THE NATURE-BASED RESTORATIVE ECONOMY IN SANTA CRUZ COUNTY, ARIZONA

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Contents

Figures

Tables

Executive Summary

What is the study about?

Nature and the resources and benefits it provides are key inputs to production processes that stimulate economic growth. They enhance quality-of-life, and ultimately provide the underpinnings for human life. They also contribute to the health of regional economies through 'nature-based' industries that depend on them, supporting jobs, income, and economic development. At the same time, how these natural resources are used can either build or degrade the natural resource base within a region and positively or negatively affect the regional economy. This study examines industries within the nature-based restorative economy (NBRE) in Santa Cruz County, Arizona. Within the context of Santa Cruz County's economy, the NBRE consists of three general areas: nature-based tourism, nature-based industries, and conservation, restoration, and preservation (C&R) (illustrated below).

Nature-Based Tourism
Tourism & associated economic activity that rely on products of and experiences with nature

Nature-Based Industries
Economic activities related to products derived from local, renewable resources provided by nature

Conservation, Restoration, & Preservation ('C&R')
Activities to conserve, restore, and preserve the natural environment, as well as mitigate human-caused environmental damage

This study characterizes and quantifies the total economic contribution of the NBRE in Santa Cruz County in 2019. This includes the direct economic activity supported in the county by the NBRE as well as the ripple of economic activity supported in other industries when businesses within the NBRE purchase goods and services from other local businesses as inputs or supplies (known as *indirect multiplier effects*) and when people employed by businesses within the NBRE spend their income and purchase household goods and services from local businesses (known as *induced multiplier effects*). These business-to-business transactions and household-to-business transactions support jobs, incomes, and sales in other industries, outside of the NBRE.

In addition to quantifying the total contributions of the NBRE to the county economy, this study provides a socioeconomic and natural resource profile for Santa Cruz County as a baseline and presents the results of a SWOT (strengths, weaknesses, opportunities, and threats) analysis to better understand and predict the medium- and long-term outlooks for the NBRE in the region.

What did the study find?

Including direct, indirect, and induced multiplier effects, Santa Cruz County's NBRE accounted for the following total county economic contributions in 2019:

- $121.7 million in output (sales)
- $53.8 million in value added (gross domestic product (GDP))
- $41.2 in labor income (employee compensation and business owner income)
- 1,188 full- and part-time jobs
- $4.7 million in state and local tax revenue

The NBRE directly supported the following economic activity in Santa Cruz County in 2019:

- $76.6 million in output (sales)
- $31.1 million in value added (GDP)
- $26.8 in labor income (employee compensation and business owner income)
- 779 jobs

Nature-based industries directly contributed $40.0 million to Santa Cruz County output (sales) in 2019, directly supporting 345 jobs and $12.5 million in income, and contributing approximately $12.6 million to Santa Cruz County's GDP (value added).

- Within the context of this study, nature-based industries are industries that derive renewable products from nature within Santa Cruz County, and those that process locally sourced renewable products of nature into value-added goods. Effectively, this encompasses agricultural industries, renewable energy generation, wineries, and select food, fiber, and wood manufacturing businesses.
- Economic activity of nature-based industries includes sales of agricultural products, wine, and manufactured products produced from locally sourced renewable resources. It also includes operational costs associated with renewable energy generation located in the county.

Nature-based tourism directly contributed $22.9 million to Santa Cruz County output (sales) in 2019, directly supporting 320 jobs and $8.9 million in income, and contributing approximately $13.0 million to Santa Cruz County's GDP (value added).

- Santa Cruz County is home to a number of state and national parks and other protected areas and is recognized as an area with high natural amenities and opportunities for outdoor recreation. Popular outdoor recreation activities in the county include wildlife viewing, birdwatching, camping, hiking, mountain biking, equestrian activities, and hunting.
- Economic activity related to nature-based tourism captures visitor spending in Santa Cruz County in 2019 and includes visits to national parks, state parks, the Coronado National Forest, and some privately-owned natural areas, including agritourism activities taking place in the region's vineyards and wineries.

Conservation, preservation, and restoration activities (C&R activities) directly contributed $13.7 million to Santa Cruz County output (sales) in 2019, directly supporting 114 jobs and $5.4 million in income, and contributing approximately $5.4 million to Santa Cruz County's GDP (value added).

- Santa Cruz County has a long history of conservation, restoration, and preservation (C&R) activities, with much of this activity increasing in recent years. A strong community of organizations and volunteers support these efforts and work collaboratively to preserve and protect the county's unique natural environment.
- Economic activity related to C&R activities involves federal, state, and local government agencies, public land managers, private landowners, nonprofits, research scientists, private contractors and consultants, tribes, and others.

The following table summarizes the economic contribution by NBRE component, economic contribution metric, and by direct, indirect and induced, and total effects.

NBRE Component	Full- & Part-Time Jobs	Labor Income	Value Added / GDP	Output / Sales
Nature-Based Industries				
Direct	345	$12,525,300	$12,619,400	$40,014,700
Indirect & Induced	263	$9,172,900	$13,761,300	$25,517,200
Total	***608***	***$21,698,200***	***$26,380,700***	***$65,531,900***
Nature-Based Tourism				
Direct	320	$8,861,300	$13,023,300	$22,923,800
Indirect & Induced	89	$2,860,900	$5,143,900	$11,842,600
Total	***409***	***$11,722,200***	***$18,167,200***	***$34,766,400***
Conservation, Restoration, & Preservation (C&R)				
Direct	114	$5,411,400	$5,415,400	$13,680,200
Indirect & Induced	57	$2,334,600	$3,812,100	$7,696,000
Total	***171***	***$7,746,000***	***$9,227,500***	***$21,376,200***
NBRE Combined Direct	779	$26,798,000	$31,058,100	$76,618,700
NBRE Combined Indirect & Induced	409	$14,368,400	$22,717,300	$45,055,800
NBRE COMBINED TOTAL	***1,188***	***$41,166,400***	***$53,775,400***	***$121,674,500***

Beyond border and international trade-related industries, the share of the county economy linked to the NBRE is considerable, particularly in rural areas.

- The Nogales area is the county's most populous area and is home to a highly concentrated fresh produce import industry cluster. The area also has a large share of federal employment related to operations of the international border and port of entry.

- Outside of the Nogales area, other communities include Tubac, Patagonia, Sonoita, and Elgin, among others. These areas are generally rural and rely on industries such as ranching, wineries, and nature-based tourism to state and national parks, the national forest, and other natural areas.
- Industries directly part of (or closely linked to) the NBRE, accounted for 30% of net job gains in Santa Cruz County over the past decade.
- Several nature-based industries are considered part of the economic base of the Santa Cruz County economy, including ranching and the growing wine industry.

Santa Cruz County is nationally distinguished as an area of immense natural and cultural resources.

