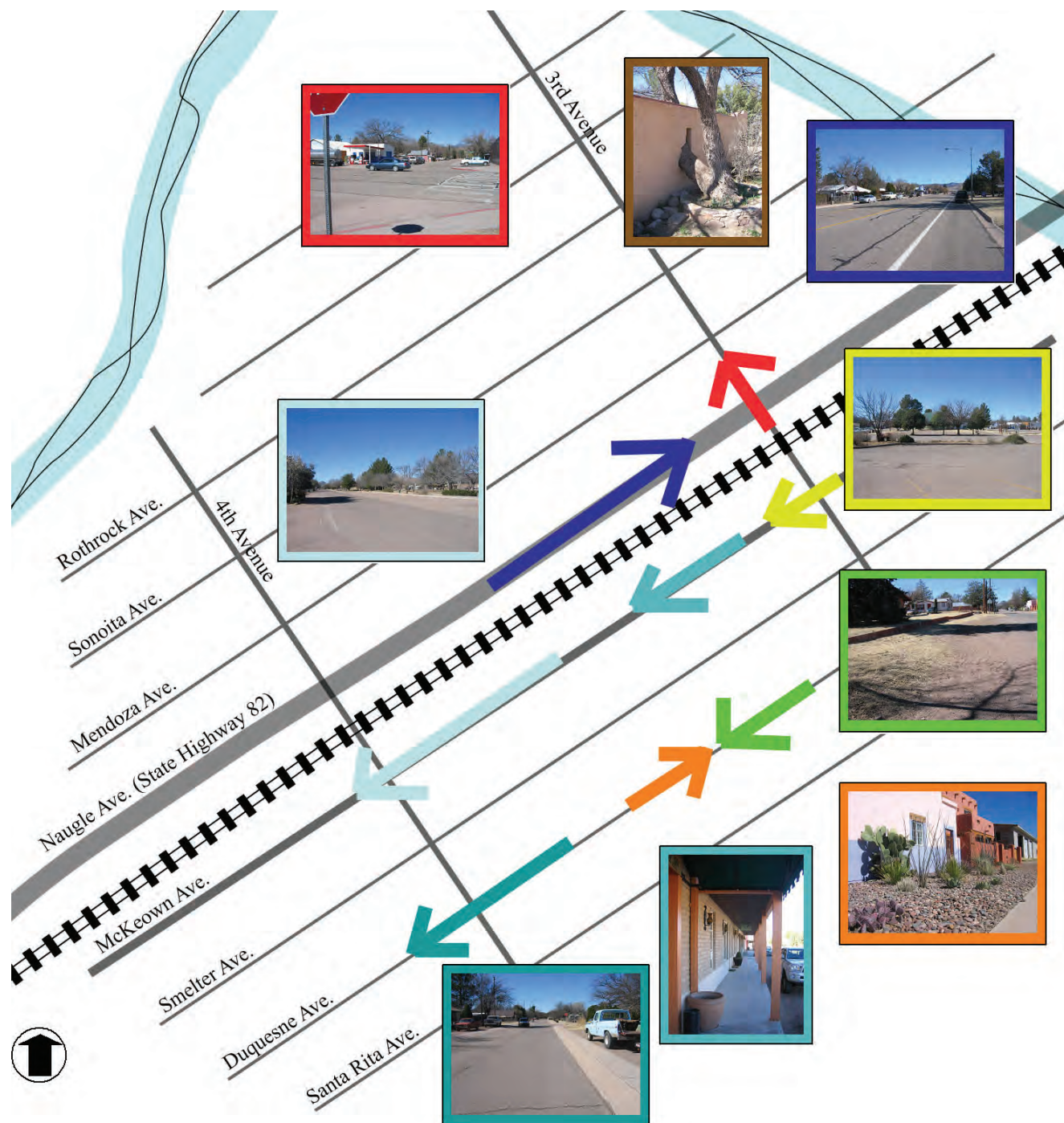
Patagonia Streetscapes

A walking tour of the streets of Patagonia showed a variety of streetside views and images that can inform design. Most streets are wide with either marked or unmarked shoulders. Some streets have sidewalks, others have none or boardwalks. Some streetscapes are well maintained with front gardens and others are not as maintained.
Such images give clues as to how the streets can be used as multi-use urban trails and how design can best reflect the neighborhoods they pass through.

Patagonia Building Facades

A wide variety of building types can be found along the streets of Patagonia. Some of these buildings have historic value, others have interest as works of folk art where owners have decorated them in very unique ways. Restoration of historic buildings would be of value as enticements to visitors to walk the urban trail.

Signage and Street Art

Historic markers can be found in urban Patagonia. These help to educate visitors about the history and culture of Patagonia. Many other visual attractions abound as well. Folk art, for example, can be found in abundance giving Patagonia a very special "sense of place". Signage and art found in disrepair should be repaired and perhaps new public art could be encouraged. Signage and art will help attract visitors to follow the urban trail and to visit shops and restaurants along the way.

KEY

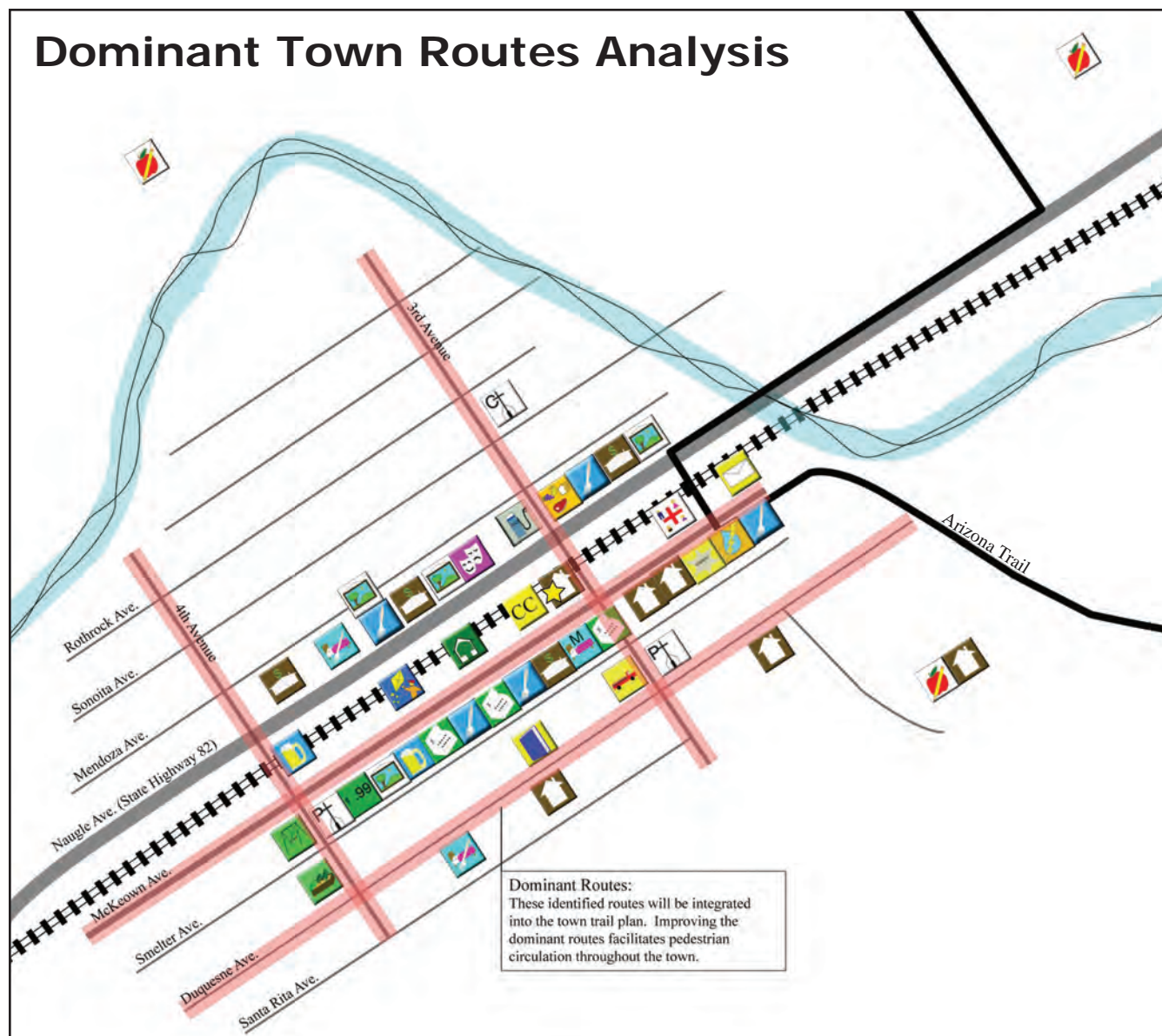|			
	Bed & Breakfast		Community Garden
	Motel		Gazebo
	Restaurant		Post Office
	Bar	CC	Community Center
	Market		Family Health
.99	Thrift store		Marshal's Office
	Shop		Fire Station
	Utilities Office		Theater
	Gas Station		Gallery
	Real Estate Office		Library
	Historic Building		Protestant Church
	Park		Catholic Church
	Playground		School

Patagonia User Amenities Analysis
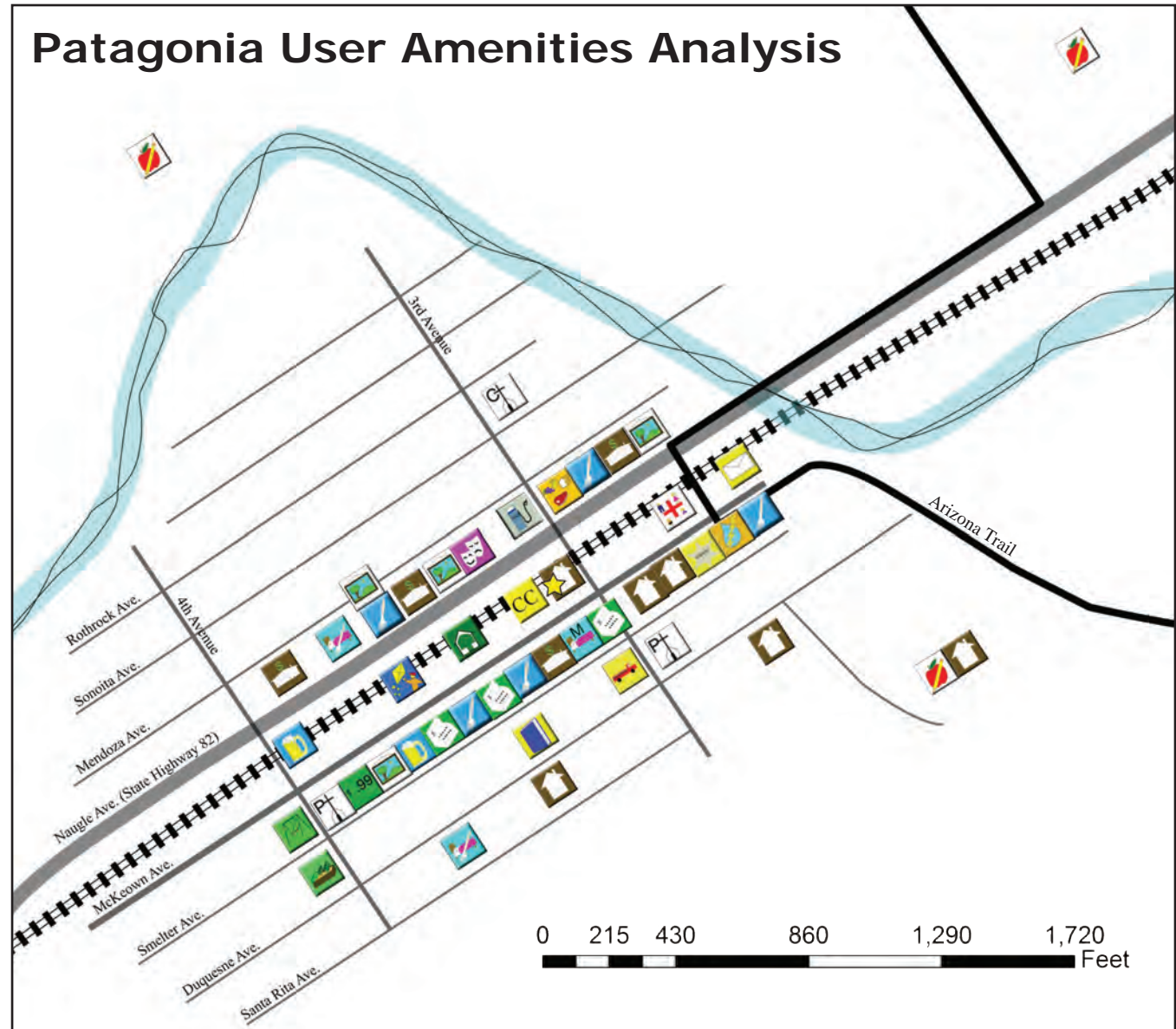
User Amenity Analysis of Patagonia

A simple walking tour of downtown Patagonia reveals the many cultural, natural, and historical resources available to the residents and potential tourists. When identified with icons (above) the downtown pattern can easily be seen. Any urban trail should run through these blocks rich in resources.
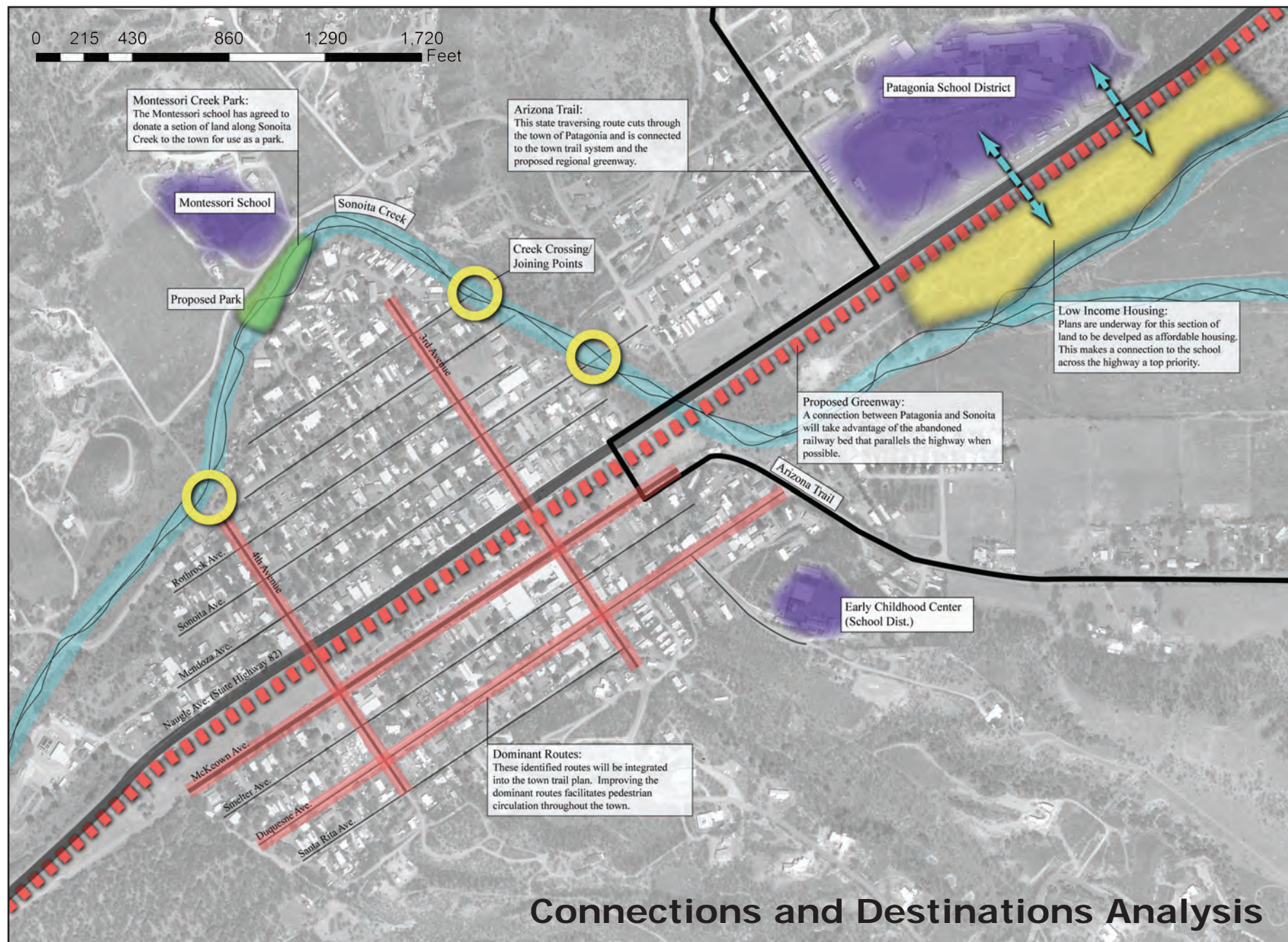
Dominant Town Routes Analysis

3rd Avenue

Rothrock Ave.

4th Avenue

Sonoita Ave.

Mendoza Ave.

Naugle Ave. (State Highway 82)

McKeown Ave.

Smelter Ave.

Duquesne Ave.

Santa Rita Ave.

Arizona Trail

Dominant Routes:
These identified routes will be integrated into the town trail plan. Improving the dominant routes facilitates pedestrian circulation throughout the town.

Dominant Routes

Once all of the user amenities were identified, we could locate the streets that were most commonly used by vehicles and pedestrians to access the majority of the destinations. These routes are highlighted in the map to the right.

These routes will be used as the backbone of the town trail system in an effort to make the heavily traveled roads more pedestrian friendly. Residents and visitors will be able to park in one central location and then use the available trail system to access all of their destinations. This will reduce dependance on the automobile throughout the town.

0   215   430   860   1,290   1,720
Feet

Montessori Creek Park:
The Montessori school has agreed to donate a setion of land along Sonoita Creek to the town for use as a park.

Arizona Trail:
This state traversing route cuts through the town of Patagonia and is connected to the town trail system and the proposed regional greenway.

Patagonia School District

Montessori School

Sonoita Creek

Creek Crossing/Joining Points

Proposed Park

Low Income Housing:
Plans are underway for this section of land to be develped as affordable housing. This makes a connection to the school across the highway a top priority.

Proposed Greenway:
A connection between Patagonia and Sonoita will take advantage of the abandoned railway bed that parallels the highway when possible.

3rd Avenue

Arizona Trail

Rothrock Ave.

4th Avenue

Sonoita Ave.

Mendoza Ave.

Naugle Ave. (State Highway 82)

Early Childhood Center (School Dist.)

McKeown Ave.

Smelter Ave.