- Santa Cruz County is part of the region known as the 'Sky Islands', characterized by a wide range of elevations, ecosystems, and rich biodiversity.
- It is also part of the newly established Santa Cruz Valley National Heritage area, one of 55 areas in the nation that are federally-recognized for their distinct landscapes with rich natural, cultural, historic, and recreation resources. This natural capital is a driver of the NBRE.

Industry stakeholders provided input on strengths, weaknesses, opportunities, and threats to promoting the NBRE in Santa Cruz County. This information, along with secondary data, informed short- and long-term projections for the three NBRE components in the county.

- Considering recent regional and national outdoor recreation trends, the unique natural, multi-cultural, and historical significance of the region, and the region's popularity as an outdoor recreation destination, nature-based tourism in Santa Cruz County is expected to grow in both the short- and long-terms. Constraints to this growth identified by stakeholders include a lack of tourism infrastructure (lodging and other tourist amenities) as well as lack of resources (human and financial) and organization to support a cohesive, coordinated approach to market the numerous nature-based tourist opportunities in the region. Opportunities exist to better promote better these natural areas in the region and cater to specific segments of the nature-based tourist population.
- Nature-based industries are not anticipated to have a consistent growth trend in the short- or long-term. In the short-term, vineyards and wineries are expected to continue growing, as they have in recent years. Given anticipated declines in precipitation due to climate change, constraints on the expansion of irrigated agricultural in the western portion of the county, and general land use and industry changes, agriculture more broadly is expected to exhibit low to moderate decline in the long-term. In contrast, a transition away from fossil fuels and strong solar resources in Santa Cruz County are expected to fuel growth in renewable energy industries. Opportunities exist to help protect and preserve working landscapes through successional planning for ranchers and support for future generations of farmers and ranchers in the county.
- C&R activities are expected to grow both in the short- and long-term within Santa Cruz County. In the long-term, conservation and preservation activities are expected to stagnate due in part to the county's limited land base, while restoration activities are expected to continue growing. Constraints to this

growth include the availability of public and private funding, though opportunities exist to pursue C&R activities within a market-oriented framework, versus a traditional not-for-profit model.

Santa Cruz County's rich biodiversity, natural beauty, and engaged NBRE community make it a dynamic location for studying the economics of conservation, restoration, and other nature-related economic activity.

- Future research could include conducting visitor surveys to better understand different economic value of the environment, including the value of things not bought and sold in a market economy, such as the value of nature-based recreation in Santa Cruz County.
- It could also involve conducting a hedonic price analysis to better understand the value that Santa Cruz County homeowners place on proximity to natural amenities such as open space, riparian areas, or scenic views.
- Finally, it could involve conducting analyses to better understand and measure the impacts of conservation and restoration and estimate the value of ecosystem services, resources, and benefits that people derive from the natural environment.
- Confronting influences such as climate change or land-use change will present unique challenges in the future, however, this study demonstrates ways in which the regional economy can benefit from efforts to protect and restore the environment.

How was the study done?

This study was conducted in four phases. The first phase involved developing a baseline profile of the county's economy in 2019, prior to the 2020 COVID-19 pandemic and resulting economic shocks. The second phase involved a deliberative process with the study's project planning group to define the component parts of the county's NBRE. Once a definition was finalized, the third phase worked from that definition to quantify economic activity that took place within the county in 2019 that was directly attributable to the NBRE. This portion of the analysis involved collecting primary data from NBRE stakeholders, in addition to compiling existing secondary data. It also involved conducting a SWOT (strengths, weaknesses, opportunities, and threats) analysis for the NBRE based on stakeholder interviews and developing projections for components of the NBRE at 10- and 30-year timeframes. Finally, working from the NBRE's direct economic activity estimated in the third phase of the project, phase four involved estimating the economic multiplier effects of the NBRE in terms of the number of jobs, income, sales, and value added using the IMPLAN 3.1 model and data for Santa Cruz County, Arizona.

This study uses a regional economic analysis framework to examine the NBRE's role in Santa Cruz County's economy. It measures the circulation of money through the regional economy attributable to the NBRE and presents measurable contributions in terms of dollar and jobs. While these methods are useful from a regional economic development perspective, they only capture one type of value attributable to the natural environment. There are many economic values that are not captured in this report that are associated with the benefits that humans derive from nature. These values represent opportunities for future research.

Introduction

Nature and the resources and benefits it provides are key inputs to production processes that stimulate economic growth. They enhance quality-of-life, and ultimately provide the underpinnings for human life. They also contribute to the health of regional economies through 'nature-based' industries that depend on them, supporting jobs, income, and economic development. At the same time, how these natural resources are used can either build or degrade the natural resource base within a region and positively or negatively affect the regional economy. This study sets out to examine the industries within the ***nature-based restorative economy (NBRE)*** and estimate their contributions to the Santa Cruz County, Arizona economy.

This report has five parts.

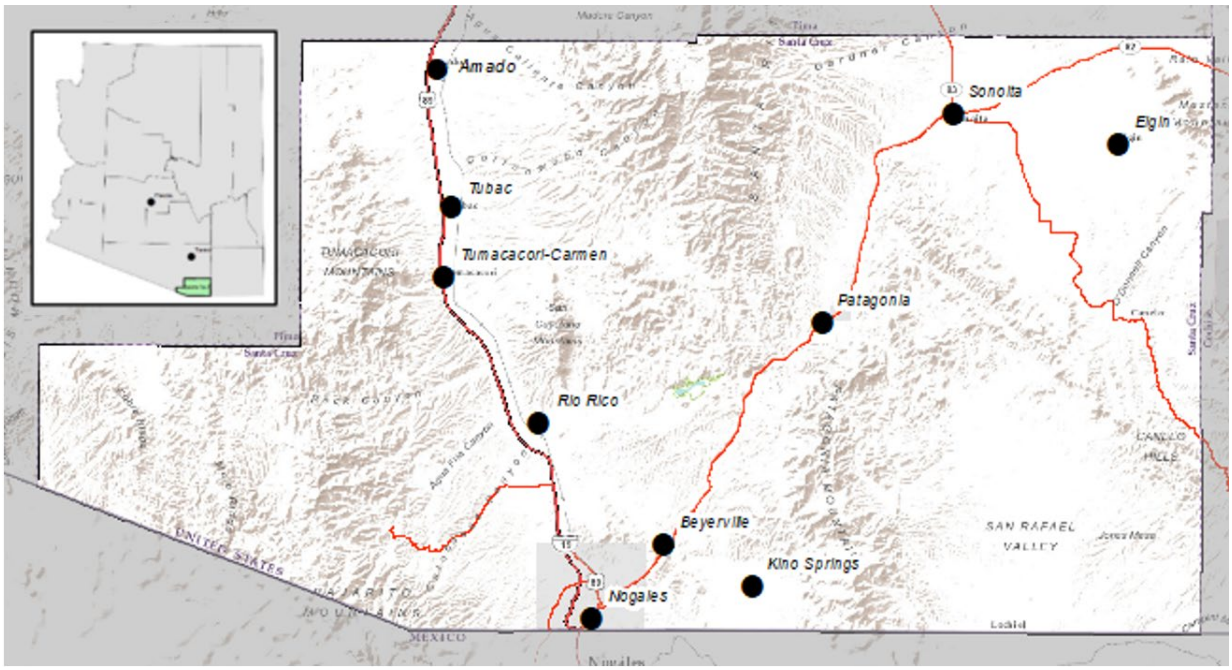
- ***Part I*** develops a socioeconomic and natural resource profile for Santa Cruz County. This information provides context for the results of this study as well as establishes a baseline of economic conditions that can be used for planning and forecasting purposes. This section includes information about county demographics, labor force and income, and industry trends prior to the COVID-19 pandemic. It also provides a profile of the county's natural resources including land, water, and related natural amenities.
- ***Part II*** establishes a definition of the NBRE for Santa Cruz County. As there is no single, official definition, this section presents a conceptual framework, provides a literature review of studies that have looked at similar topics, and describes the stakeholder-driven process used to define the NBRE within Santa Cruz County.
- ***Part III*** then utilizes the definition established in the previous section to develop a profile of the Santa Cruz County NBRE, characterizing and quantifying economic activity taking place in the NBRE in 2019. As part of this section, a SWOT (strengths, weaknesses, opportunities, and threats) analysis is also conducted to better understand and predict the short- and long-term outlooks for the NBRE in Santa Cruz County.
- ***Part IV*** presents the results of an economic contribution analysis for the Santa Cruz County NBRE in 2019. This section provides an estimate of the number of jobs, income, and economic activity that are directly supported by the NBRE as well as the economic activity supported in other industries in the county through *indirect* and *induced multiplier effects*. *Indirect effects* are the economic activity generated through business-to-business transactions, or when businesses within the NBRE purchase goods and services from other local businesses as inputs or supplies while *induced effects* are the economic activity generated when NBRE employees use their income to buy goods and services from local businesses.
- Finally, ***Part V*** provides a summary of the study's results, including a discussion of study limitations and possible future research.

Part I. Profile of Santa Cruz County's Pre-Pandemic Economy

Introduction & County Demographics

Santa Cruz County is the smallest of Arizona's 15 counties as measured by land area and is located at the state's southern border with Mexico between Pima County to the west and Cochise County to the east (Figure 1). Despite its small size compared to other counties in the state, Santa Cruz County is of critical importance to Arizona's economy as it supports a logistics hub for international trade in the Nogales area.

Figure 1. Map of Santa Cruz County, Arizona



The largest cities and towns in the county are Nogales and nearby Rio Rico, with roughly 20,000 residents each (Table 1). These two communities are located along the I-19 corridor and represent the largest employment centers in the county.

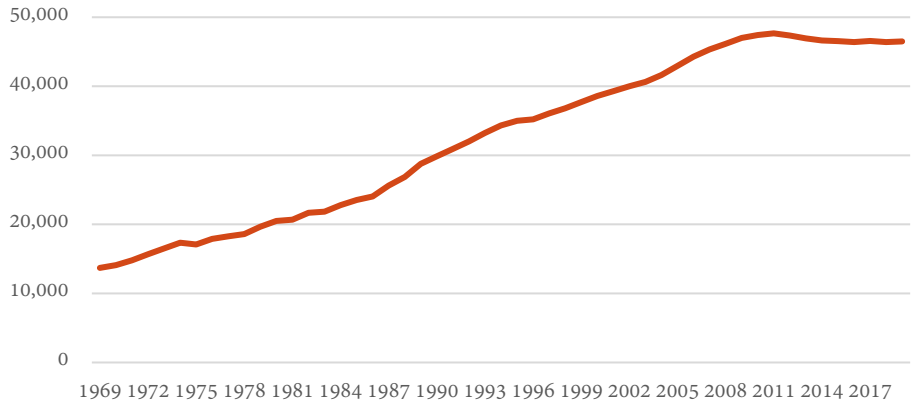
Table 1. Population of Cities & Towns in Santa Cruz County, 2019

City, Town, or Census Designated Place	2019 Population	Percent of Population
Nogales	20,201	43.5%
Rio Rico	19,581	42.1%
Tubac	1,375	3.0%
Sonoita	801	1.7%
Patagonia	772	1.7%
Kino Springs	321	0.7%
Tumacacori-Carmen	132	0.3%
Elgin	91	0.2%
Beyerville	33	0.1%
Amado	33	0.1%
Undesignated	3,140	6.8%
TOTAL Santa Cruz County	46,480	

Source: American Community Survey, 2019

Between the 1970s and 2010, Santa Cruz County saw steady population growth, adding residents at a rate of almost 1,000 people per year between 1980 and 2010. Beginning in 2010, the county's population growth slowed, and in fact become negative for a number of years (Figure 2). This change in the population trend is attributable to domestic out-migration (U.S. Census Bureau, 2020).

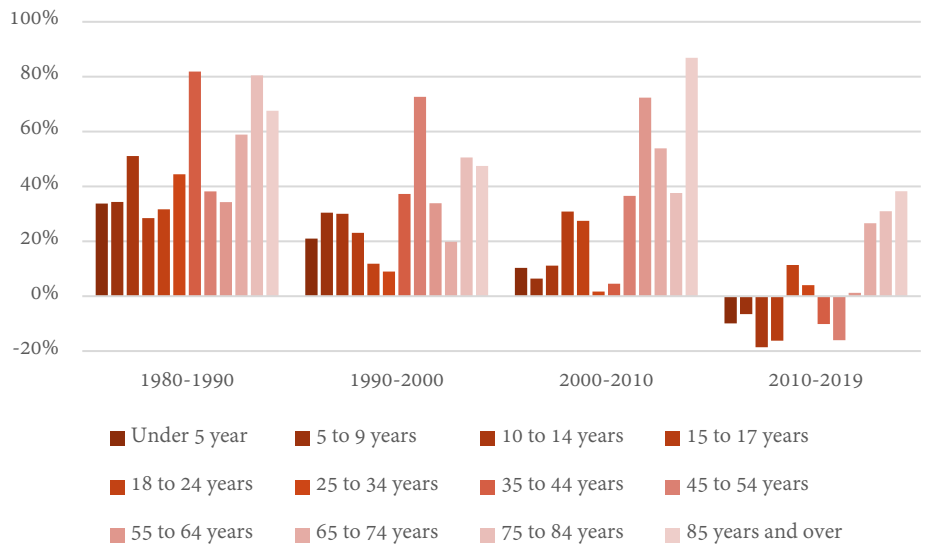
Figure 2. Santa Cruz County Population, 1969-2019



Source: U.S. Census Bureau

While overall the county's population has seen significant growth since the 1980s, that growth has occurred unevenly across age groups. Between 1980 and 1990, population growth among individuals over age 40 to 50 was high, meanwhile, population growth among lower age groups declined during that time. Between 2010 and 2019, population growth for individuals aged 65 and over remained high, while growth rates were generally negative for individuals under age 65 (Figure 3).