Duquesne Ave.

Santa Rita Ave.

Dominant Routes:
These identified routes will be integrated into the town trail plan. Improving the dominant routes facilites pedestrian circulation throughout the town.

Connections and Destinations Analysis

Connections and Destinations:

The town of Patagonia has many unique and historic amenities that are treasured by residents and visitors alike. There are old adobe buildings, convieniently located parks, eateries, galleries and shopping destinations.

The Creek-
One amenity that has been mostly overlooked is Sonoita Creek, which runs through and around the town. This waterway is dry for most of the year but the water hidden underground sustains many riparian vegetative species which in turn attracts a wide variety of wildlife species. A trail loop along the creek is suggested to take advantage of this ecological amenity. All trail construction should be sited with consideration for the environment. The trail layout should cause a minimum of distrubance to existing vegetation and remain sensitive to the often changing land that surrounds all watercourses. See trail sections below for more detailed spatial arrangement.

Sonoita Creek

Historic Sites-
There are several buildings within the town of Patagonia that can be considered historic. Most of these unique buildings are constructed of adobe and some are in need of repair, but they are an intrinsic part of

Early Childhood Center

The Schools-
Safe connections to the schools in Patagonia is essentail in this planning process. Pedestrian access to all three school locations have been identified in the town trail plan.

Historic Adobe House

Patagonia School District

Montessori School

Sonoita Creek

Creek Crossing/
Joining Points

A.

Proposed Park

Arizona Trail

Rothrock Ave.

Sonoita Ave.

Mendoza Ave.

Naugle Ave. (State Highway 82)

McKeown Ave.

Smelter Ave.

Duquesne Ave.

Santa Rita Ave.

B.

C

Early Childhood Center
(School Dist.)

Town Trail System:
This trail layout takes advantage of the
historic, environmental, and economic assets
of the community.

Town Trail Plan

0   215   430   860   1,290   1,720
Feet

A. Developing a multi-use trail along Sonoita Creek will provide users contained access to the ecological resources found along the riparian strip.

B. Creating pedestrian and bicycle routes to destinations such as playgrounds makes safer environments for children and families.

C. Improvements along the wide streets of Patagonia will benefit all user groups as well as enhance the aesthetic of the town.

The Patagonia to Sonoita Rails-to-Trails Greenway:

The focus of this part of the planning document is on a potential Rail-to-Trails greenway project. The proposed trail would follow an old rail bed from the center of the town of Patagonia to the town of Sonoita.

The original railroad was built as part of the New Mexico-Arizona railroad in the 1890s and was on the Nogales-Benson route. The primary role of the railroad was to move copper ore from the mines to processing centers to the east. At this time, the population of the Patagonia-Sonoita area was estimated at over 10,000, about four times what it is today.

As mines were tapped out and eventually closed, the railroad was no longer needed. The final rail haul left Patagonia in 1960. The historic depot that is now Patagonia's city hall was bought and preserved, but the old rail line was abandoned and all but forgotten.

The goal of this part of the project is to offer an overview of how that proposed greenway could be planned and designed, and to explain its role in Patagonia's and southern Arizona's rebirth and rejuvenation. This project has the potential to celebrate the cultural, historic, and environmental heritage of the town of Patagonia and the entire region. Alone or as part of a larger network, this greenway can generate economic activity tied to sustainable tourism, offer much needed connections to other communities, and promote healthy lifestyles for all the community's members.

Sonoita

Coronado NF Connector Trail

Arizona Trail

Proposed Routes

Three Canyons

Patagonia

Miles

0 0.5 1 2 3 4

N

Arizona Trail

Arizona Trail

Arizona Trail

N

A
B
Sonoita
C
D
E
Proposed Routes
Three
Canyons
F
Coronado NF
Connector
Trail
G
Arizona Trail
Patagonia
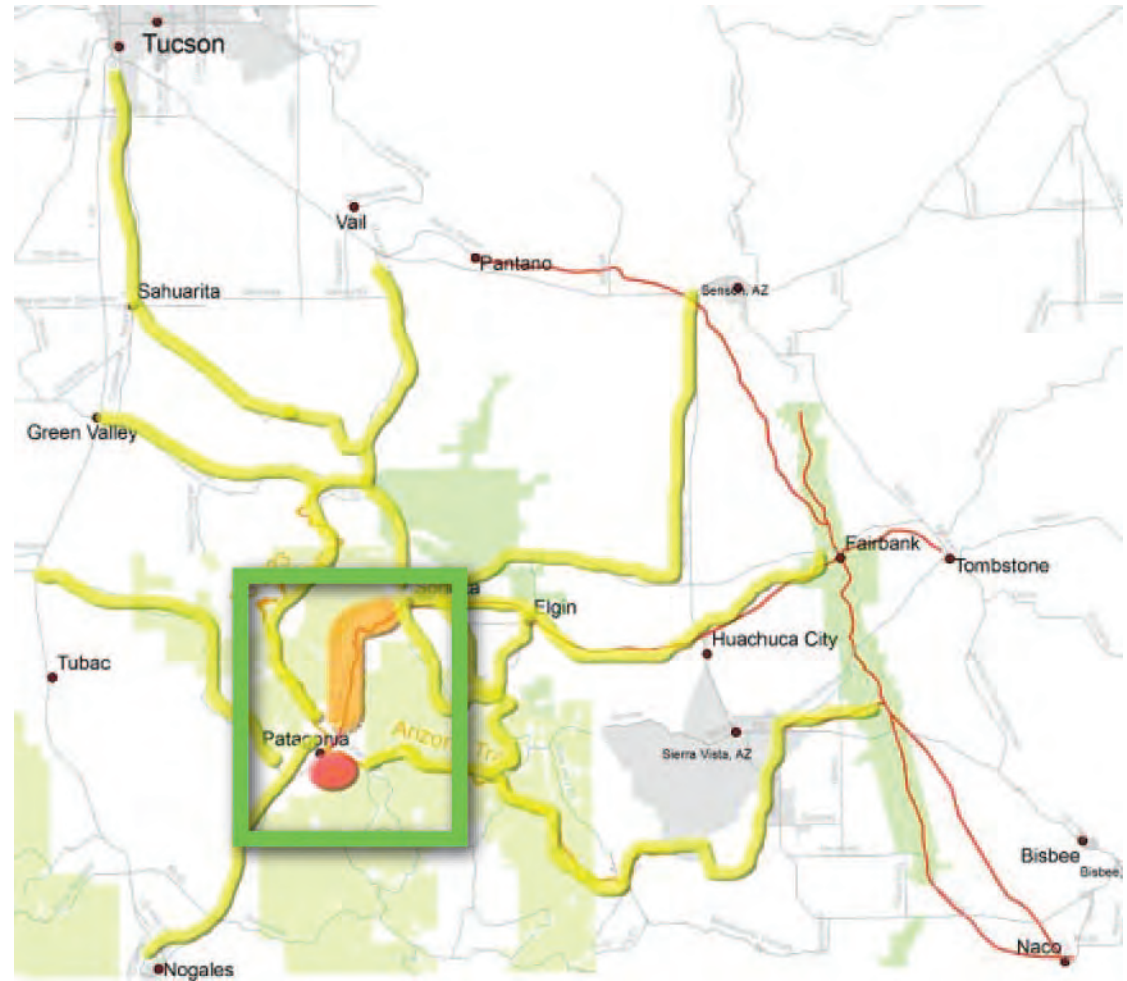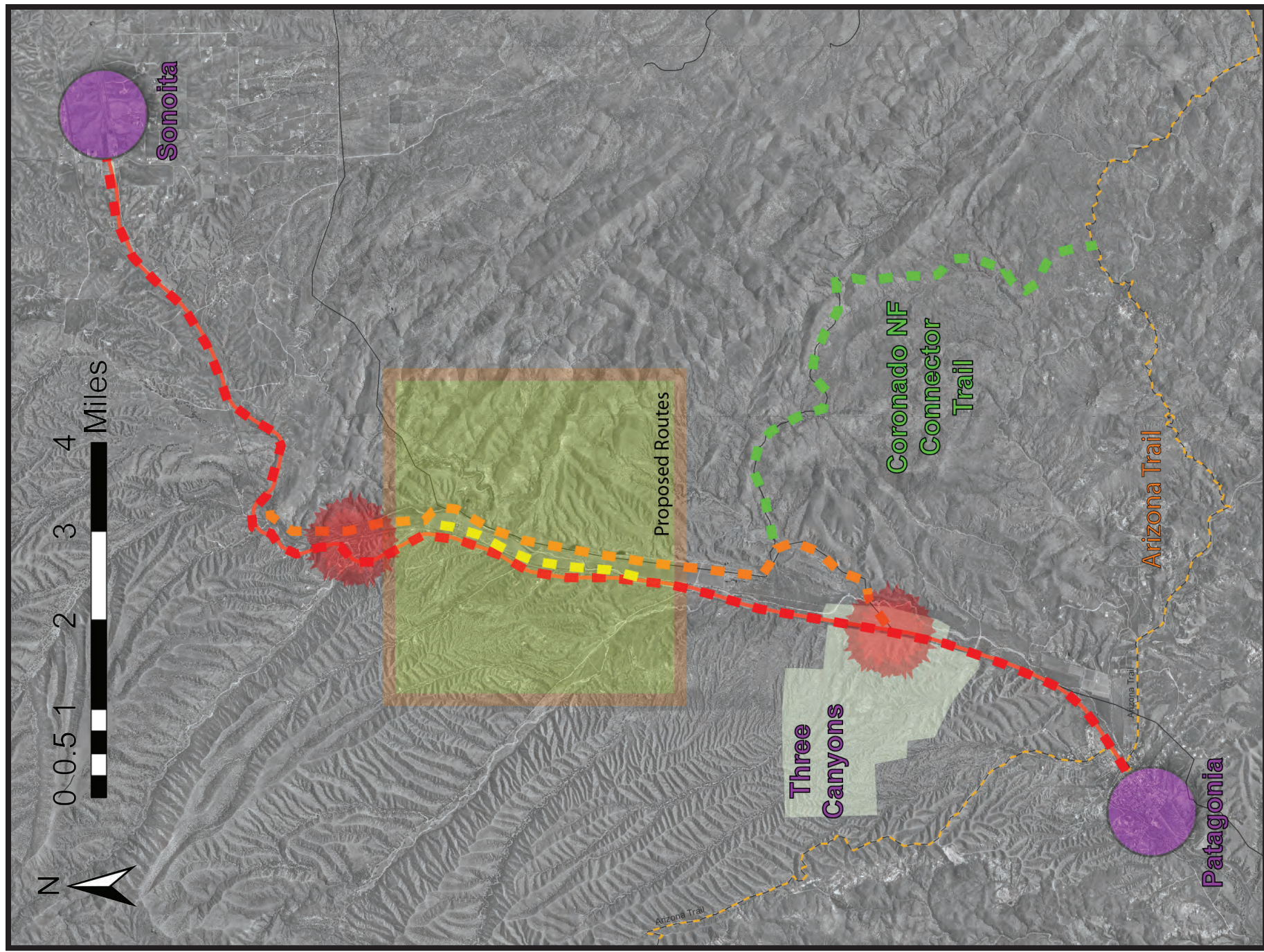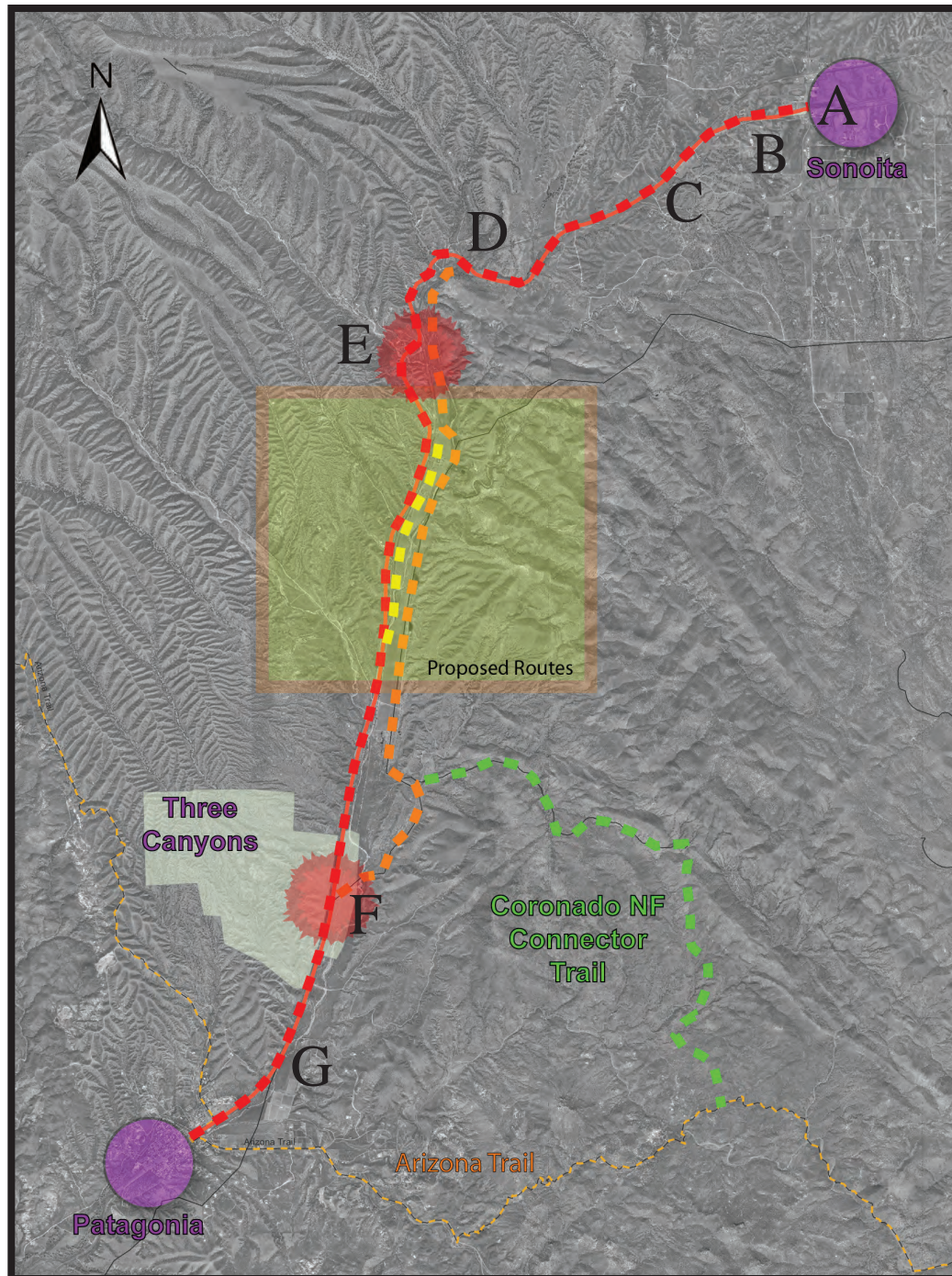
Visual Analysis:

The letters on the images correspond to locations on the map.

A

The Santa Cruz County Rodeo grounds, adjacent to the proposed Sonoita terminus of the greenway

B

Looking west towards Coronado National Forest along the historic rail bed, just outside Sonoita.

C

The remnents of an old bridge along the historic rail bed.

E

The raised historic rail bed as it passes to the west of Highway 82. While not an ideal route due to circulation and private property issues, this section of the rail bed offers excellent views of the surrounding area.

G

This is a typical section of the historic rail bed as it heads north out of Patagonia, running parallel to Highway 82.

D

A view to the west of Highway 82. From this vantage point four different vegetative communities are visible.

F

This area is across Highway 82 from the entrance to the Three Canyons Development. This area is recommended for an entry/exit park.

Implications:

Visual value of different routing options must be taken into account. Wherever possible, the views from the greenway should be positively augmented to increase the value of this greenway to the various user group. There are a number of different elements already existing that will add to the overall value of the greenway as a recreational amenity, should they be capitalized upon.

Map Key

State Routes
Existing Trails
Roads
USFS
USFS Wilderness
State Parks
Nature Conservancy
State Trust Lands
Private Lands
Towns
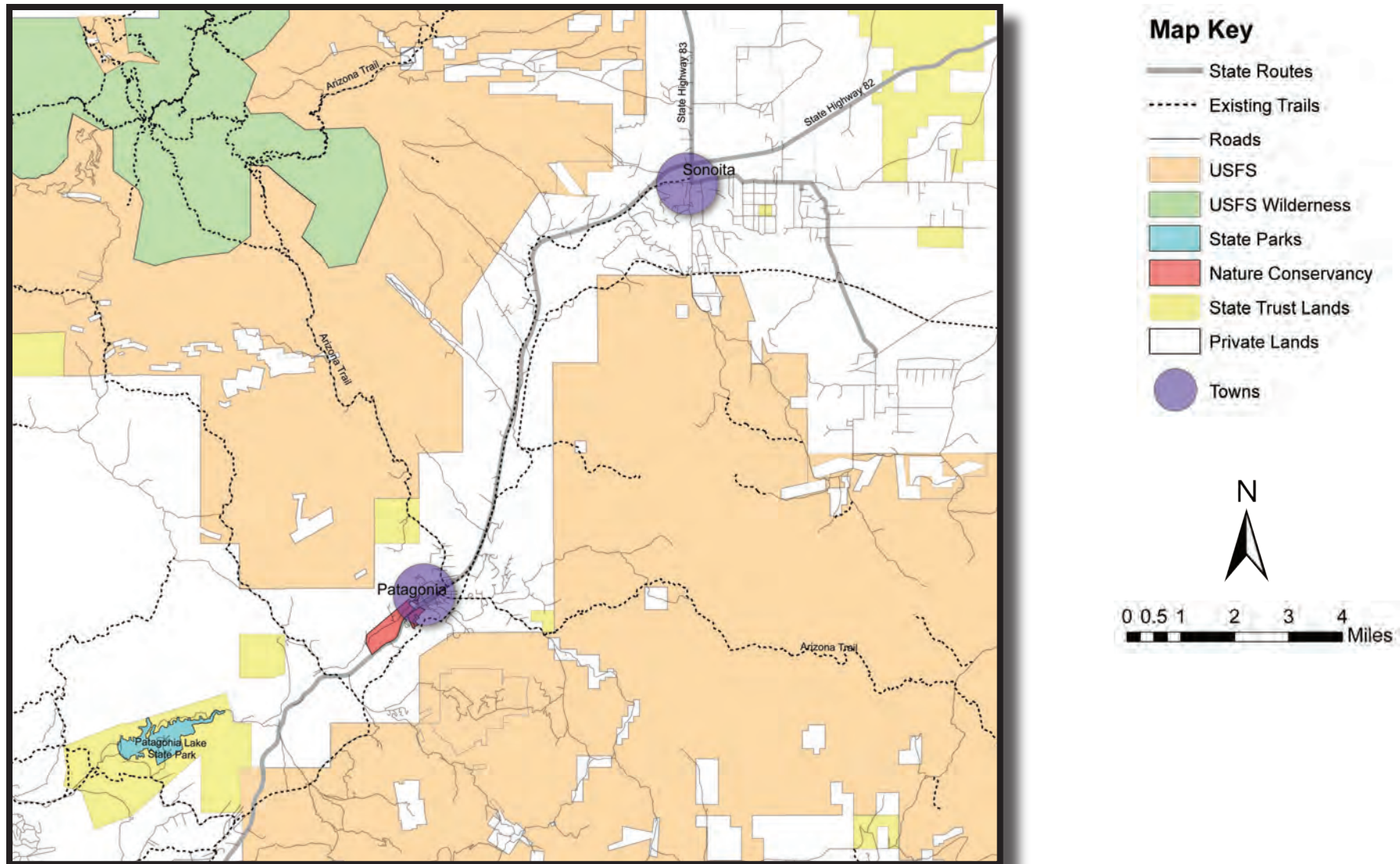
Land Use Analysis

Land use directly along the original rail bed is predominantly private property, with some city and state owned parcels in the towns of Patagonia and Sonoita. Some of the private land owners, particularly the owners of the Three Canyons develop are highly supportive of the proposed greenway. Beyond the reaches of the linear strip of private property are large tracts of public lands, the most significant being two different sections of Coronado National Forest. With added public support for this project, this greenway could be a way to tie recreational users to these public amenities as well as aid migrating wildlife.

Map Key

— State Routes

- - - - Existing Trails

—— Roads

 Plains Grassland

 Desert Grassland

 Encinal Oak Communities

 Pine Communities

 Temperate Chapparal Scrubland

⬤ Towns

0 0.5 1   2   3   4
Miles

N
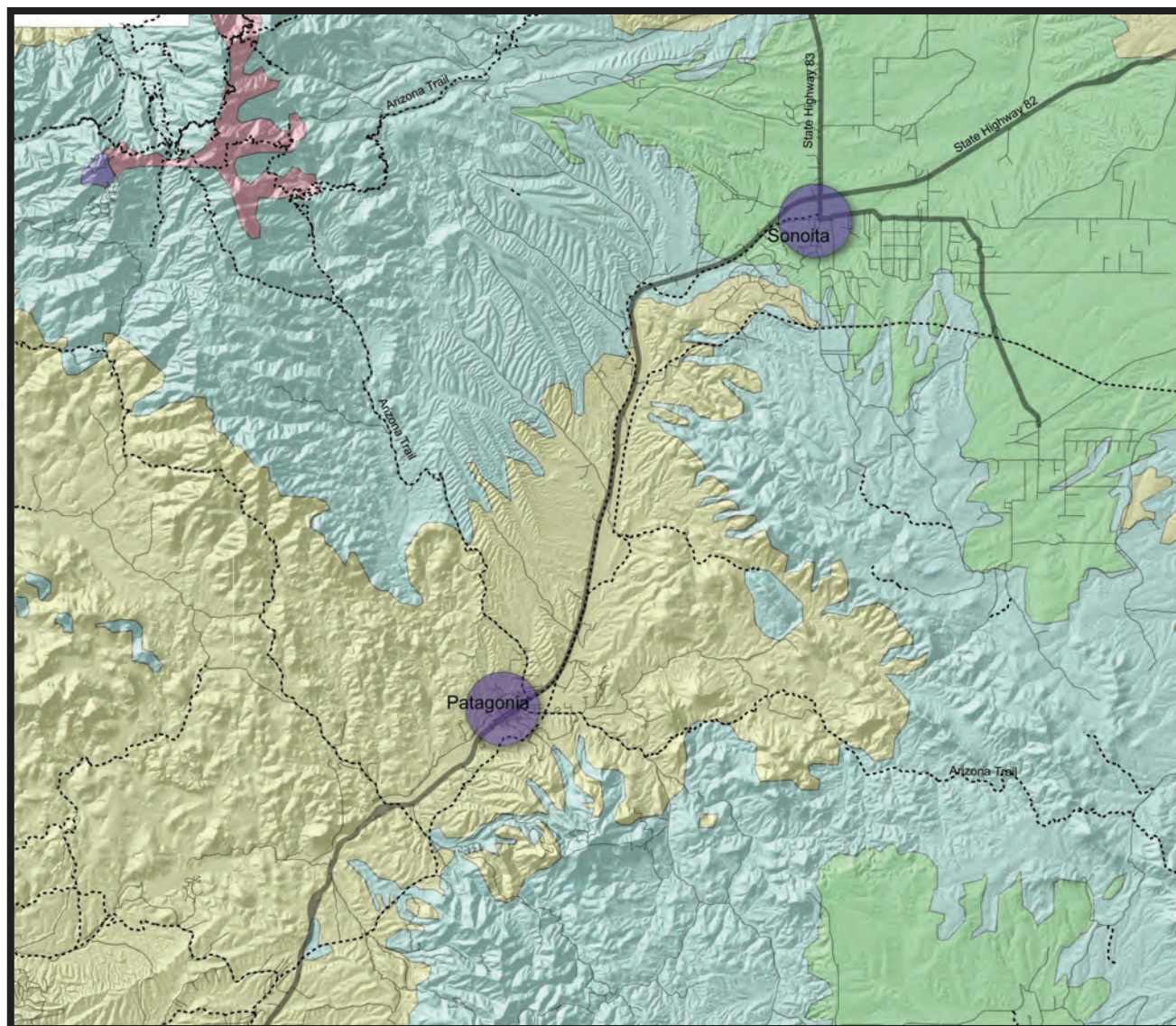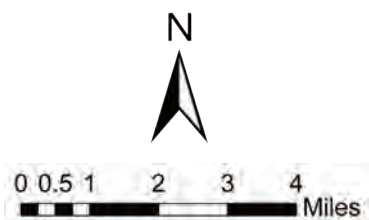
Vegetative Analysis

The vegetation around the proposed greenway is primarily desert grasslands, with some oak communities at the higher elevations in the surrounding hills. At the northern end of the route, just outside of the town of Sonoita, is an area covered in the plains grasslands found in few other locations in the southwestern United States. The grasslands in particular make excellent bird habitat, and the connections between the grasslands and the mountain forests are essential for various animal and bird species to move between habitat types.
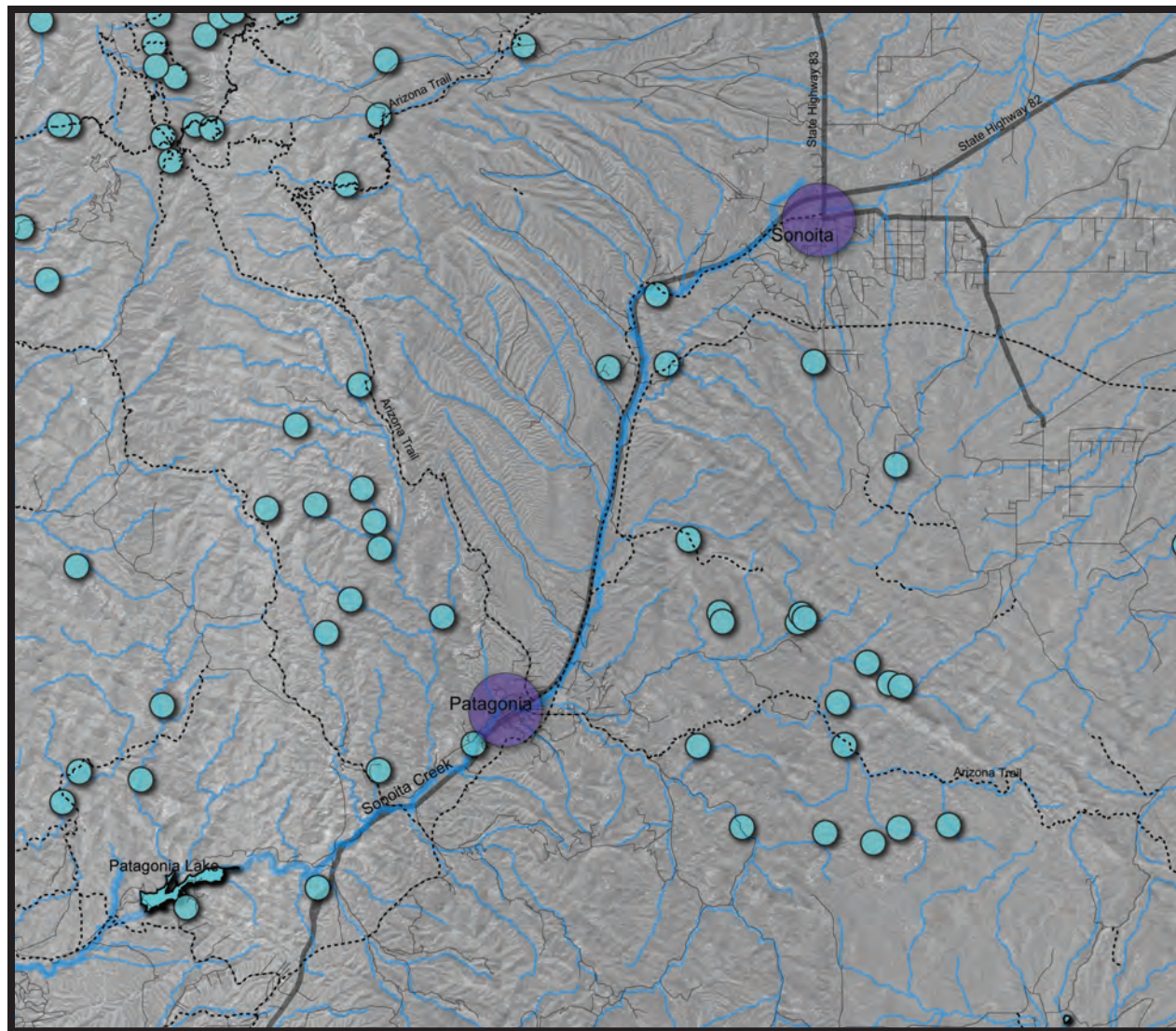
Map Key
- State Routes
- Existing Trails
- Roads
- Streams, Creeks, and Washes
- Sonoita Creek
- Towns
- Springs
- Lakes

Hydrologic Analysis

In the surrounding Coronado National Forest there are numerous springs which drain down into the land along the route of the greenway. The most significant water body for this project is the Sonoita Creek drainage area. This stream bed is dry for most of the year, but the water table is relatively high. This stream bed parallels the proposed greenway route and has potential to be incorporated into the final design process. For the health of the region, environmentally and economically, it is key that these hydrologic resources be conserved.

Map Key

— State Routes

------ Existing Trails

— Roads

● Towns

▭ Riparian Habitat

N

0 0.5 1   2   3   4
Miles
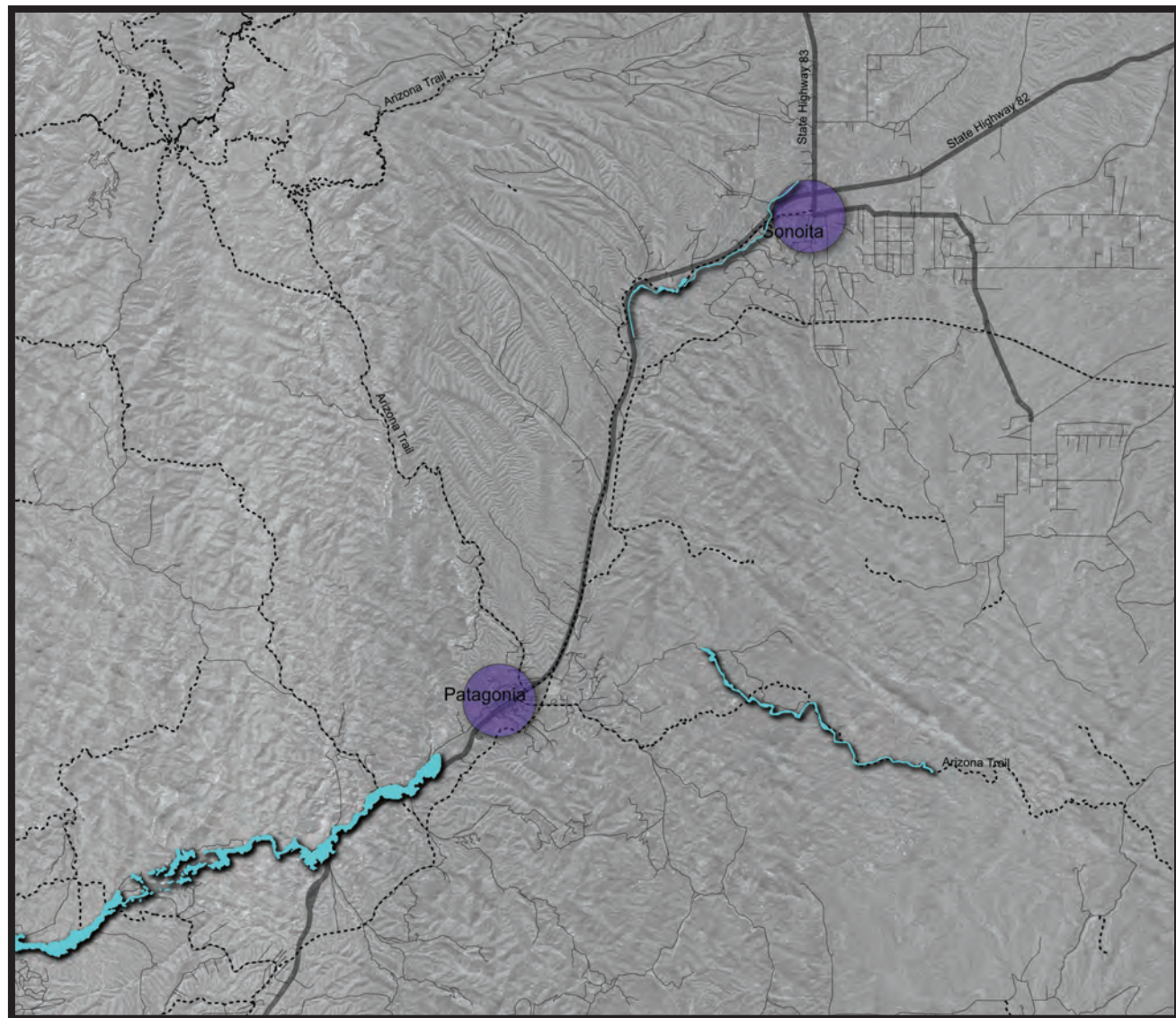
Critical Habitat Analysis