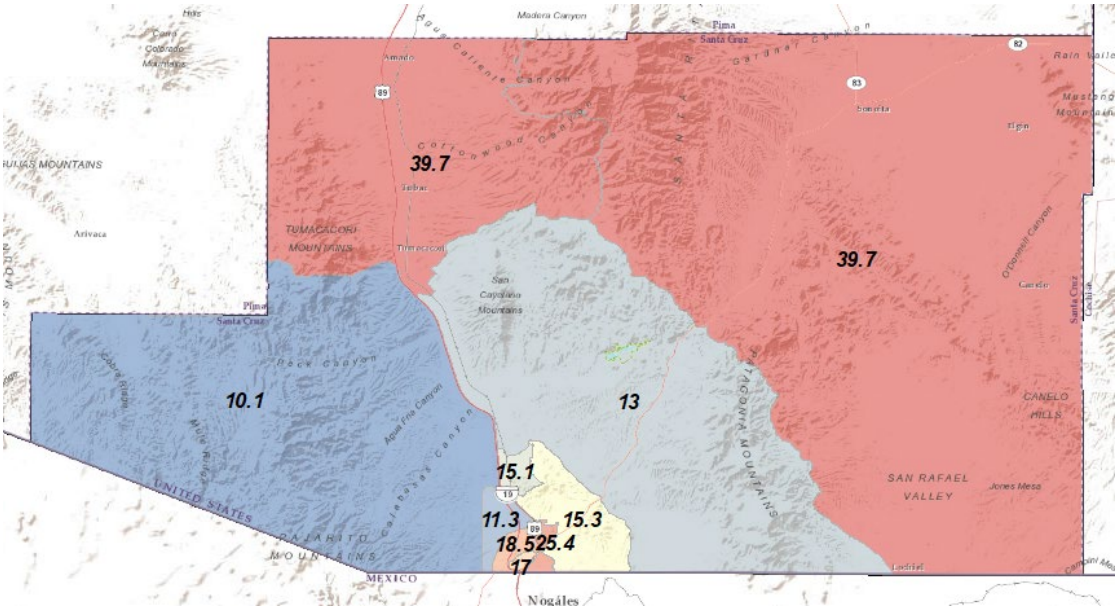
Figure 3. Santa Cruz County Population Growth Over Time by Age Group, 1980-2019



Source: 1980, 1990, 2000, & 2010 Censuses, 2019 American Community Survey

The share of Santa Cruz County's population over age 65 (Figure 4) varies significantly across the county, with two general segments of the population: a younger population centered in and around Nogales, and an older retirement-age population in other areas of the county.

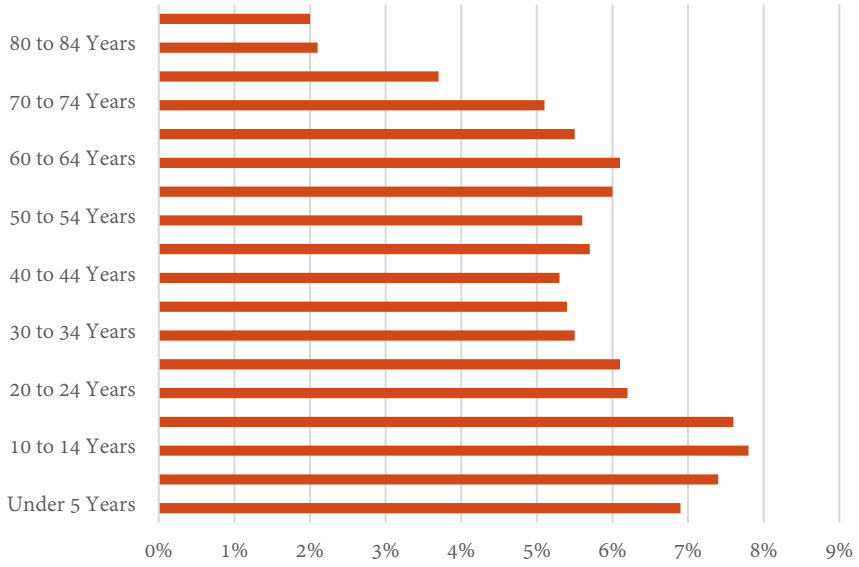
Figure 4. Percent of Population Over Age 65 by Census Tract, Santa Cruz County, 2019



Source: 2019 American Community Survey 5-Year Estimates

These two predominant segments of the county's population are particularly evident in examining a population pyramid for the county (Figure 5).

Figure 5. Santa Cruz County Population Pyramid, 2019



Source: American Community Survey, 2019

As of 2019, the county's population stood at 46,480 individuals. Nearly 84% of Santa Cruz County's population was of Hispanic or Latino origin (Table 2).

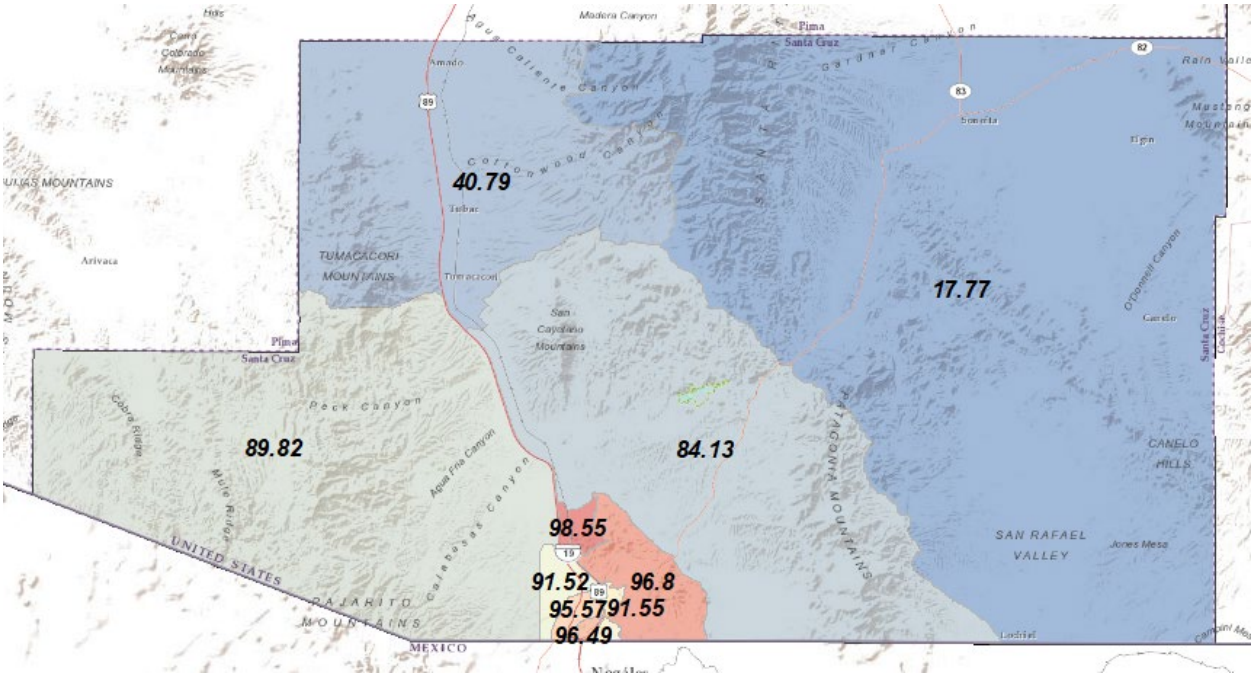
Table 2. Population by Race and Ethnicity, Santa Cruz County, 2019