To the south of Patagonia is a large stretch of critical riparian habitat, much of it owned by the Nature Conservancy as the Sonoita Creek Nature Preserve. This is one of the primary tourist attractions to the Patagonia area. At the other end of the greenway, just south of Sonoita, is another patch of riparian habitat. This patch follows the drainage basin of the northern end of Sonoita creek and is in close proximity to the highway 82. More riparian habitat can be found in the eastern section of Coronado National Forest.
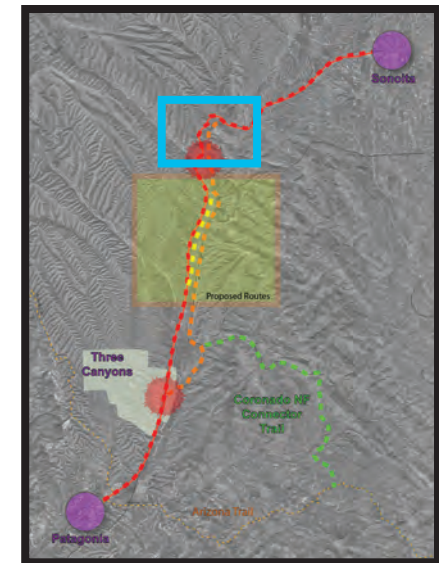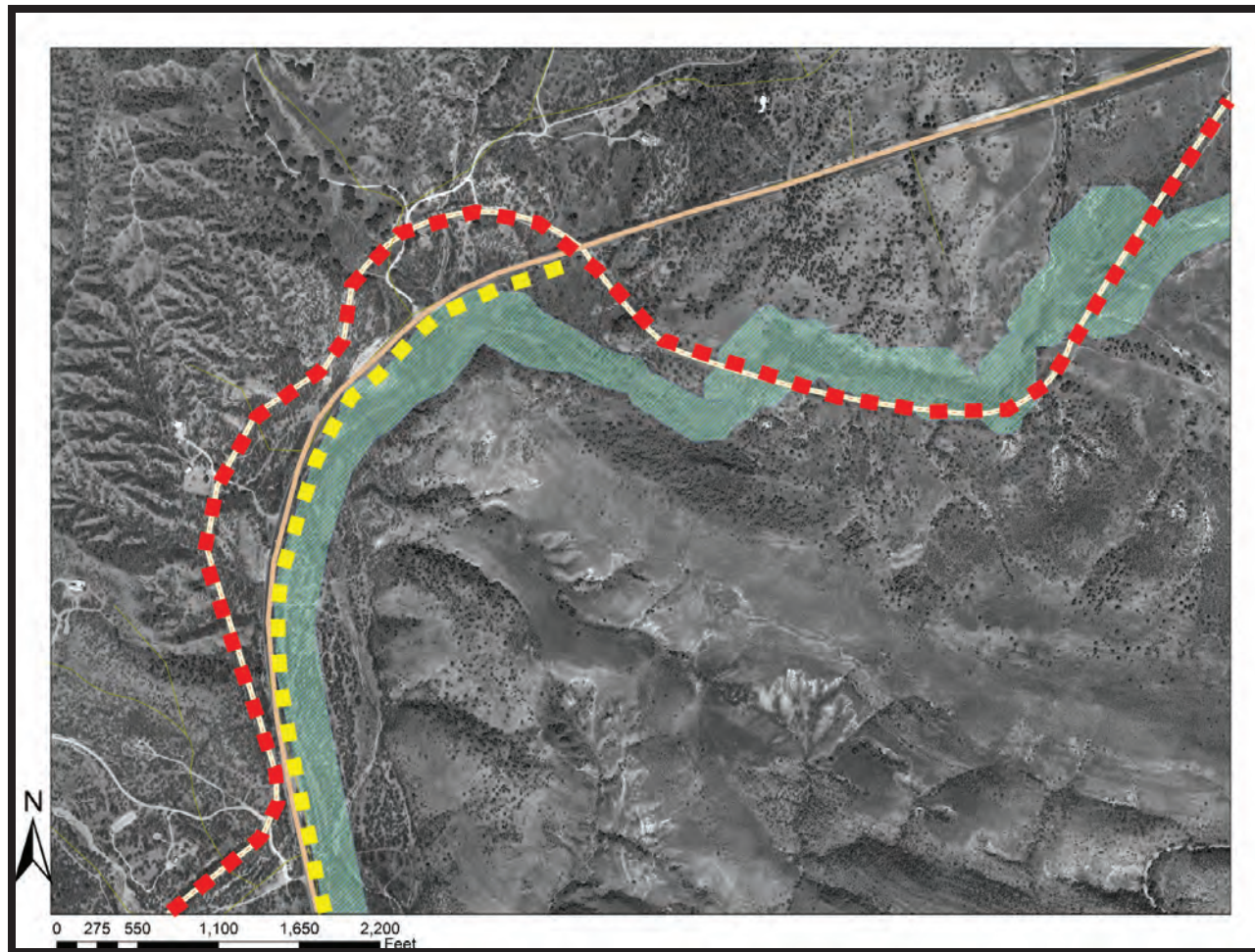
This aerial image shows critical riparian habitat along the Sonoita Creek drainage area adjacent to Highway 82, approximately 4 miles south of Sonoita. This area is where Sonoita Creek passes across Highway 82. There is the opportunity to use the greenway as buffer against the highway and also as a way to use eco-tourism to protect this vital habitat. This riparian area is close to an historic marker noting the location of Camp Crittenden. The fusion of the historic with the ecological, along with relative distances between destinations makes this a key area in the development of the greenway and the possible site of park facilities.
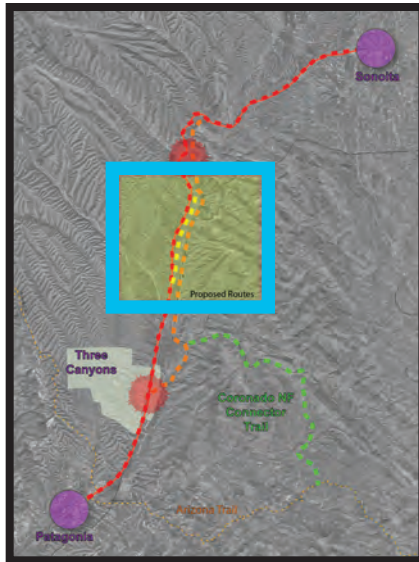
This section presents some challenges to routing. The original rail bed crosses Highway 82, and then passes through private property. The route following the rail bed has some attractive aspects: it is situated at a higher elevation and has good views and there are some remnant structural elements. If the route is continued off the original rail bed on the east side of highway 82, one solution is to have it stay close to the highway to reduce conflict with private landowners. A second option is to place a route further to the east, across the drainage basin, and along the existing El Paso Gasline service road. Another option would be keep a bicycle orientated path to the west and use the El Paso road as for equestrian users.
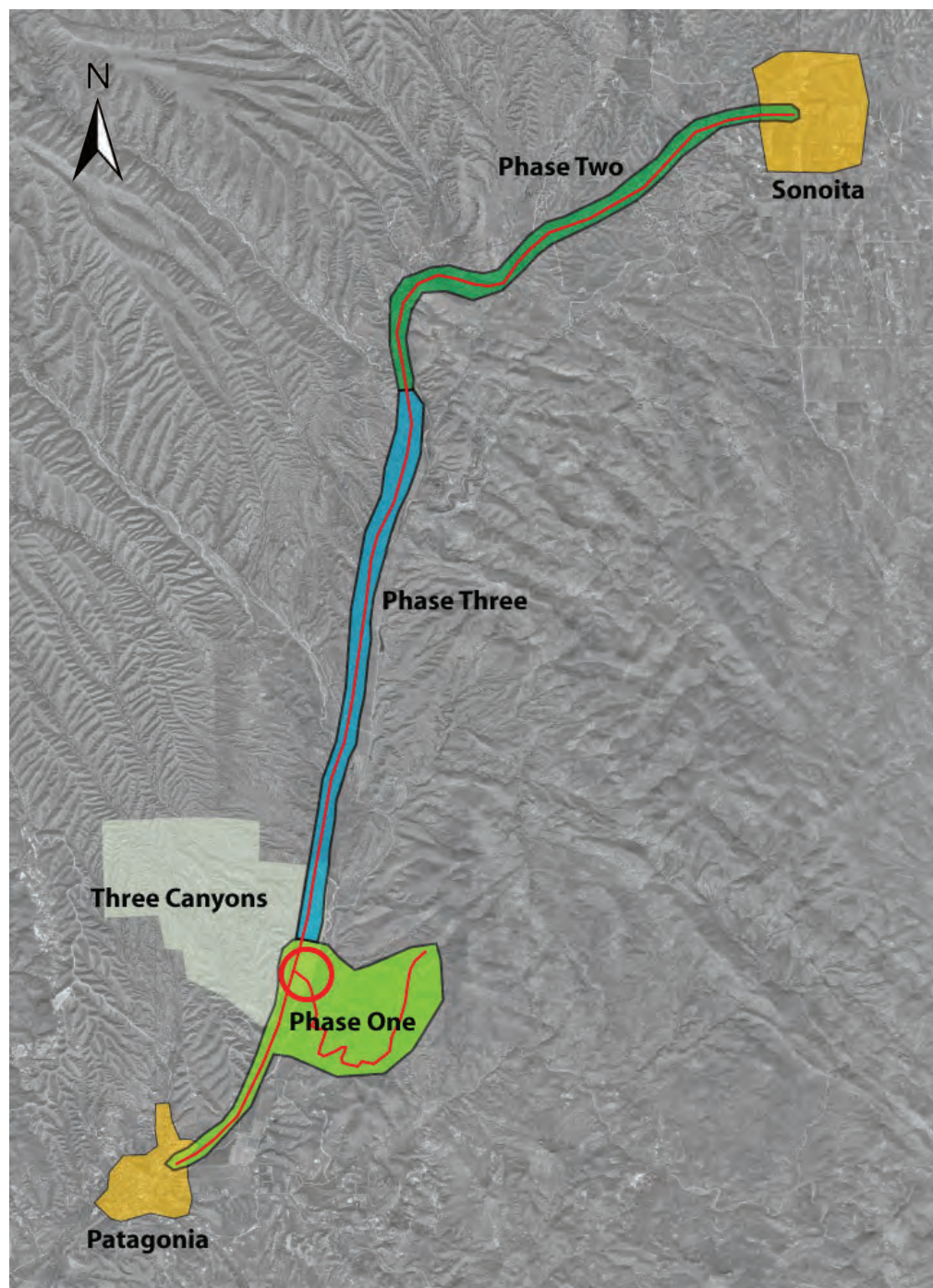

Proposed Routes
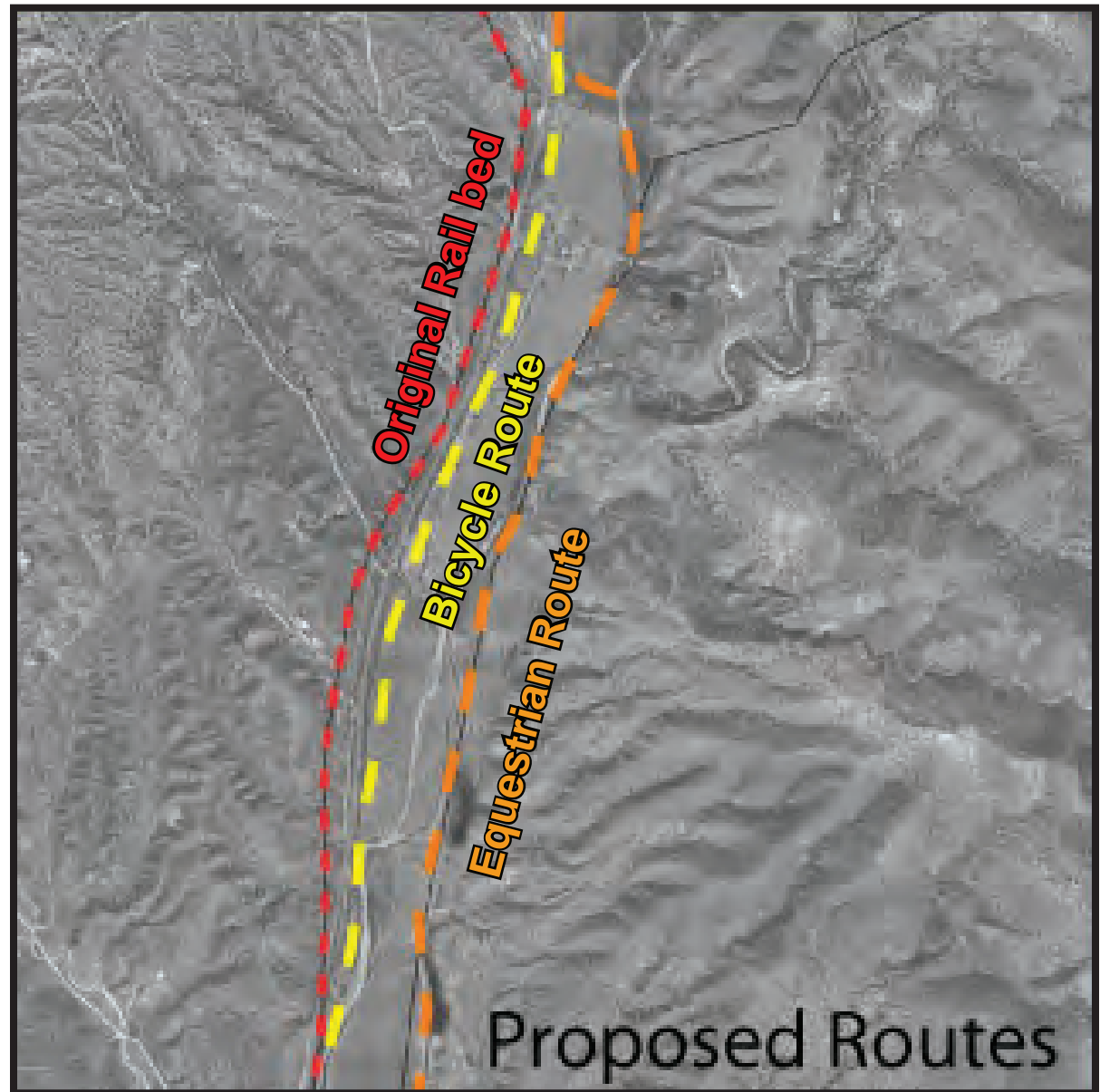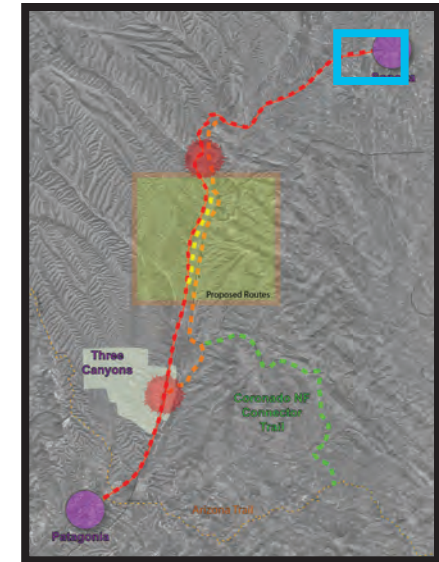
The Sonoita end of the Patagonia-Sonoita greenway is conveniently located next to the intersection of State Highways 82 and 83 on Papago Springs Road, right in the commercial heart of the town of Sonoita. The rail bed passes between an Arizona Department of Transportation facility and is just tot he south of the Santa Cruz County Rodeo Grounds. Using the historic route of the railroad will place a major access node near government and commercial facilities, and also what can be considered the cultural heart of Santa Cruz County at the rodeo grounds.

Phase One: Connect the Train Depot in downtown Patagonia to the school and up to the Three Canyons development. At Three Canyons, put in a trail head with basic facilities. This is a critical node and can function as an entry/exit point and the trail head for secondary paths along the El Paso Gasline service road and connections to existing Coronado National Forest access roads.

Phase Two: Start this section at the suggested terminus and work back towards Patagonia. Create an entry/exit node near the riparian area where Sonoita Creek passes underneath the highway. If feasible, incorporate the historic marker into this node to increase it's value to users. Doing this will bring Sonoita on board and increase the desire to finish the third phase.

Phase Three: This is where the routing can possibly deviate from the historic rail bed. The rail bed crosses the highway and passes through a several different landowners' property. Depending on the reaction of the landowners in this phase, it may be prudent to put the greenway on the other side of the highway where there are several attractive options.

Regional Connections in Southern Arizona

At the regional scale the goal is to show that these proposed pedestrian paths and greenways are going to be tied to a much larger system that filters throughout southern Arizona.

It is critical that these connections are made because this will amplify the appeal of the attractions themselves to draw a greater number of users, it is truly a case where "the sum of the whole is greater than the parts".

This system of trails and greenways will connect natural open spaces, historic ranching towns, vineyards, ghost towns and abandoned missions with a constellation of communities and people.

Potentially, with refined development and national exposure, the greenways of southern Arizona could become one of the new principle draws for tourists in Arizona, reinvigorating southern Arizona's economy while improving our quality of life.

Imagine being able to ride a bicycle from your home in Tucson to your favorite campsites in the San Pedro NCA and then onto a wine tasting at a vineyard near Elgin, followed by some evening bird watching in Patagonia.

This is more than an opportunity to enjoy being outside or just having fun. It is the opportunity to begin to define what kind of place southern Arizona will be decades into the future, and it is an opportunity that should not be missed.
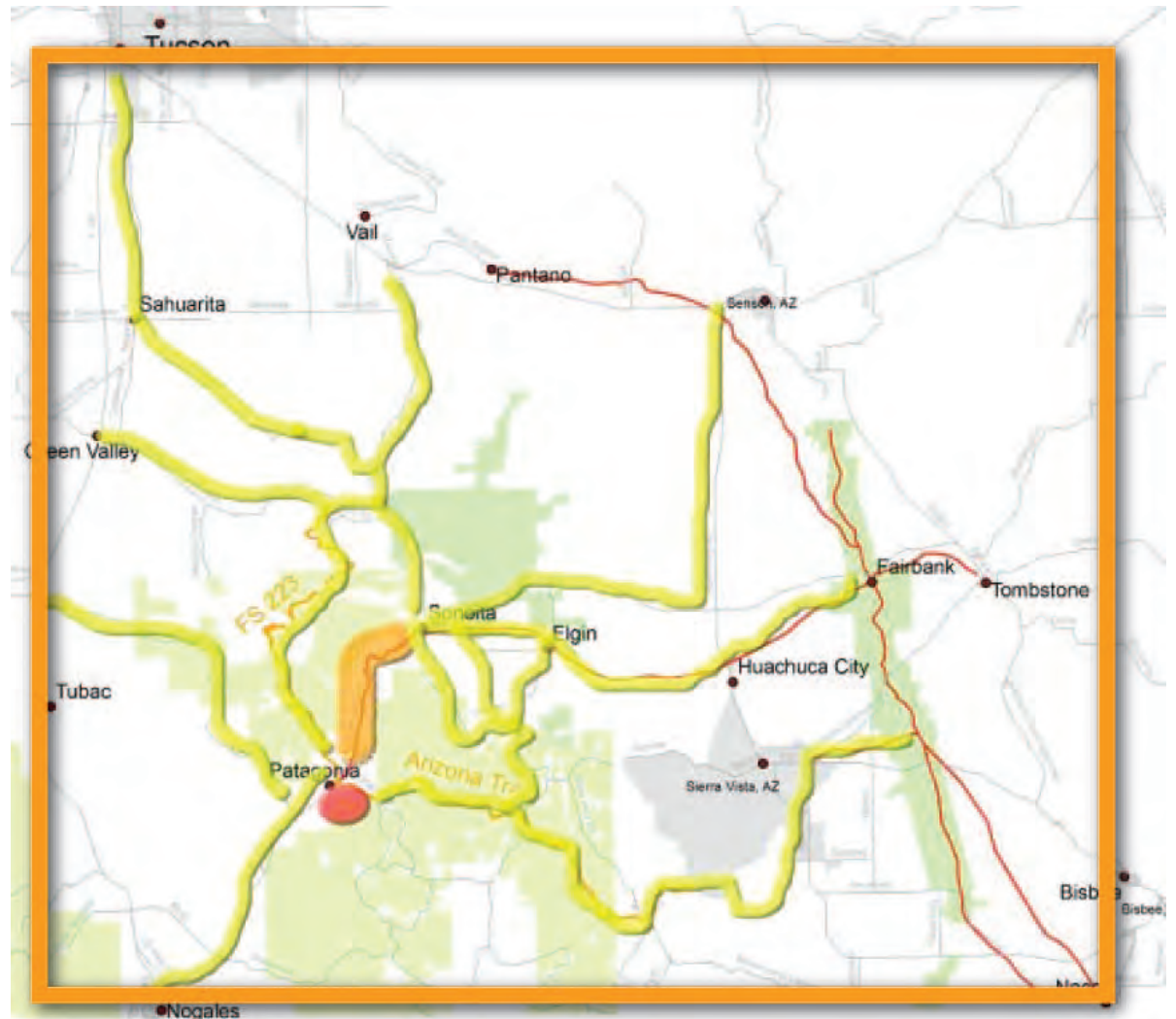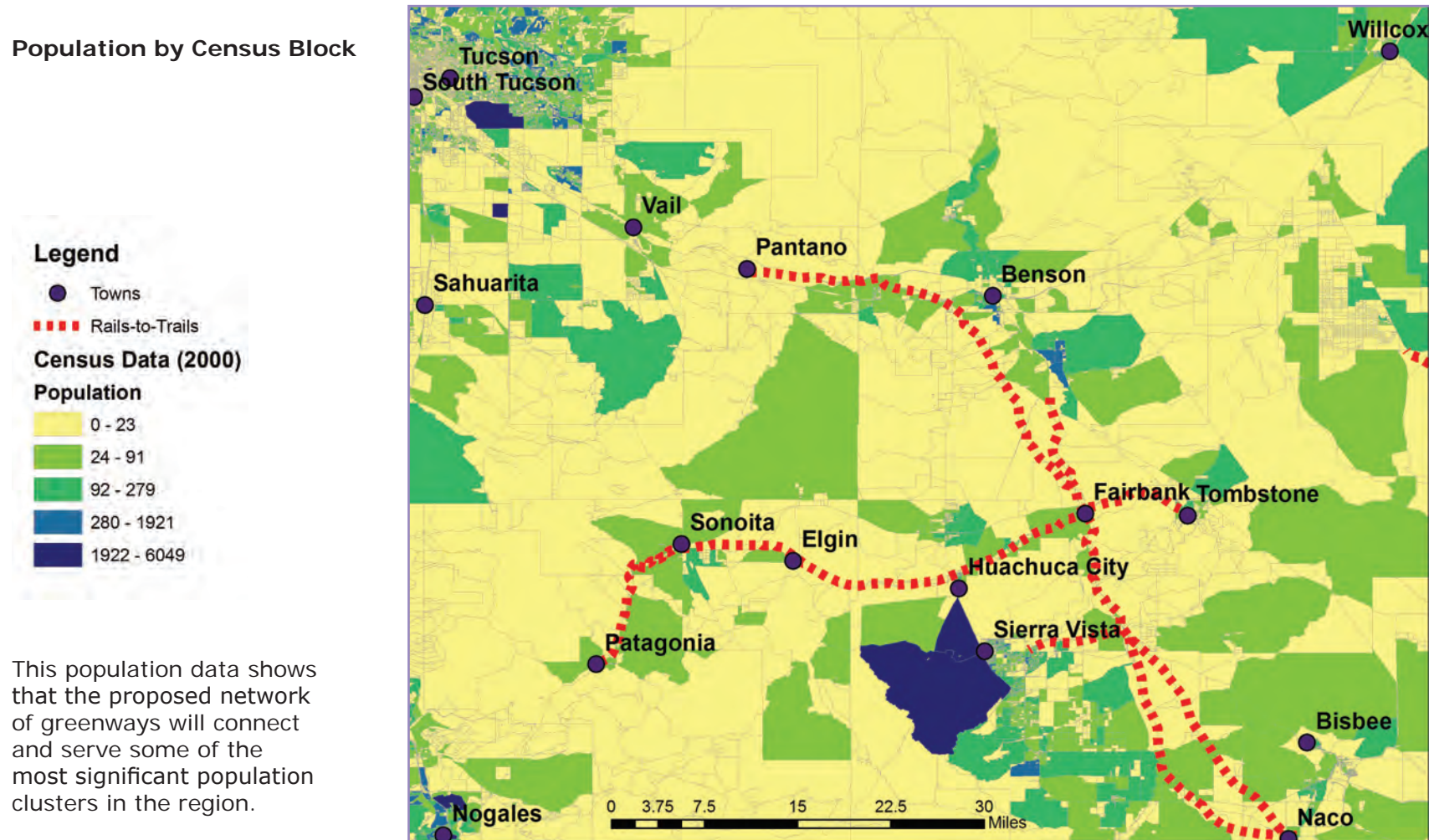
Regional Connections in Southern Arizona
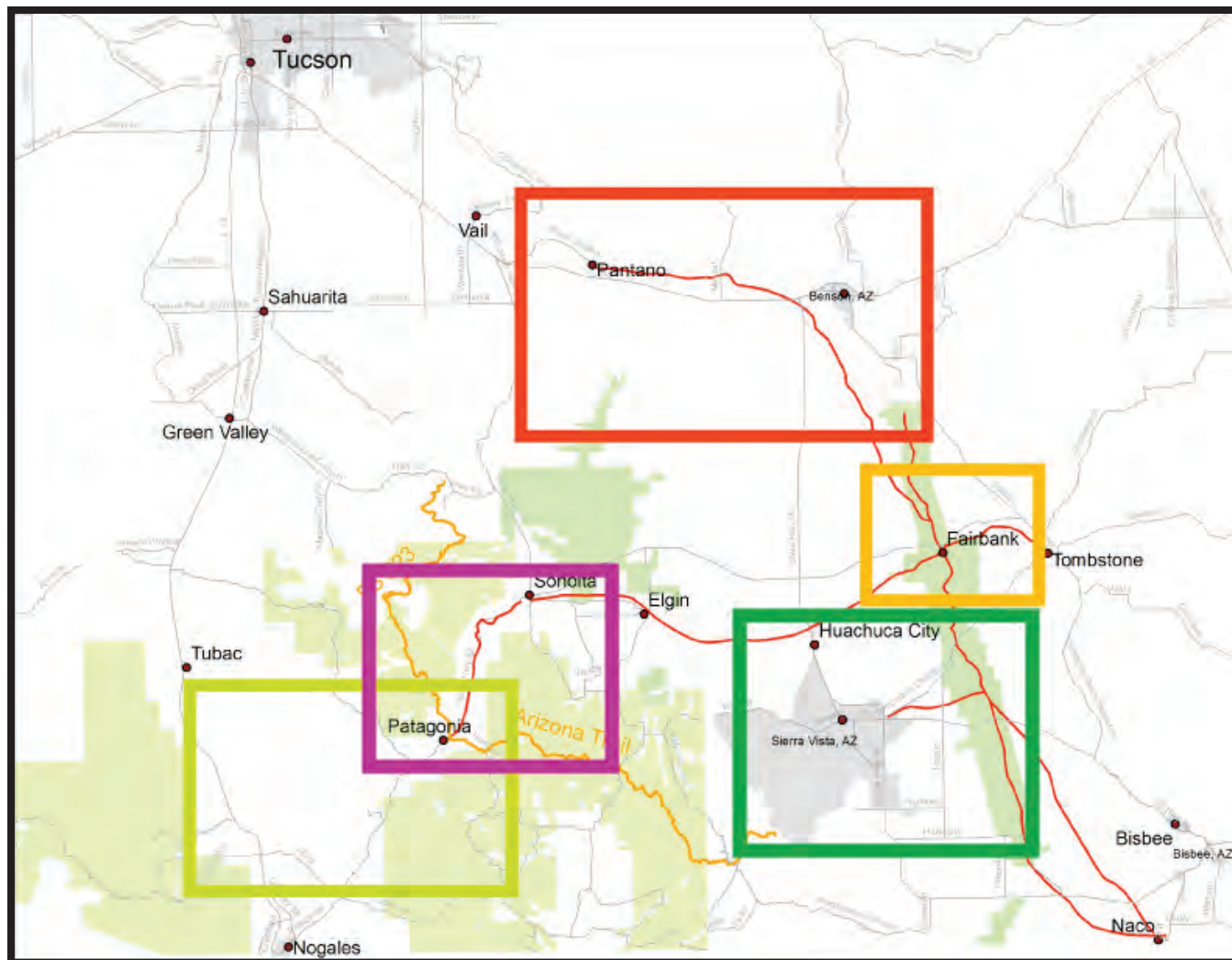
This map shows five different areas we focused on and wish to emphasize. In these areas there are important connections to other trails, historic or recreational amenities, or important population centers. If needed, this map will be the master spatial reference for the rest of chapter. The maps and their related images are color-coded for clarity.

Regional Demographic Analysis:

This analysis focused on the people and communities that are located in the region using data from the US Census Bureau and using the census block as the basic spatial unit.. The objective of this GIS analysis was to see where the most people lived, but also where members of specific groups are concentrated. The information we generated shows that the population clusters lie in close proximity to all the proposed greenways, trails, and paths of this study. Further, families, children, and retirees follow a similar spatial distribution pattern. This indicates that there is a strong demand amongst the local populations for recreational amenities and these spatial patterns were considered when we made planning and design decisions.

Population by Census Block

This population data shows that the proposed network of greenways will connect and serve some of the most significant population clusters in the region.

Number of Families

Legend

● Towns

▮▮▮▮ Rails-to-Trails

Census Data (2000)

Families

▢	0 - 5
▢	6 - 21
▢	22 - 57
▢	58 - 166
▢	167 - 939

This map indicates that there are groupings of large numbers of families in the area. Connecting the greenway to these nodes gives a greater number of people access to the circulation network.

Household Size

Legend

● Towns

▮▮▮▮ Rails-to-Trails

Census Data (2000)

Average Household Size

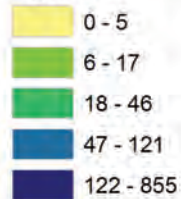|	
▢	0.00
▢	0.01 - 2.09
▢	2.10 - 2.84
▢	2.85 - 3.86
▢	3.87 - 17.00

According to census data there are many large households clustered along the greenway route. This type of recreational amenity will improve quality of life for these households.

People Aged 5-17

Senior Citizens

Legend

● Towns

▪▪▪▪ Rails-to-Trails

Census Data (2000)

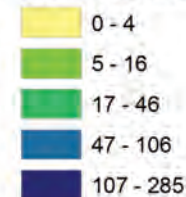Ages 5-17

- 0 - 5
- 6 - 17
- 18 - 46
- 47 - 121
- 122 - 855

    This map identifies the locations of large numbers of young people who would constitute a large percentage of users for the proposed greenway.

Legend

● Towns

▪▪▪▪ Rails-to-Trails

Census Data (2000)

Senior Citizens

- 0 - 4
- 5 - 16
- 17 - 46
- 47 - 106
- 107 - 285

    This map identifies the areas with higher concentrations of senior citizens. Connecting the greenway to these areas provides active recreation opportunities for this portion of the population.

Regional Connections in Southern Arizona

This map shows the route of a possible Rails-to-Trails greenway that would follow an abandoned spur railbed that used to run from the San Pedro NCA northwest to the city of Tucson. GIS analysis indicates that the abandoned railbed terminates near the settlement of Pantano.

At this point, it would connect to the Pima County trail system and follow the Pantano wash greenway all the way to Tucson. It would then be possible to ride a bicycle on greenways from Douglas, Arizona to the town of Oro Valley, to the north of Tucson
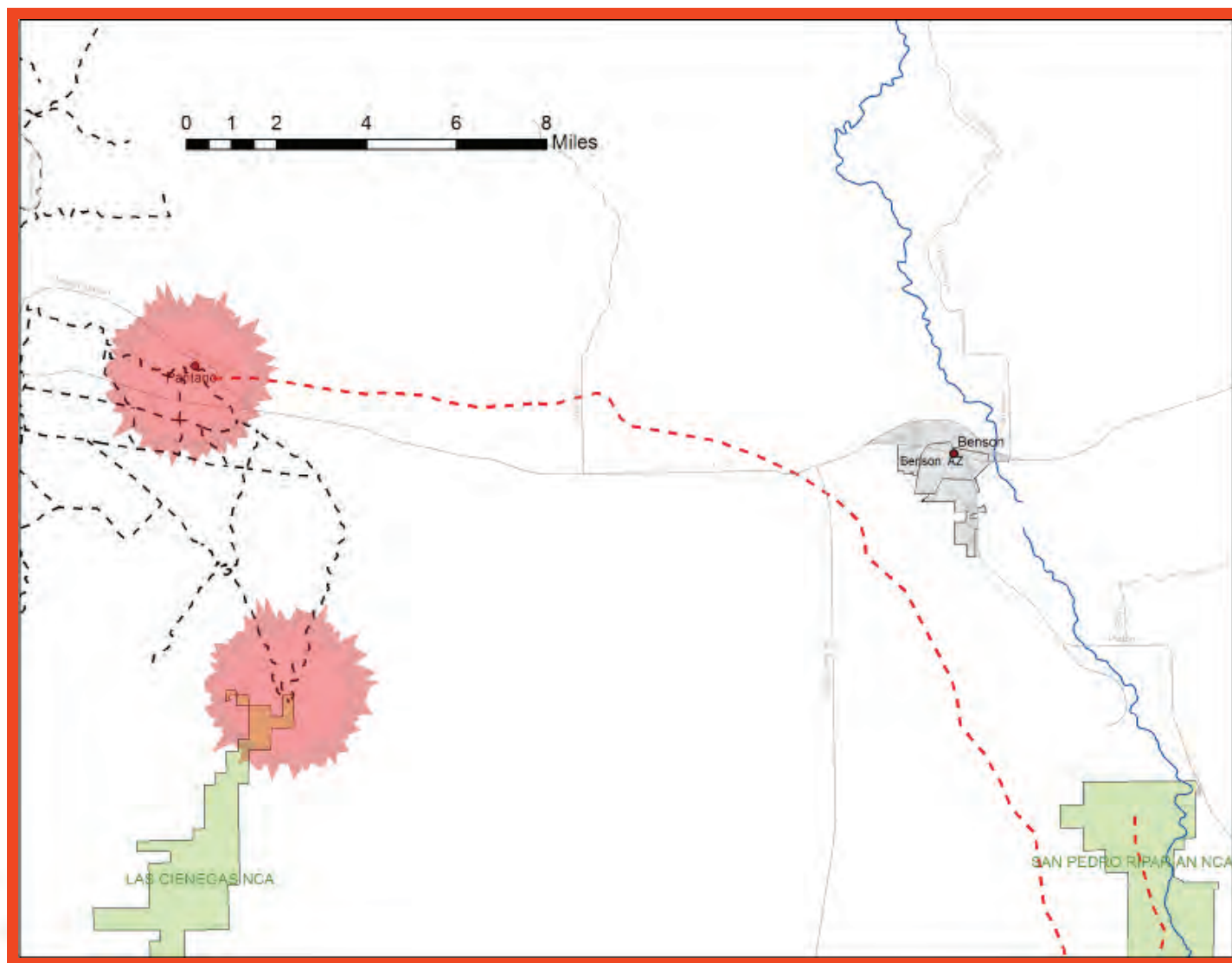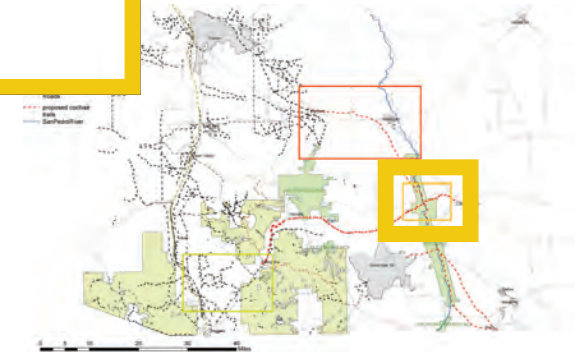
Regional Connections in Southern Arizona

Meeting Point: The place where the Patagonia-Sonoita Rails-to-Trails greenway meets the San Pedro greenway is an ideal place for camping facilities. This location is the site of a Bureau of Land Management historical park for the old west ghost town of Fairbank.

Many historic structures still stand at this old mining settlement, and a few miles upriver, to the north, is an abandoned Spanish mission. These historical amenities, combined with the ecological treasure of the San Pedro River and the equidistant location from major greenway system termini makes this a logical stopping point long-range journeys.

The relative short distance from Tombstone makes this an excellent start or end point for leisure walkers coming or going from Tombstone.
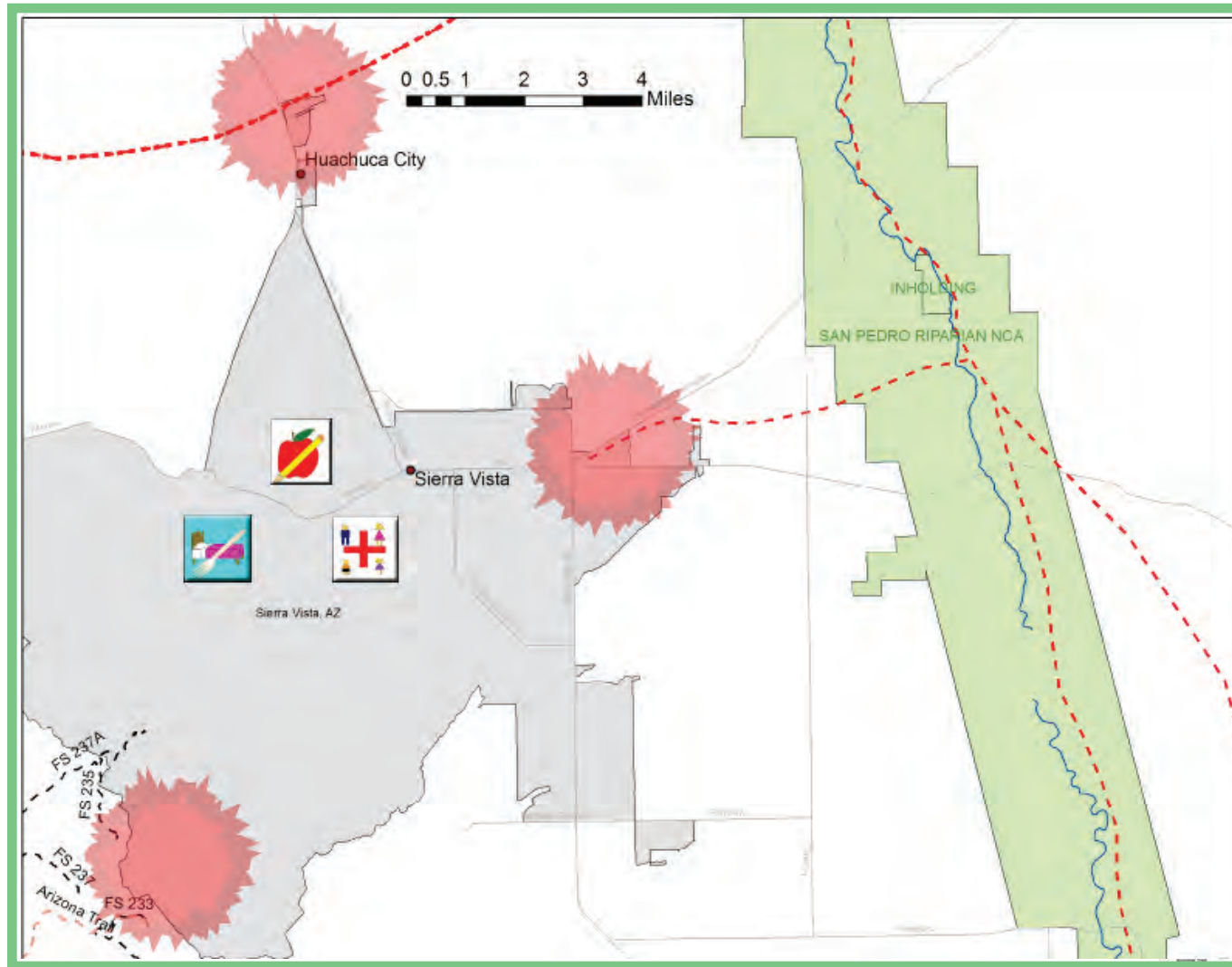
Regional Connections in Southern Arizona