	Not Hispanic or Latino		Hispanic or Latino	
	Population	Percent	Population	Percent
Total	7,687	16.5%	38,793	83.5%
White Alone	6,904	14.9%	32,936	70.9%
Black or African American Alone	110	0.2%	191	0.4%
American Indian & Alaska Native Alone	104	0.2%	256	0.6%
Asian Alone	387	0.8%	37	0.1%
Native Hawaiian & Other Pacific Islander Alone	0	0%	0	0%
Some Other Race Alone	16	0%	4,915	10.6%
Two or More Races	166	0.4%	458	1.0%

Source: American Community Survey 2019 (5-Year Estimates)

In a pattern opposite to the distribution of population 65 year of age and older, the areas of the county with the highest concentration of population of Hispanic or Latino origin are clustered in and around Nogales, while the eastern portion of the county has the lowest concentration of Hispanic or Latino population (Figure 6).

Figure 6. Percent of Population of Hispanic or Latino Origin by Census Tract, Santa Cruz County, 2019



Source: 2019 American Community Survey 5-Year Estimates

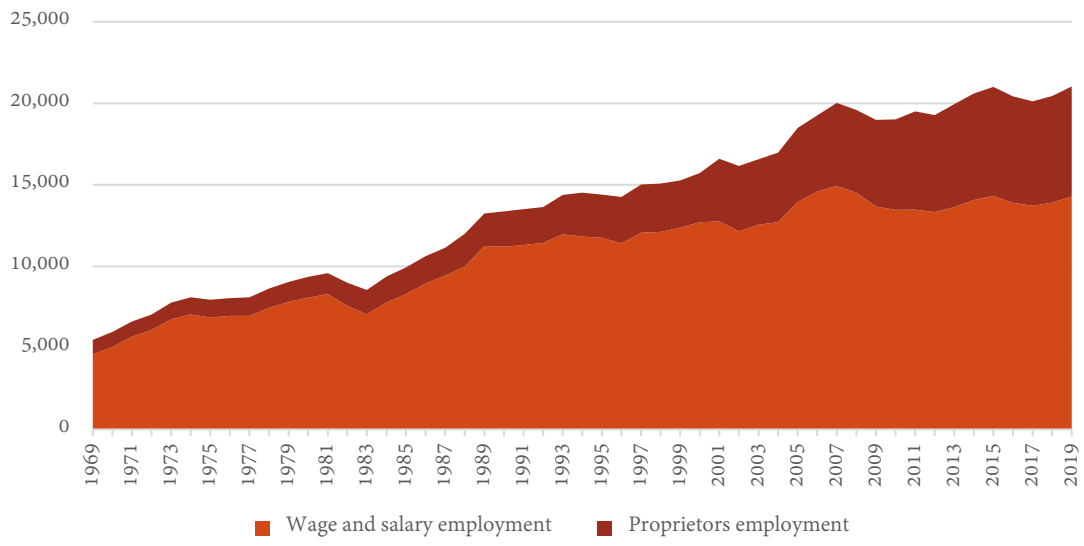
County Economy Overview & High-Level Indicators

In 2019, the county GDP for Santa Cruz County was $2.1 billion, including both private industries and local, state, and federal government. Though the smallest county in Arizona in terms of land area, Santa Cruz County's GDP ranked 11th among the state's 15 counties. Total county employment was 21,036 in 2019, and the unemployment rate was roughly 4%. The county's population was 46,480 in 2019 and about 53% of the county's population was in the labor force. Median household income was $41,259 in 2019, and 18.8% of the county's population lived in poverty (U.S. Census Bureau, 2021).

Labor Force & Income

Total employment in the county stood at 21,036 in 2019, 14,280 of which was wage and salary employment and 6,756 of which was proprietor employment (business owners) (Figure 7). Proprietor employment has grown from 16% of total employment in 1969 to 32% of total employment in 2019. Since 2007, wage and salary employment has remained essentially flat, while growth in employment since that time has occurred through increases in proprietor employment.

Figure 7. Santa Cruz County Wage & Salary Employment & Proprietors Employment, 1969-2019



Source: Bureau of Economic Analysis (2020)

Roughly 53% of the county's population was in the labor force as of 2019 (Table 3), and unemployment stood at 4%. People that are not in the labor force are persons that are not actively looking for work, which could include students, retirees, and caretakers.

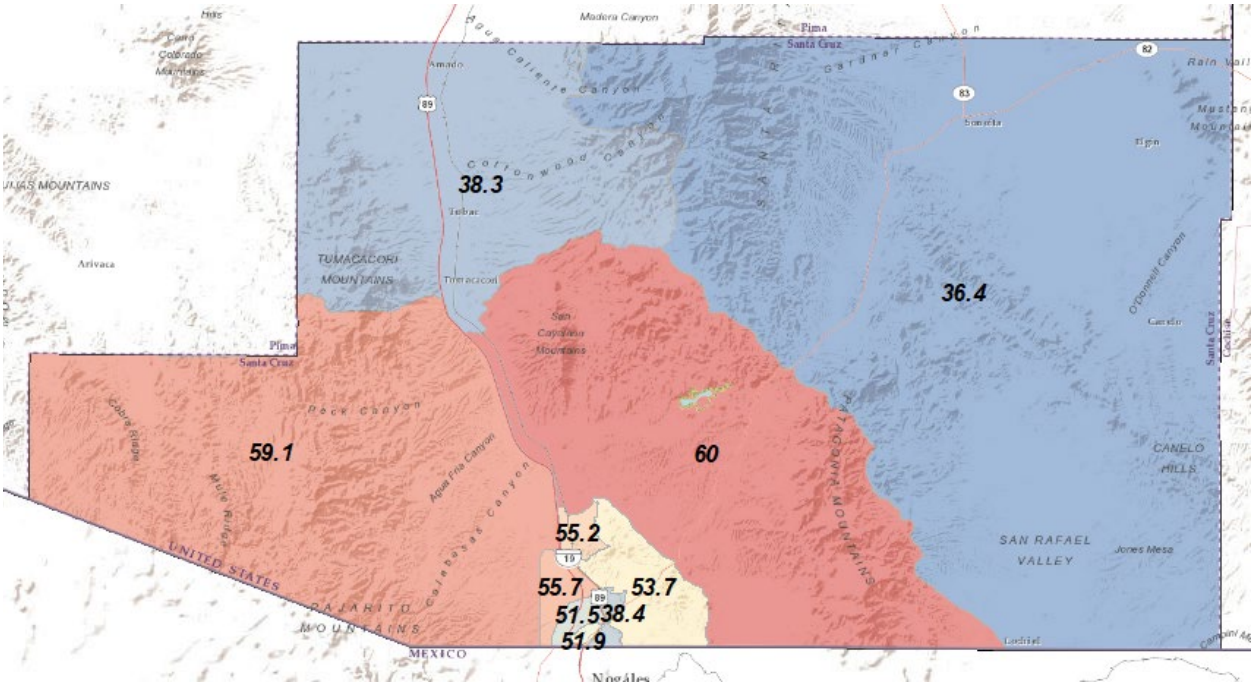
Table 3. Employment Status for Total Population 16 Years and Over, Santa Cruz County, 2019