Connecting Open Spaces: the Patagonia-Sonoita area is poised to undergo a population boom as more and more retirees discover this region and all it has to offer. By using land donated by the Three Canyons development and an existing National Forest service road, this proposed greenway can connect the Coronado National Forest to the Las Cienegas National Conservation Area and ultimately to the San Pedro Riparian Conservation Area.
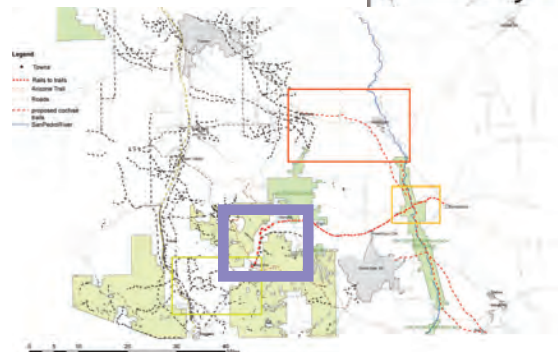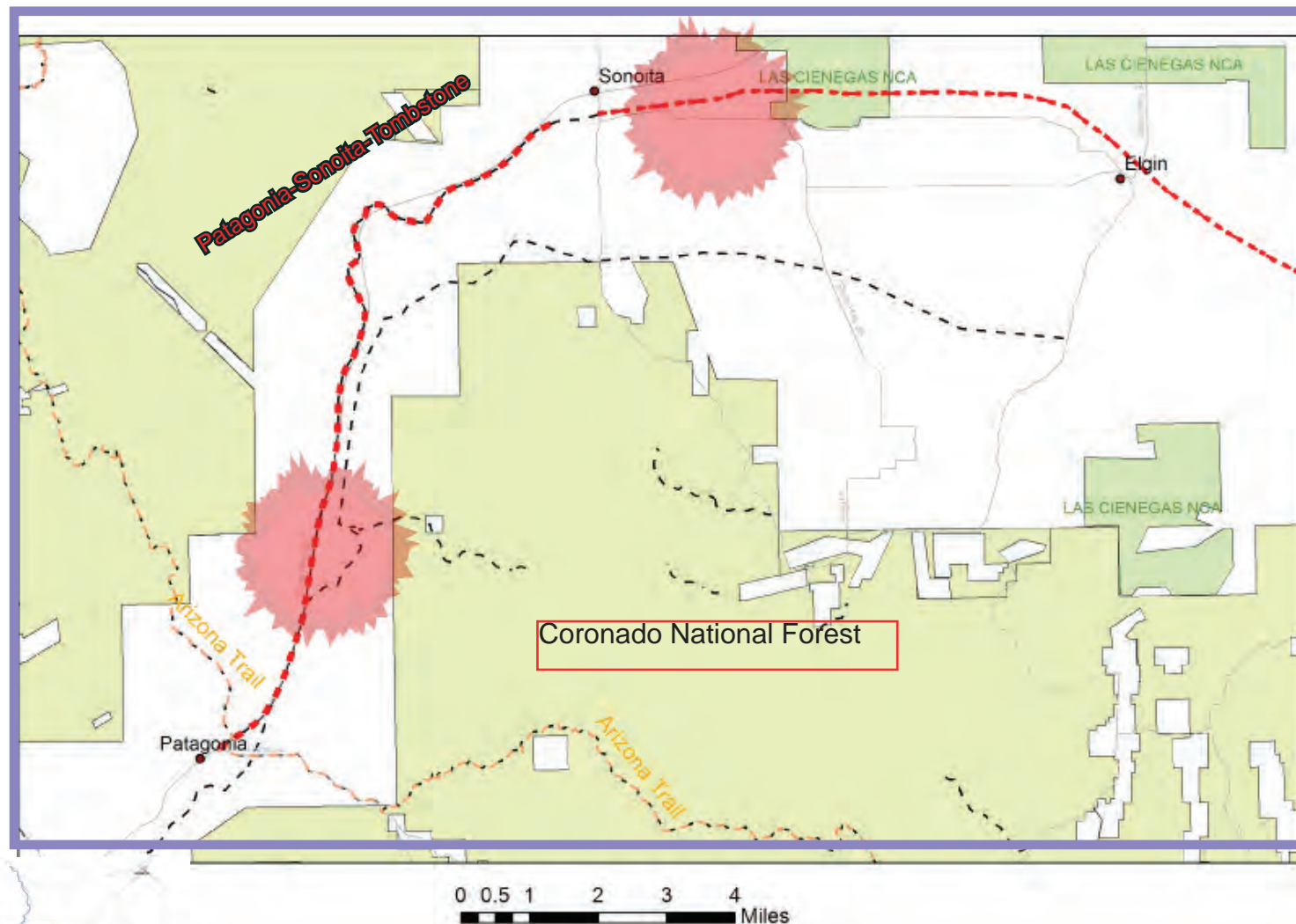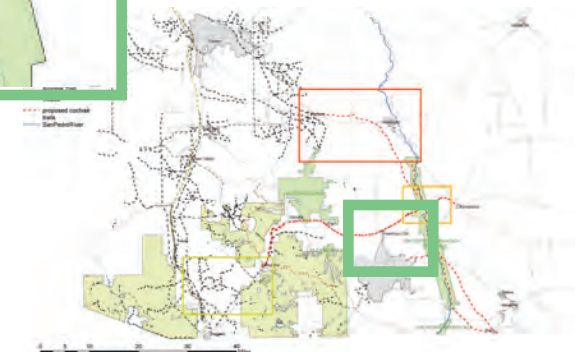
Regional Connections in Southern Arizona

Sierra Vista: This is a major southern Arizona community, and one that is diverse culturally, economically, and socially. With a large proportion of military personnel and retirees, this community would benefit immenselydv from connections to the proposed greenways. GIS analysis shows that the proposed routes would connect the community at the northern tip, as well as connect to the Coronado

National Forest and the Arizona Trail to the south. Additionally, an abandoned railroad spur line could be converted to a Rails-to-Trails project to connect Sierra Vista to the San Pedro NCA and the San Pedro Greenway.

Regional Connections in Southern Arizona

Southwest Connectors: The proposed Patagonia-Sonoita greenway can easily be connected into the current system of trails around the Nogales-Rio Rico area.

One trail connector can connect the Santa Rita West Slope Trail to the western end of the Sonoita Creek Trail. To the south, a trail that parallels the SR 82 can connect the town of Patagonia, the Sonoita

Creek Preserve, Lake Patagonia State Park, and ultimately to the historic Anza Trail. These simple, short connections will tie the Patagonia-Sonoita Rails-to-Trails greenway into two regional-scale trail systems: the Arizona Trail and the historic Anza Trail
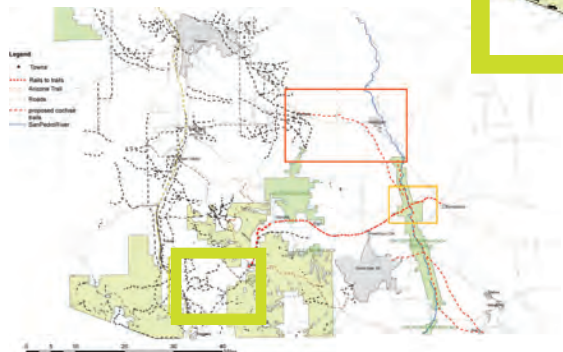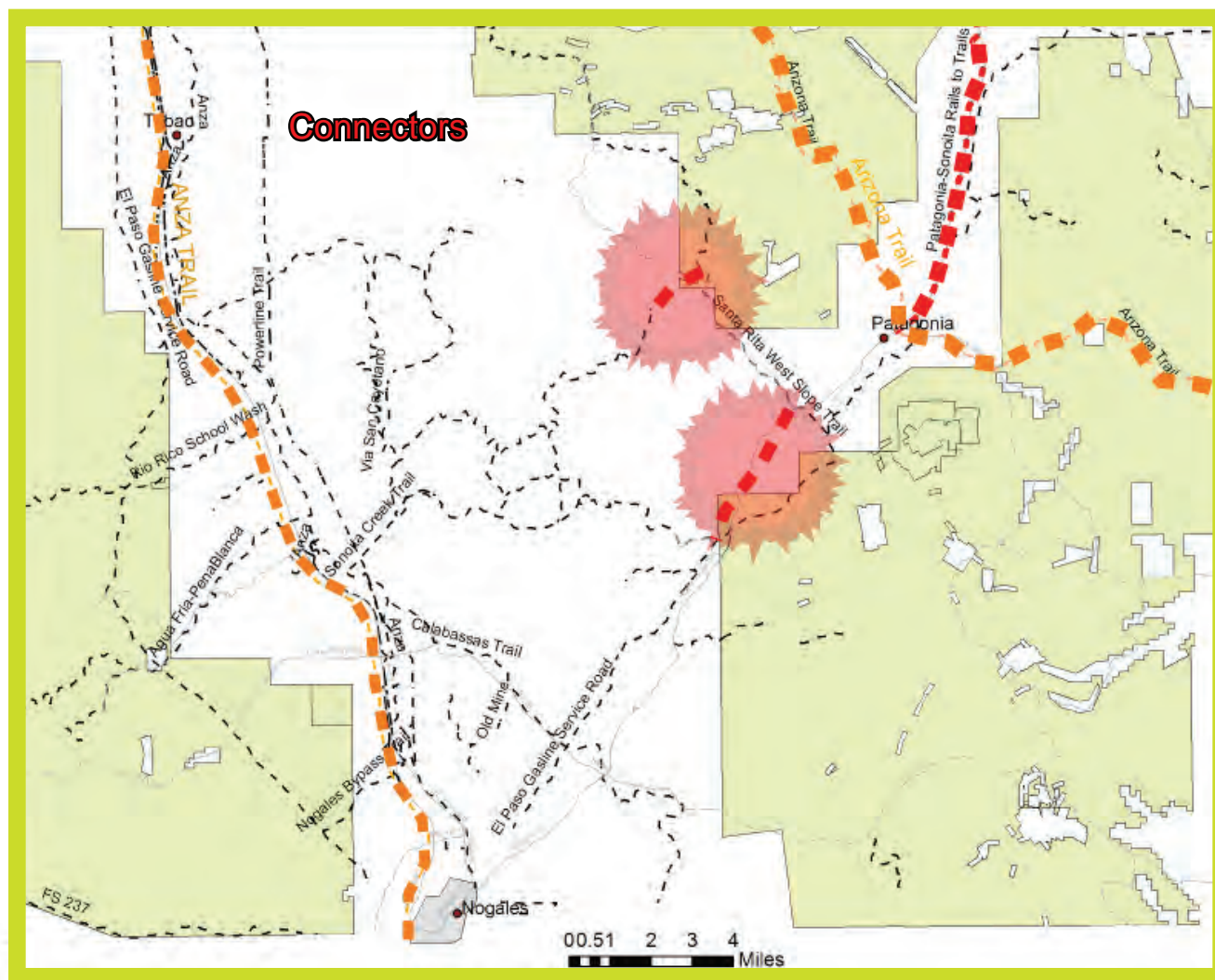
Trails

The following material was taken from
Trail Guidelines: Pedestrian and Bicycle Design Guide
by the City of Flagstaff Coconino County
Arizona Department of Transportation, Flagstaff Metropolitan. It
gives information about trails in general and some other elements
to be considered to include in the Patagonia Trail System.

I. Bicycle Paths

Dedicated bicycle paths will not only encourage more bicycle
use, but will improve safety conditions by restricting use to
specific routes. These routes with increased volume will be more
noticeable to drivers. Clearly marked bike routes will also aid
in linking trails on one end of town with trails on the other. For
bicycle paths there are three primary types: on-street bike lanes,
off-street multi-use paths, and bike routes in mixed traffic.

The Patagonia to Sonoita section of the greenway should
be considered to be a "rural collector" type of situation (no curb
and gutter), or bike lane. This kind of trail is a portion of a street
reserved for the exclusive use of bikes.

Design implications

- They are always designated by a sign with lines and
  symbols marked on the pavement.
- It is paved with a cross-slope of 1.5%
- Recommended bike speed: 20mph
- Bike lane width: 4' minimum
- Striping: 6" city, 4" county

In the town of Patagonia there are a couple of options:

1. "Minor collector bike lane" (no on-street parking, curb and
gutter)
Design implications

It is paved with a cross-slope of 1.5%
Recommended bike speed: 20mph
Bike lane: 4.5' min., gutter pan width: 18"
Striping width 6" city, 4" county

2. "Bicycle Route" (a public road or street identified, signed
and designated or mapped for use by cyclists). Cyclists share
the public street with, and are not separated from, motorized
vehicles. Several criteria also should exist before such a route is
signed. A traffic engineer should be consulted.

Design implications

- It is paved, usable lane width: 14', gutter pan width:
  18"
- Recommended bike speed: 15 mph

This image enhancement shows one possible way that a street in Patagonia
could incorporate pedestrians, seatings, shade trees, parking, and bike lanes.

Off-street multi-use paths should use the criteria for "rural unpaved" (an unpaved path, physically separated from motor vehicle traffic by an open space or barrier, used by cyclists, pedestrians, and other non-motorized travelers).

Design implications

- It is unpaved with a cross-slope of 1% min., 2% max.
- Recommended bike speed: 15 mph
- Vertical clearance of 10' (more for horses), width: 6-10' (4' ped. use only, 6' ped/equestrian use, 8' multiple users,10' primary bike path [must have long sight lines, wide curve radii, drainage features must be unobtrusive and few in number]), shoulders 2'

The following information was taken from
Trails for the twenty-First Century, 2nd edition
Charles A. Flink, Kristine Olka, Robert M. Searns
Island Press, Washington, 2001
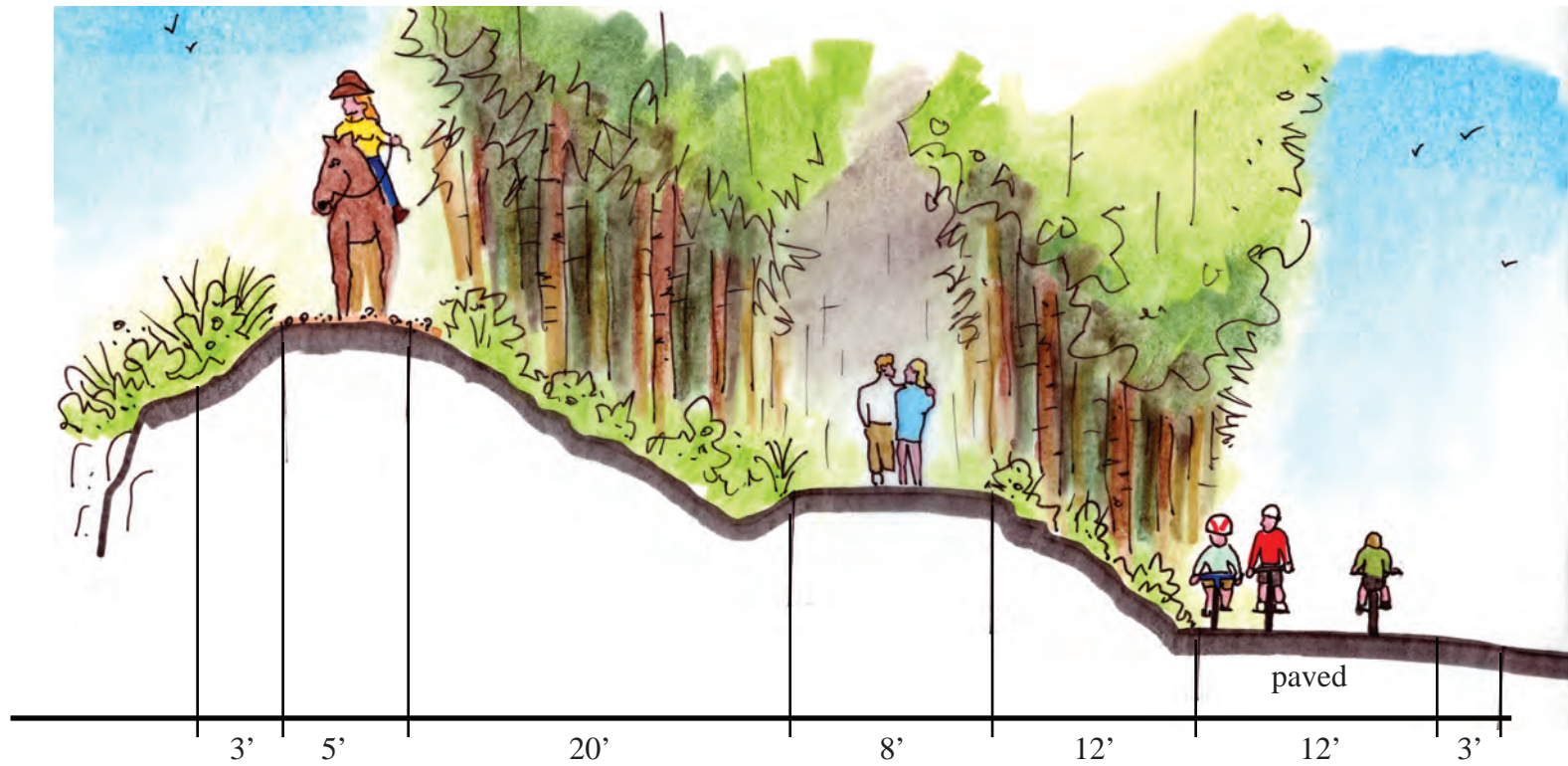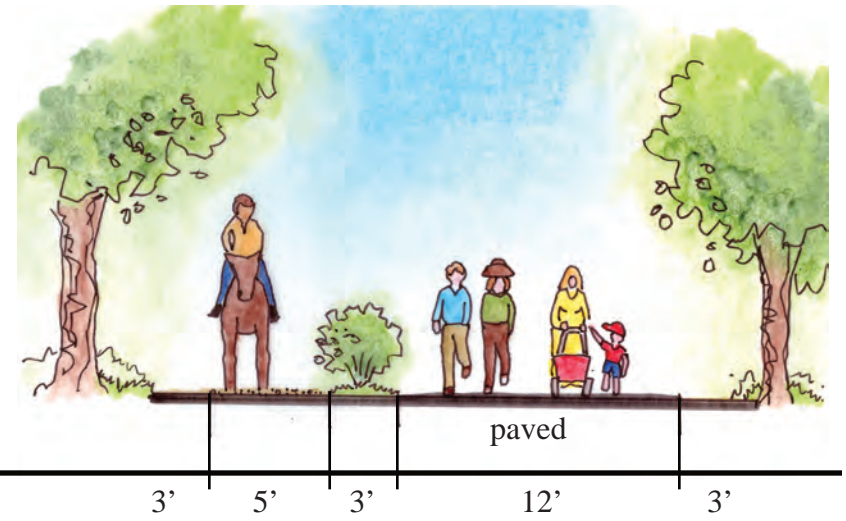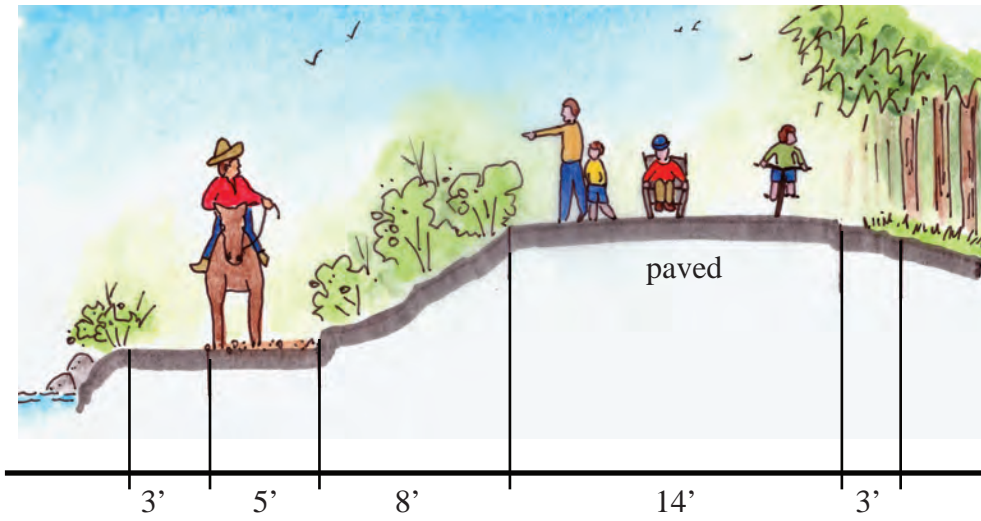
II. Equestrian Trails

Trails for horses and riders should be considered as this activity is very popular in many areas. Furthermore, the more types of users designed for, the more users will be attracted to the trail. If the trail has connectivity to the town, this could mean more business for downtown shops and restaurants. Equestrian trails, however, have special design requirements such as the need for soft (unpaved) trail surfaces.