Category	Population	Percent
Population 16 Years and Over:	35,419	
In Labor Force:	18,694	52.80%
In Armed Forces	107	0.30%
Civilian:	18,587	52.50%
Employed	17,163	48.50%
Unemployed	1,424	4.00%
Not in Labor Force	16,725	47.20%

Source: American Community Survey 2019 (5-Year Estimates)

Labor force participation rates are highest around the Nogales area, but particularly in outlying areas such as Rio Rico, which serves as a bedroom community to Nogales as well as Pima County. The lowest labor force participation rate is in the eastern portion of the county (Figure 8).

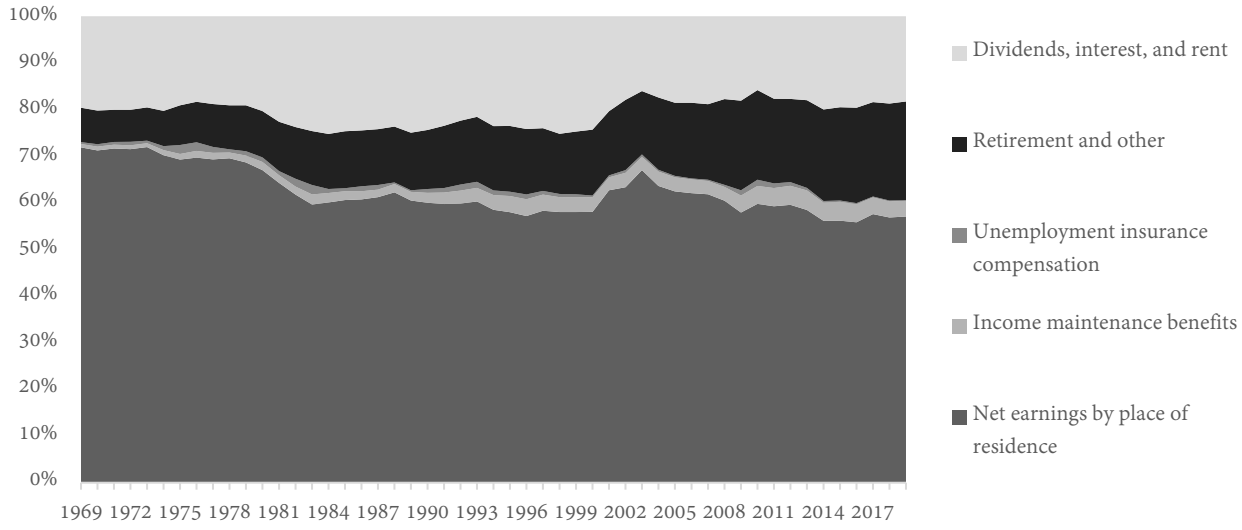
Figure 8. Percent of Population Age 16 and Over in Labor Force, Santa Cruz County, 2019



Source: 2019 American Community Survey 5-Year Estimates

Since the late 1960s, the share of county personal income derived from employment earnings has fallen from over 70% to just over 57% in 2019. Meanwhile, the share of county personal income from retirement income has grown from 7% to over 21% (Figure 9).

Figure 9. Share of Santa Cruz County Personal Income by Type, 1969-2019



Source: Bureau of Economic Analysis, 2020

The educational attainment of Santa Cruz County's population falls below both the state and national averages. Approximately 20% of the county's population has a bachelor's degree or higher, compared to the state (30%) and national (32%) average (Table 4).

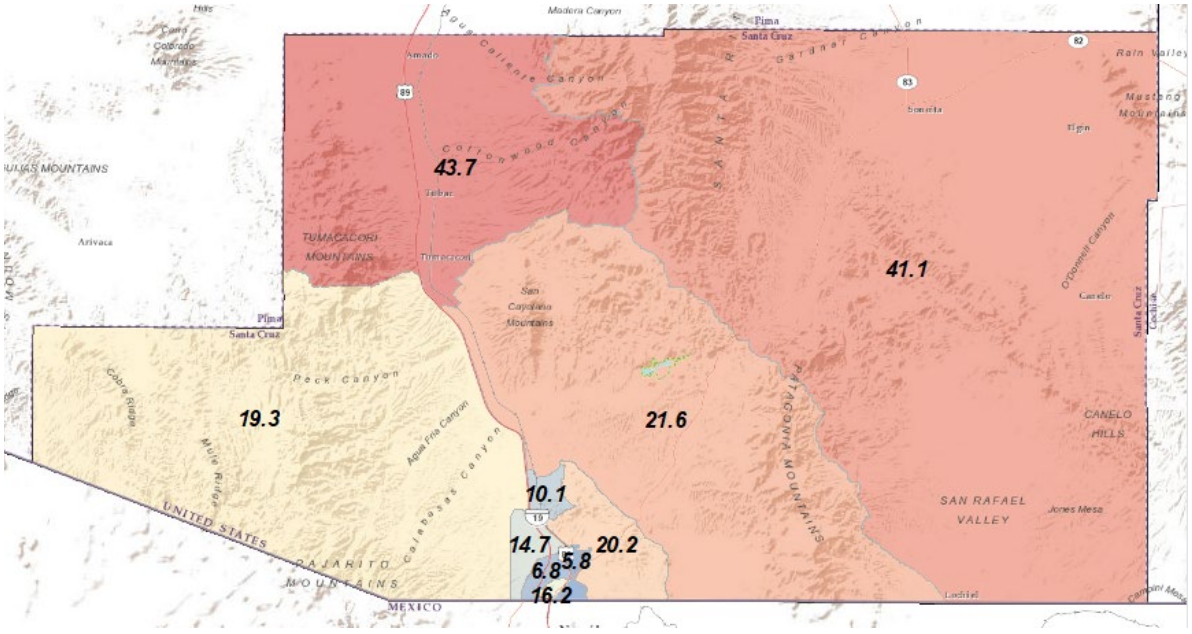
Table 4. Educational Attainment for Population 25 Years and Over, Santa Cruz County, 2019

Category	Santa Cruz County		AZ	US
	Population	Percent	Percent	Percent
Population 25 Years and Over:	29,302			
Less than High School	6,857	23.4%	12.9%	12.0%
High School Graduate (Includes Equivalency)	8,398	28.7%	23.9%	27.0%
Some College	8,060	27.5%	33.8%	28.9%
Bachelor's Degree	3,857	13.2%	18.4%	19.8%
Master's Degree	1,468	5.0%	8.0%	8.8%
Professional School Degree	541	1.9%	1.8%	2.1%
Doctorate Degree	121	0.4%	1.3%	1.4%

Source: American Community Survey 2019 (5-Year Estimates)

The proportion of the population with a bachelor's degree or higher varies widely across the county, from 5.8% of the population in one area of Nogales, to 43.7% of the population in the northwestern portion of the county (Figure 10).