Design implications

- Surfaces: dirt, stabilized dirt
- Width: include 5' wide dirt track on multi-use trails with harder surfaces
- Vertical distance 10' min., horizontal clearance 5' min. (limbs cut flush)
- Sight lines at 100' min.
- Signs stating right-of-way for horses should be posted, and for bikers to give verbal warning before passing; keep bikes separate from horses where possible
- Water crossing preferred to high bridge crossings

paved

3'   5'   8'   14'   3'

paved

3'   5'   3'   12'   3'

paved

3'   5'   20'   8'   12'   12'   3'

3'   8'   8'   paved 12'   3'

paved
3'   12'   3'
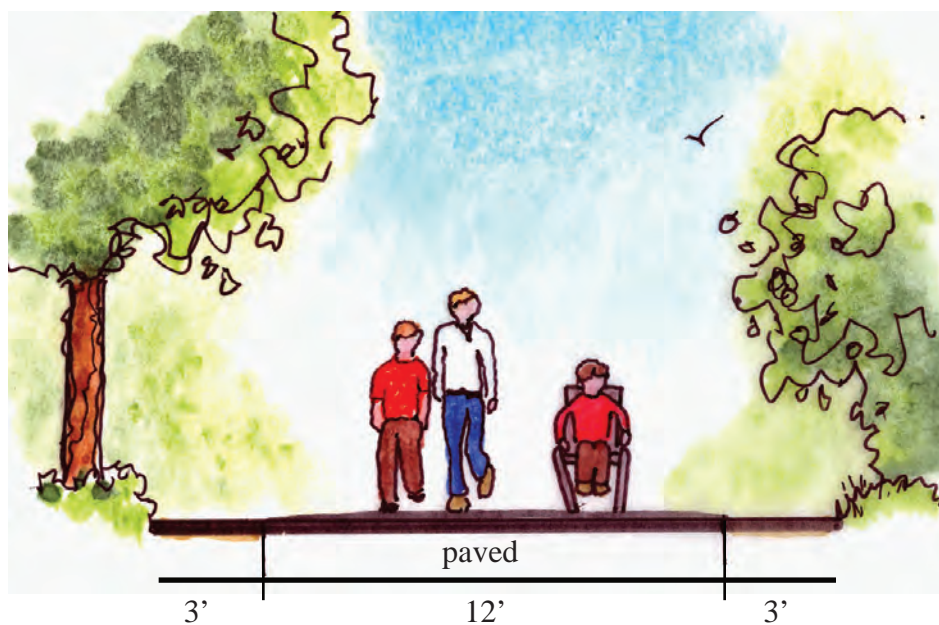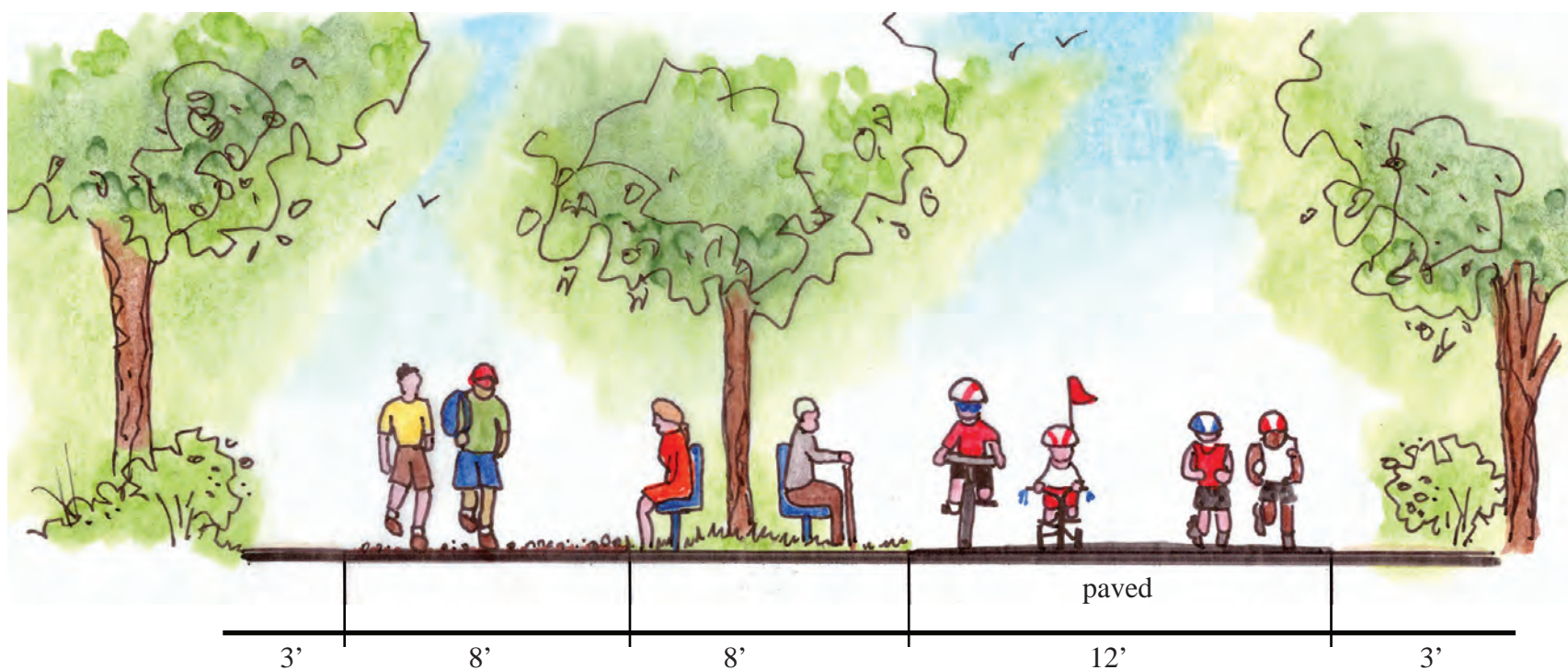
Various possible trail section configurations, from single to multi-use, showing the need to separate equestrians and bicycle users, hard and soft surface types, and the creative use of elevation changes across the trail section.

III. Trail User Slope Requirements (p.63)

Each user group of the rail trail will have slightly different restrictions. Longitudinal slope especially should be taken into consideration. Fortunately, most rail beds are uniformly flat or with only minor slopes, so unless the trail leaves the rail bed, trail steepness should not be a limitation.

User	Average speed mph	Longitudinal slope	Cross slope
Pedestrian	3-7	No restriction	4% max.
Wheelchair	3-7	3% pref./5% max.	2% max.
Bike	8-10	3% pref./8% max.	2-4%
Horses	5-15	10% max.	4% max
Skier	2-8	3% pref./5% max.	2% pref.

Design implications

- Trails for all users except equestrians should be kept fairly flat
- Minimal cross slopes will let water drain

IV. Surface Types: (p. 68)

What kind of surface to use will depend upon many factors such as budget, preferred user groups and aesthetic ("looks") considerations. Many types of materials are available: granular stone, asphalt, concrete, soil cement, resin-based stabilized material, wood chips, natural. Materials can be considered hard or soft depending on ability to repel moisture.
Hard surfaces are: soil cement, crushed stone, asphalt, resin-based stabilized material, concrete; soft surfaces are earth and wood chips.

Design implications

- Equestrian trails should only use soft surfaces but do not hold up well over time to multiuse
- Multi-use trails may use hard surfaces as they require less maintenance, but are more expensive.
- Surface types can be used to encourage or discourage use (thereby controlling user groups), where softer surfaces discourage many user groups and harder surfaces encourage different users.
- Wheelchair use requires firm and stable surfaces, not necessarily concrete or asphalt. Some soft, unstable materials can be used if soil stabilizers are added.

- Phasing: trail surfaces can always be upgraded. It is better to open a rails trail with only the ballast material in place (as long as it is stable for intended users), rather than delay use while waiting for funds to pave it with asphalt.

Surface Material (cost per mile) (longevity)	Advantages	Disadvantages
Soil cement, $60,000-$100,000), medium	Uses natural materials, more durable than native soils, smoother surface, low cost, multiple use	Surface wears unevenly, not a stable all-weather surface, erodes, difficult to achieve correct mix
Granular stone, $80,000-$120,000, medium-long (7-10 yrs.)	Soft but firm surface, natural material, modest cost, multiple-use	Surface can rut or erode with heavy rainfall, regular maintenance needed to keep consistent surface, replenishing stones may be long-term expense, not for areas prone to flooding or steep slope
Asphalt, $200,000-$300,000, medium-long (7-15 yrs.)	Hard surface supports most types of use, all-weather, accommodates most users simultaneously, smooth surface to comply with ADA guidelines, low maintenance	High installation cost, costly to repair, not a natural surface, freeze/thaw can crack surface, heavy construction vehicles need access
Concrete, $300,000-$500,000, long-term (20 yrs. plus)	Hardest surface, easy to form to site conditions, multiple-use, lowest maintenance, resists freeze/thaw, best cold weather surface, most resistant to flooding	High installation cost, costly to repair, can be slippery when wet
Boardwalk, $1.5-$2 million, medium-long	Necessary in wet or ecologically sensitive areas, natural-looking surface, low maintenance, multiple-use	High installation cost, costly to repair, can be slippery when wet
Resin-stabilized, cost varies depending on type of application, medium-long depending on type of application	Aesthetics, and less environmental impact, possible cost savings if soil used, can be applied by volunteers	Need to determine site suitability and durability, may be more costly in some cases
Native soil, $50,000-$70,000,short to long depending on local use and conditions	Natural material, lowest cost, low maintenance, can be altered for future improvements, easiest for volunteers to build and maintain	Dusty, ruts when wet, not an all weather surface, can be uneven and bumpy, limited use, possibly not accessible
Wood chips, $65,000-$85,000, short-term (1-3 yrs.)	Soft, spongy surface good for walking, moderate cost, natural material	decomposes under high temperature and moisture, requires constant replenishment, not typically accessible, limited availability, not appropriate for flood prone areas
Recycled materials, cost and life vary	Good use of recyclable materials, surface can vary depending on materials	Design appropriateness and availability vary

Trail surfaces can be made of nearly anything but a careful consideration of the potential users and functions must be made. Some rural trails have soft surfaces suitable for most users (above), especially equestrians which require soft surfaces. On the other hand, where equestrians would be restricted, such as on this urban trail (previous page top), asphalt is better suited to pedestrians and wheelchair users. This urban trail (previous page bottom), however, is covered with stone dust, very fine chips of stone, that is perfect for runners and joggers. Trails with viewing decks can be made into boardwalks (previous page middle).

V. Bridges (p. 78-81)

If bridges currently exist, they should be examined by a structural engineer to determine integrity and by an architect or historian if historical significance is suspected. The refurbishing of historically valuable bridges can greatly add value (in tourist dollars) and interest (educational value) to a rails trail. Information about a bridge's history can also be obtained from the *Historic American Engineering Record*, available through the National Park Service or the Library of Congress in Washington, D.C.

Bridge decking: The surface of the bridge (decking) acts as a continuation of the trail surface: that is, it should be comfortable to walk or ride on, stable and not slippery when wet. Appropriate decking may need to be installed. Note: Horses prefer a water crossing to a high, hard-surfaced bridge crossing wherever possible.

Design implications

- For bikes, horses, and snow-mobiles: use 4"-thick, pressure-treated planks, laid perpendicular to the bridge beams, or at 45 degrees if the railroad ties are intact.
- Gaps no wider than 1/4 inch will allow drainage without tripping up users.
- Concrete decking (poured over corrugated metal decking) may also be used as it is less slippery, more durable and cost competitive.

Bridge railings: Railings provide a safety factor and can be either post and rails or posts and mesh. Posts are vertically attached to the bridge decking or superstructure and placed no than 6 feet apart. Horizontal components (rails or mesh) are attached to the posts. (AASHTO standards should be consulted for weight distribution requirements.)
Railing height depends upon the anticipated user groups.

Design implications

- For pedestrians: top of railing height should be 42 inches above bridge decking.
- For bicyclists, height should be 54 inches.
- For equestrians, post signs encouraging riders to either walk their horses across the bridge or to use a water crossing (ford).
- Railings can be made of wood, metal, wire, concrete steel cable, metal alloys, plastic or rope.
- Minimum standards require three rails: top, middle and bottom, with the middle rail being 33-36 inches above the deck for pedestrians and bike users, and the underside of the bottom rail no higher than 15 inches.
- The maximum vertical opening between railings should not exceed 15 inches.
- Refer to local, state and federal building codes for child-proofing railings, especially where dangerous drop-offs exist.
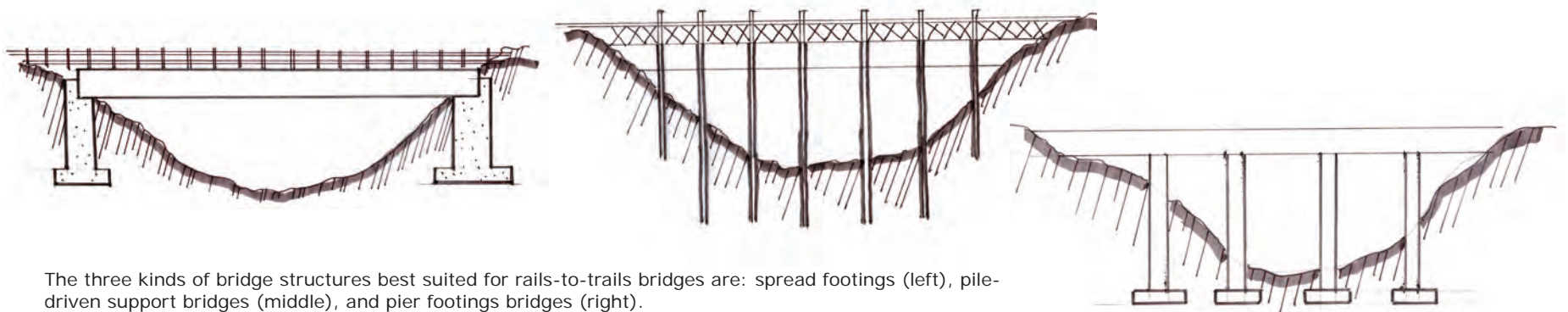
The three kinds of bridge structures best suited for rails-to-trails bridges are: spread footings (left), pile-driven support bridges (middle), and pier footings bridges (right).

Bridge approaches: Approaches to bridges should not be overlooked in the design. Approach railings facilitate safe passage onto the bridge and an appropriate trail width mitigates congestion.

Design implications

- Approach railings should be constructed in a similar manner to bridge railings (except that posts are inserted into the ground) and extend to at least 15 feet from the bridge end. Clear sight lines and extra-wide trails at bridge approaches will help to prevent congestion at bridges.
- If railroad margins exist on the original bridge (to allow pedestrians to side-step an on-coming train), these should be retained to allow users to safely pass each other on the bridge.

If bridges no longer exist but the footings, pilings, etc. are intact, have an engineer evaluate their structural integrity (design load should accommodate at least 12,500 pounds), then have the engineer design the superstructure. Bridge superstructure style will depend upon required span, intended weight bearing capacity, site limitations, and aesthetic considerations. Prefabricated bridges can be purchased and installed and have several advantages: low cost, minimal disturbance to the project site, and usually simple installation requiring little expertise. Bridge footings (supports and foundations) are generally not included with prefabricated bridges, but instructions for installation may be included, provided that the footings have been determined by an engineer to be safe. Funding for bridge site preparation and engineering work is available from the Historic Bridge Program within the Federal Highway Administration of the U.S. department of Transportation. Bridge companies that sell new or reasonably priced old bridges may also be found on the internet.

If neither bridges nor footings of an old bridge exist, the feasibility of an alternate crossing should first be investigated. This may involve using an existing road, purchasing new land, or gaining an access agreement with the land owner.

If a new bridge is required, a structural engineer should be consulted to design the footings. Various design styles exist and should be considered based on site requirements, cost and aesthetics. [three kinds of bridge footings: p.81]

VI. Road Crossings (p.84-87)

For safety and consistency roads and streets have a hierarchical relationship such that the one with the higher volume of traffic has the right-of-way. That said, where trails intersect public and private streets, trail users should yield the right-of-way. However, wherever trails have more traffic than a private street or driveway, the vehicle driver should yield. Signage and construction will help to make this clear.

Determining the kind of trail crossing at grade is the responsibility of a traffic or transportation engineer. Various factors such as gaps in peak traffic times, traffic volumes, sight lines, and the unique features of the intersection itself will help determine if the trail crossing needs a pedestrian activated cross light, a traffic signal or merely painted stop bars on the pavement.

Design implications

- Trails should cross as close as possible to intersections where crosswalks would normally be placed
- If existing crosswalks are used, make sure all safety features such as painted crosswalk, curb cuts and signage are in place.
- When trails cross streets with curbs, the curb cut should be the same width as the trail.
- For streets wider than three lanes median island "refuges" could be considered for pedestrians and wheel chair users.
- Since volume of trail use will probably increase over time, future means of trail crossing improvements should be considered.

Restricting vehicular traffic to trails

Bollards are the usual means to preventing vehicles from using a trail. Either one bollard placed in the trail center, or three bollards (one in the trail center and one in each of the middle of each trail lane) should be used. Two bollards encourages circulation to flow to the center, thus creating conflicts. Bollards should be as visible at night as possible, so they should be marked with reflective tape and/or reflectors. Bollards should be at least 3 feet tall, placed no closer than 10 feet to the intersection and be spaced 5 feet apart for safe access to bikes and wheel chairs. Bollards should also be designed to be removed or folded down to allow for emergency vehicle access and for snowmobiles access in winter, where such use is possible.

Stopping trail users at intersections

Trail users, especially those on bikes and horses, need to be warned when approaching an at-grade intersection with vehicular traffic. Various techniques can be used, in combination where possible to ensure safe trail usage: trail surface warnings, signage, and safe sight lines.

Design implications

- On asphalt trails an 18" concrete strip should be placed 30 feet from the intersection
- A center line should be painted starting 150 feet from the intersection
- Stop signs should be posted 5 feet from the intersection to warn trail users.
- Sight lines to the intersection should be checked with AASHTO guidelines for safe stopping distances for bike users, especially on downslopes and on curves.

Bridges can take many forms depending upon budget, site characteristics, and aesthetics.
This bridge (top) over the trail prevents hiker / vehicle conflict.
A simple I-beam bridge (middle) spans the trail gap where the old rail bridge footings still exist. Where very wide river crossings are necessary, elaborate new bridges like this one (bottom) may need to be constructed.

VII. Trail Signage (p. 88-93)

Types of signs
There are four types of signs for trails: regulatory, warning, informational, and educational.

Regulatory signs are used to inform users about the rules of the trail. Such signs are stop, yield, right-of-way, speed limit, and exclusion signs.

Warning signs are used to alert trail users to potential hazards, usually near intersections, bridges, and severe grade changes. These signs include any that may be found along typical streets and roadways or for indications specific to a trail hazard.

Informational signs are usually used to orient trail users to their location or tell them about facilities and points of interest. These signs may include mile markers, kiosks with trail maps, and information about trail difficulty levels. In addition, public bulletin boards could be placed on trails near towns or trail heads to inform people about civic and cultural events. Such use would encourage people to use trails to come into town.

Educational signs can teach trail users about historic relics, best if left in place along the trail: old bridges, canals, work camp refuse heaps, and building foundations. Local history can also be included in the signage to bring life to an unfamiliar area. Opportunities for interpreting unique features of geology, ecology, and even reminding users of trail etiquette should also not be overlooked.

Use of standard signage

Because trails are transportation corridors, signage familiar to street users should be used for ease of recognition. Signage standards can be found in the U.S. Department of Transportation's Federal Highway Administration's *Manual on Uniform Traffic Control Devices (MUTCD).*

Signage has many different functions and should be carefully thought out during the trail design phase. Signs can help in wayfinding, trail use guidelines, and warnings.Signage can also help to educate on nature and historical events. Signs can also be purely visual and playful.

Signage materials

Several kinds of materials for signage are available, each with advantages and disadvantages. Cost, maintenance, and aesthetics should all be considered when planning a trail signage system.

Plastics are widely available in a number of forms. Some plastics can fade in sunlight. Many plastics expand and contract with temperature changes.

Fiberglass is durable, impact resistant and can be formed into customized shapes. Graphics can be applied then sealed for color fastness.

Wood can be relatively inexpensive, and has a natural appeal but must be treated for weather resistance. It can also be easily damage by vandals.

Aluminum is widely available and does not rust. However, some aluminums require special surface treatments to protect against pitting.

Steel is also widely available and easy to weld and form. However, it, too, may need special finishes to avoid rust.

Stone is a natural material and extremely durable but difficult to work with. It is also heavy to move to remote trail sites.

Recycled materials can also be used, especially where it is desirable to instruct trail users about ecological behavior.

Making trails unique

The use of a recognizable logo can add uniqueness to a trail and help create unity and continuity. Create a logo, simple and recognizable, which represents the community or organization supporting the trail. Place the logo on all signage where possible, especially at orientation and public informational kiosks and trail heads.

By repeating the logo at regular intervals, such as at half-mile trail markers, a sense of continuity is reinforced in trail users' minds. Also, different logos associated with different connecting trails help users orient themselves, find direction and emphasis the uniqueness of each trail experience. Logos can also be used on all official fund raising and public relations materials such as T-shirts, letterhead, and window decals. Repeated emphasis of a trail organization's logo and its association with a trail builds strong impressions of professionalism, public support and interest that will lead to greater trail use and contributions of volunteer, political, and financial support.

VIII. Trail Support Facilities (p. 93-102)

A trail system intended to serve many people and last into the future will need trail support facilities: parking areas, rest rooms, drinking fountains, seating, trash receptacles, and picnic areas. These facilities, to be successful, should be planned for, if not immediately built, right from the start. Grouping facilities at access points will help give the trail a level of high visibility as well as serving as a link to the community. Some general design guidelines follow:

Design implications

- Clustering different types of facilities together can help distinguish major trailheads from minor trailheads
- Clustering also makes trailheads recognizable
- Access points should link the trail to as many different forms of transportation as possible
- Locating major access points close to developed areas such as shopping and public transportation centers has many benefits for the trail users and business owners
- Minor access points should have different kinds of facilities and be located at parks and residential areas
- Access points with connections to rivers from the trail should also be considered

Parking areas

Parking areas should be kept as simple and easy to use as possible. They should also be harmonized with the surroundings as much as possible. At least one space for disabled accessibility should be designed into every parking lot. If equestrian use is a goal of your trail, special design considerations need to be taken. Room for horse trailers and installation of hitching posts may be desirable. As safety and efficiency are vital in parking lot design, a suitable traffic engineer should be consulted for construction details.

Design implications

- Entrances and exits should be clearly marked and be no less than 50 feet from an intersection
- Parking lots should drain but not exceed 5% slope
- Plan for at least 300 to 350 square feet per car space
- Disabled parking spaces require between 234 and 270 square feet, or 1 13 foot by 18 foot space
- Equestrian trailers with vehicles require about 45 feet long and 15 feet wide
- Hitching posts, where trees are not available, might be installed to allow horses to be tied

Rest rooms

Along with parking lots, rest rooms can be the most expensive trail side facility. Expense, however, will depend upon number of stalls, whether or not sewage connections will be used or organic composting, and accessibility to maintenance. Local ordinances and construction guidelines should be consulted very early in the facilities design stage.

Design implications

- Toilet facilities should be visually buffered from neighboring residences
- Stalls for the disabled must be properly scaled for wheel chair accessibility: minimum of 5 feet by 10 feet with a sink (consult building guidelines for details)
- Standard single stalls require at least 3 feet by 9 feet 6 inches with a sink (consult building guidelines for details)

Drinking Fountains

Drinking water, whether in fountains, or bottled, or in vending machines must be accessible to all. Locating fountains near rest rooms can make double use of existing water line and drainage utilities. If no water is available, signs should be posted alerting trail users to bring their own.

Design implications

- Adult height spigots should be 42 inches above the ground
- Heights for the disabled should be no more than 36 inches, with 27 inches of space below the basin for wheel chair pull up
- Children should either have steps up to the adult spigot or their own at 30 inches above the ground
- Fountains should be both hand and foot operated where possible
- Fountains should be located at least 4 feet off the trail, with drainage away from pathways
- Consider the inclusion of special spigots for dogs to use available at manufacturers

Seating

Seating is available in a number of forms: benches, stools (fixed in place), seatwalls, concrete blocks, whimsical sculptural forms, and natural boulders. Choice of style and materials will determine if a rest area is formal or informal, urban or rustic and will determine maintenance issues as well. Seating can be grouped at access points where family picnics might be desirable or it can involve a solitary on-trail rest spot for contemplating a view. Many kinds of prefabricated seating can be purchased from dealers.

Design implications

- Typical benches measure 72 to 90 inches wide with a 15 inch high back and a seat that drains gently to the rear
- Consider aesthetics and maintenance when choosing materials
- Benches should be securely anchored to the ground for safety reasons
- Seating should be set at least 3 feet off any paths
- Seating area should drain away from trail
- A distance of 4 feet between benches and other facilities will allow for disabled circulation

Trail-side seating can vary from rustic (top left) to urban (top right), and from traditional (bottom left) to contemporary (bottom right).

Shelters

Shelters can be an especially welcome facility for long-distance users of the trail as a place to rest out of the elements. Shelters can be located at major access points closely grouped with other facilities, or they can be in more remote areas. In either case they should be placed no closer than 3 feet to the trail edge.

Design implications

- Visibility into and out of shelters should not be obstructed by natural or built features or utilities
- Shelters are best used when located along with rest rooms, pay telephones, and parking lots
- Shelters should be positioned to block prevailing winds; wind screens can be built if needed
- Exterior walls of shelters can be between 10 and 16 feet in length and between 5 and 8 feet wide
- Interior height should be between 7 feet and 8 feet 6 inches

Bicycle racks

Bike racks located at trail entrances and access points near other facilities will allow for safe and tidy securing of bicycles when bikers are using other facilities, going for a hike, or visiting local shops and restaurants.

Design implications

- Racks should be set as close as possible to the trail or other facilities without interfering with traffic
- Locate racks where lighting and visibility are good
- Lockers should be considered for storage where daily bicycle commuting is a priority; they are, however expensive and high on maintenance
- For normal trail use, consider some kind of rack or locking post system; manufacturers can provide many styles and colors
- Allow 2 feet of space between bicycles at racks to allow ease of movement
- Racks should accommodate bike dimensions of 5 feet 6 inches long by 42 inches high

Picnic areas

Picnic tables and benches located at major trailheads or access points are major incentives to trail use, especially for family and group outings.

Design implications

- Locate picnic areas well back from trails, sidewalks and parking lots
- Tables and benches should be located on flat, hard surface areas with good drainage
- A single table with benches requires about 168 square feet, an area of 12 by 14 feet
- The table and bench should be about 6 by 8 feet with 48 inches on all sides for wheel chair circulation
- Tabletops should be between 30 and 34 inches high with a 29 inch wheel chair clearance on each end
- Many materials are available and prefabricated units can be purchased from manufactures in many styles and colors

Fitness Courses

Fitness courses added to a multi-use trail system will expand the potential user groups. Fitness courses are usually circular loops with "stations" where equipment for performing specific exercises are located. Some fitness courses are small areas where all the equipment is grouped together, other courses have each station located a regular, widely-spaced intervals to encourage running between stations.

Design implications

- Soft surfaces (wood chips, gravel, sand) should be used around equipment to minimize injury from falling
- Signage at the first station should explain the course, show a map if necessary and provide rules for usage
- Signs at remaining stations should be numbered and illustrate how the equipment should be used
- Manufacturers can provide information on appropriate kinds of equipment for specific multi-use trail types

Bibliography

• Tejido Group. Pinetop-Lakeside Town Plan. Summer 2006.

Image References

All images without reference information are the property of the design team.

Chapter 1:
Design team

Chapter 2:
Page 11: mapquest.com, http://www.patagonia-lake.com/images/patagonia-day-use.jpg, http://www.patagonia-lake.com/images/patagonia_lake.jpg, http://www.roysephotos.com/zzVermilionFly-catcher8.jpg
Page 12: http://www.go-arizona.com/AZ/images/detail/intro-Nogales-tmb.jpg, http://images.google.com/imgres?imgurl=http://www.ctv.ca/generic/WebSpecials/border/gallery/images/img01.jpg&imgrefurl=http://www.ctv.ca/generic/WebSpecials/border/gallery/image01.html&h=300&w=400&sz=51&hl=en&start=140&tbnid=SfBE-N7swVcRsM:&tbnh=93&tbnw=124&p, http://www.over-land.com/images/st_montezumapass.jpg, http://www.montereybay.com/creagrus/Coronado-sign-Jun70-n.jpg
Page 13: http://www.go-arizona.com/AZ/images/detail/intro-Sierra-KR.jpg, http://www.ci.sierra-vista.az.us/svlibrary/LibImages/svlibrary.jpg, http://community.iexplore.com/photos/journal_photos/FtHuaSign2.jpg, http://www.go-arizona.com/AZ/images/photos/HuachucaMtns-tmb-montezumapass.jpg, http://k43.pbase.com/u8/larrytucaz/upload/37224925.

dscn7801_rz.jpg, http://www.ci.tucson.az.us/tcb/images/tucson.jpg
Page 14: http://z.about.com/d/gosw/1/0/u/A/smcavetour.jpg, http://www.thepepper.com/tucson_colossal_cave.jpg, http://www.over-land.com/images/ApachePowderDriver1.jpg, http://www.geocities.com/southernarizona3/Benson3.JPG, http://images.google.com/imgres?imgurl=http://www.cityofbenson.com/vertical/Sites/%257BF59197D1-30ED-49AE-8751-2EBA89C105BA%257D/uploads/%257B5CD07BCC-D062-4AD4-BED3-EE35F05A8232%257D.JPG&imgrefurl=http://www.cityofbenson.com/&h=225&w=300&sz=15&hl=en&start=1&, http://home.rica.net/uvrpa/Parade/media/kartchner.jpg
Page 15: http://www.ghosttowngallery.com/ghostsariz/bisbee1085-036.jpg, http://magazineusa.com/images_st2/az/tucson/bisbee.jpg, http://www.faceters.com/askjeff/images/bisbee1.jpg, http://www.tombstonemotels.com/mainphoto.jpg, http://www.eugenecarsey.com/tourist/roads2004/tombstoneAZ01.jpg, http://huachuca-www.army.mil/NEWCOMER/images/gunfight.jpg
Page 16: Allison Kennedy, http://www.agilitynut.com/p/rexa1104.jpg, http://www.photoseek.com/03AZ-13-07-ChiricahuaNM.jpg, http://pix.epodunk.com/AZ/az_douglas01.jpg, http://www.riosonora.com/images/gadsden.jpg
Page 17: http://www.geol.ucsb.edu/faculty/sylvester/Patagonia/Patagonia.html, http://www.geol.ucsb.edu/faculty/sylvester/Patagonia/Patagonia.html, http://www.oac.cdlib.org/affiliates/images/csfcp/kt0j49q24k/hi-res/scp_1028.jpg
Page 18: http://www.webucate.org/our-gallery/albums/photoart/landscapes/nor
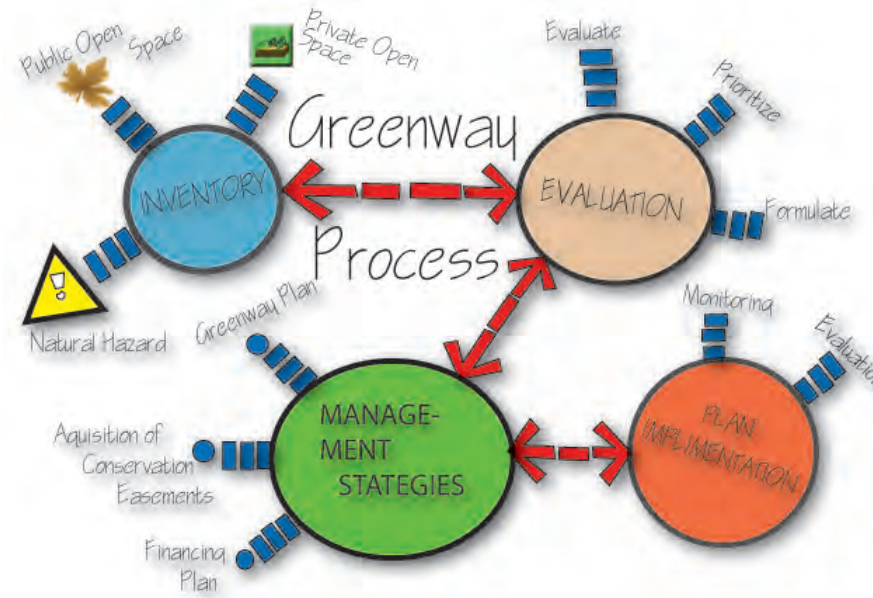
mal_windtrad442.jpg, http://www.latrobe.vic.gov.au/WebFiles/Image%20Library/Enjoying%20a%20local%20winery.jpg http://southernarizona.tripod.com/sonita_and_me.JPG, http://www.nogaleschamber.com/sonoita.htm

Chapter 3:
All images produced and taken by the design team.

Chapter 4:
Page A: http://www.solarnavigator.net/sport/sport_images/mountain_biking_rocky_terrain.jpg, http://www.destination360.com/north-america/us/utah/images/s/utah-mountain-biking.jpg,
Page B: http://www.lcra.org/newsletter/currents/nov06/images/horses.jpg, http://www.nwk.usace.army.mil/harryst/gif/equestrian-2.jpg, http://www.lasr.net/images/attractions/NE02sp001a003.jpg
Page E:
Page F:
Page G:
Page I:
Page J:
Page K: http://www.beatricecoron.com/image/publicart/kent1Sml.jpg, http://www.compusign.com/images/signs/wickertonview.jpg
Page L:
Page M: http://www.cincinnati-oh.gov/cityparks/images/cityparks_img4886.jpg, http://www.meszoo.com/images/picnic1.jpg
Page O: http://www.cora.com.au/images/Pg1-2.jpg, http://www.meszoo.com/images/picnic1.jpg
Page P: http://www.outdoor-fitness.com/images/aw9.jpg, http://www.gocolumbiamo.com/ParksandRec/Images/Parks/lsexer.jpg, http://www.fawns.co.uk/playground_equipment/Trails/Trails%20003.jpg

Potential Stakeholders

Governmental Organizations

    National Park Service
    National Forest Service
    Bureau of Land Management
    US Fish and Wildlife Service
    US Border Patrol
    State of Arizona (various agencies)
    Counties of Santa Cruz, Cochise, and Pima
    Town Governments: Patagonia, Sonoita, Tomb
    stone, Sierra Vista, Nogales, Rio Rico, Tucson

Private Organizations

    Chambers of Commerce (region-wide)
    The Nature Conservancy
    Santa Cruz Valley Heritage Alliance
    Mariposa Community Health Center
    AARP
    Local tourism and service businesses
    The Three Canyons community
    Greater Arizona Bicycling Association
    Santa Cruz Valley Bicycle Advocate Committee
    Mountain Bike Association of Arizona
    Arizona Tourism Alliance
    El Paso Gasline Company

This is a basic list of the types of organizations that could offer support to this process. It is by no means exhaustive, but is rather representational, and should be considered only the starting point in these efforts. It is vital that the people working to see this project through get as broad a support base as possible. The more people feel this project belongs to them, too, the better the chances it has of being completed. Any business or landowner in the region that could possibly benefit from this project is a potential ally. Also, federal and state agencies such as the National Park Service or Arizona Department of Parks and Recreation are two excellent places to start, as are the local business communities.