Figure 10. Percent of Population Age 25 or Older with Bachelor's Degree or Higher, Santa Cruz County, 2019

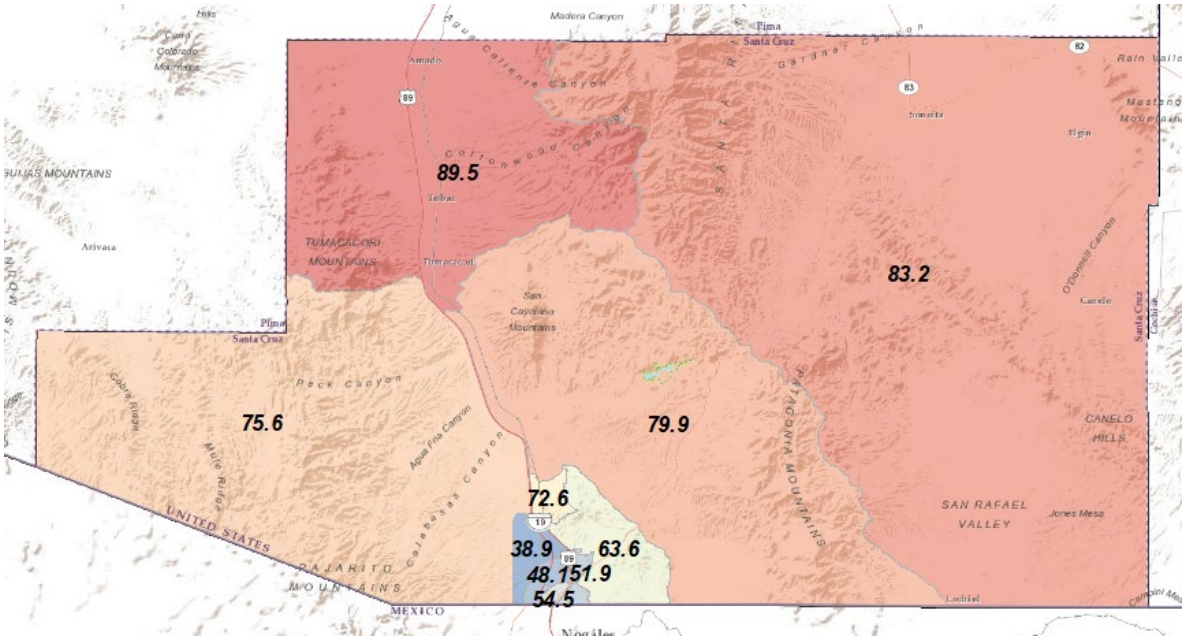


Source: 2019 American Community Survey 5-Year Estimates

There was a total of 18,334 housing units in the county in 2019, of which 10,725 were owner-occupied. The proportion of the population that owns their own home varies across the county, with a relatively lower

proportion owning in the area of Nogales than in other areas in the county (Figure 11). The median value for all owner-occupied housing units in the county was $151,200 in 2019.

Figure 11. Homeownership Rate, Santa Cruz County, 2019



Source: 2019 American Community Survey 5-Year Estimates

Estimated commuting patterns show evidence of significant commuting between Santa Cruz County and Pima County, and vice versa, for work. It is estimated that nearly 2,300 individuals residing in Pima County commute to Santa Cruz County for work, and over 1,600 individuals living in Santa Cruz County commute to Pima County for work (Table 5). Commuting to and from work occurs between Santa Cruz County and other nearby counties as well, including Mexico.

Table 5. Estimated Work Commuting Flows Into & Out of Santa Cruz County

Work County → / County of Residence ↓	Cochise	Coconino	Greenlee	Maricopa	Pima	Pinal	Santa Cruz	Yavapai	Mexico	Other
Cochise County							155			
Coconino County							33			
Greenlee County										
Maricopa County							32			
Pima County							**2,296**			
Pinal County							22			
Santa Cruz County	266		53	20	**1,632**		14,694		324	91
Yavapai County							15			

Source: 2011-2015 5-Year ACS Commuting Flows, U.S. Census Bureau

Industries

Santa Cruz County's economy is dominated by a few high-level industries: *government and government enterprises*; *wholesale trade*; *finance, insurance, real estate, rental, and leasing*; and *transportation and warehousing*. Combined, these industries accounted for 71% of county GDP in 2019 (Table 6).

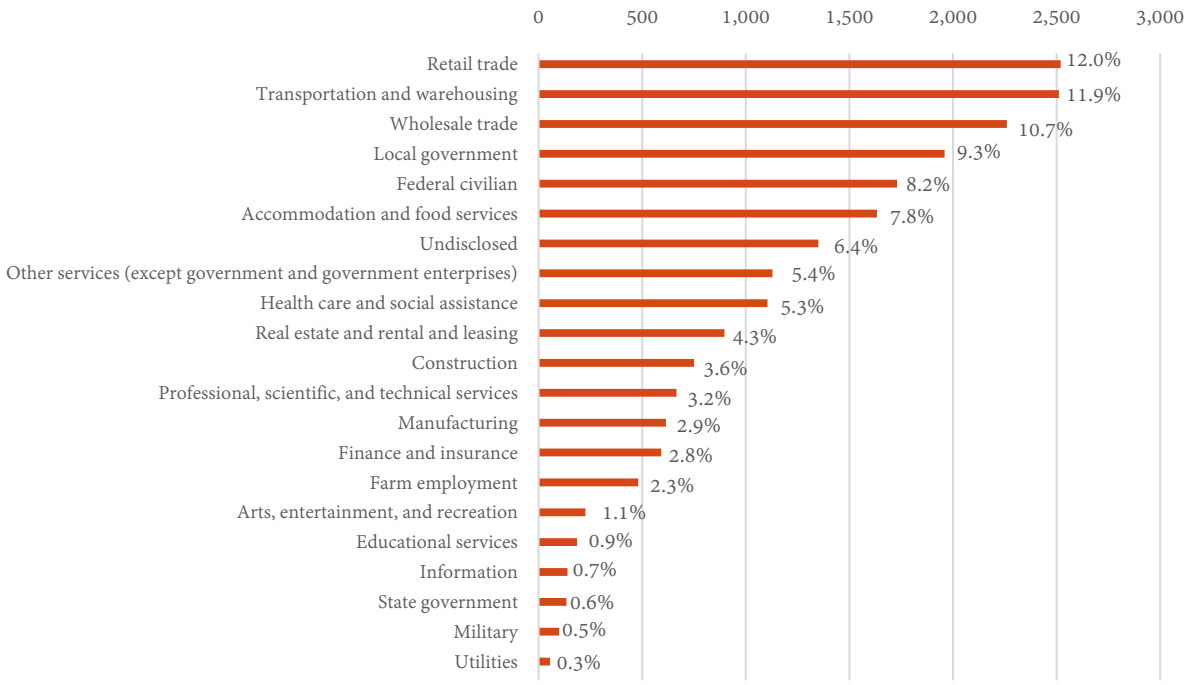
Table 6. GDP by Industry, Santa Cruz County, 2001 & 2019

Industry	Value (2019 USD)		Percent of Total	
	2001	***2019***	***2001***	***2019***
Agriculture, forestry, fishing & hunting	$16,598,412	$23,587,000	1.2%	1.1%
Mining, quarrying, & oil & gas extraction	$130,851	$22,598,000	0.0%	1.1%
Utilities	$4,932,952	$7,867,000	0.4%	0.4%
Construction	$30,790,849	$26,027,000	2.3%	1.2%
Manufacturing	$69,037,407	$108,308,000	5.1%	5.1%
Wholesale trade	$271,972,235	$456,669,000	19.9%	21.6%
Retail trade	$151,017,832	$159,948,000	11.1%	7.6%
Transportation & warehousing	$130,810,458	$235,762,000	9.6%	11.2%
Information	$12,254,994	$14,082,000	0.9%	0.7%
Finance, insurance, real estate, rental, & leasing	$252,623,132	$318,439,000	18.5%	15.1%
Professional & business services	$40,081,289	$93,248,000	2.9%	4.4%
Educational services, health care, & social assistance	$27,871,319	$60,947,000	2.0%	2.9%
Arts, entertainment, recreation, accommodation, & food services	$40,053,149	$59,636,000	2.9%	2.8%
Other services	$26,492,456	$35,181,000	1.9%	1.7%
Government & government enterprises	$290,305,481	$488,798,000	21.3%	23.2%
TOTAL	$1,364,972,816	$2,111,097,000	100.0%	100.0%

Source: Bureau of Economic Analysis (2020); Data retrieved May 20, 2021

Though retail trade accounted for 7.6% of county GDP in 2019, it represented a slightly larger percent of jobs (12.0%) than transportation and warehousing (11.9%), and a larger share of jobs than wholesale trade (10.7%) (Table 6 and Figure 12). Local and federal government, combined, represented the largest share of employment in the county in 2019, with over 3,800 jobs combined (Figure 12). Most government employment in the county was local government employment (1,960 jobs), followed by federal government employment (1,730), state government employment (134 jobs), and military employment (99 jobs) (BEA, 2020b).

Figure 12. Santa Cruz County Full-Time & Part-Time Employment by Industry, 2019



Source: BEA (2020b)

Economic Base Analysis

A common way to assess economic specialization in a county is to conduct an economic base analysis. An economic base analysis determines the relative concentration of an industry within a local economy by analyzing the industry's share of local employment or earnings relative to the national average (Siegel, et al., 1995). This analysis uses an analytical tool known as Location Quotients (LQs). When an industry has an LQ >1.00, it means that the region employs more people (or produces more output) than is needed to meet the demands of their local residents. These industries are referred to as basic industries and demonstrate that the region is more specialized in production than the same industry at the national level. An LQ >1.25 indicates that the industry is part of the economic base—exporting goods and services outside the region and bringing money into the region from outside. Note that tourism-related industries generate "exports" even if spending occurs within the county. This is

because visitors are bringing in spending from outside the county. Industries with LQs ≤ 1.00 indicate that the industry is equally specialized or less specialized than the nation.

Agriculture, Forestry, Fishing and Hunting

Santa Cruz County's *agricultural, forestry, fishing, and hunting* industry was responsible for $23.6 million in county GDP in 2019, or 1.1% of county GDP. While an overall employment location quotient for *agriculture, forestry, fishing, and hunting* in Santa Cruz County is not available, the county's establishment location quotient in this area stands at 2.22 as of 2019, indicating the share of establishments in this industry is more concentrated in the county than for the nation as a whole (Bureau of Labor Statistics, 2020; herein all LQs are from the Bureau of Labor Statistics, 2020). Within this industry, *beef cattle ranching and farming* (NAICS 112111) is highly concentrated with an employment LQ of 15.4. Even more concentrated is *other postharvest crop activities* (NAICS 115114) with an employment LQ of 20.26. This is likely connected with processing related to the county's fresh produce industry. Detailed information on agricultural production in Santa Cruz County is presented later in the report under the section regarding the county's natural resources.

Mining, Quarrying, and Oil and Gas Extraction

Similar to agriculture, *mining, quarrying, and oil and gas extraction* represented 1.1% of Santa Cruz County's GDP in 2019, at $22.6 million. There is no employment location quotient available for *mining, quarrying, and oil and gas extraction* in Santa Cruz County. However, there were 2 establishments in the county as of 2019, with an establishment LQ of 0.54, less concentrated than the national average.

Utilities

The *utilities* industry in Santa Cruz County has an overall employment location quotient of 0.81, less concentrated than the national average. *Utilities* contributed $7.9 million to the county's GDP in 2019, or 0.4% of county GDP.

Construction

Construction accounted for 1.2% of county GDP in 2019, or $26.0 million. In terms of employment, the county's location quotient was 0.27, significantly less concentrated than the national average.

Manufacturing

Manufacturing accounts for 5.1% of county GDP, or $108.3 million, $83.7 million of which was *durable goods manufacturing* and $24.6 million of which was *non-durable goods manufacturing*. The employment LQ for manufacturing in Santa Cruz County is 0.37, less concentrated than the national average. Within manufacturing, a few specific industries show a relatively high concentration of employment in the county. *Wineries* (NAICS 312130) are classified as a manufacturing industry and had an employment location quotient of 5.4 in Santa Cruz County in 2019. There were an estimated 8 wineries with 35 employees in the county[1]. Part of Santa Cruz County falls within the Sonoita American Viticultural Area (AVA), Arizona's first such designated wine grape producing region. Additional information on wineries is provided later in the report. Another industry with no available employment LQ but with an establishment LQ of 9.0 was *wood container and pallet manufacturing* (NAICS

[1] The BLS QCEW identifies 8 establishments with 35 employees. More detailed industry-specific data suggest that there were 18 wineries in Santa Cruz County in 2019 (Bickel, et al., 2021; TTB, 2021).

321920). Pallets and wood containers are used by the fresh produce industry for shipping and packaging imported goods.

Wholesale Trade

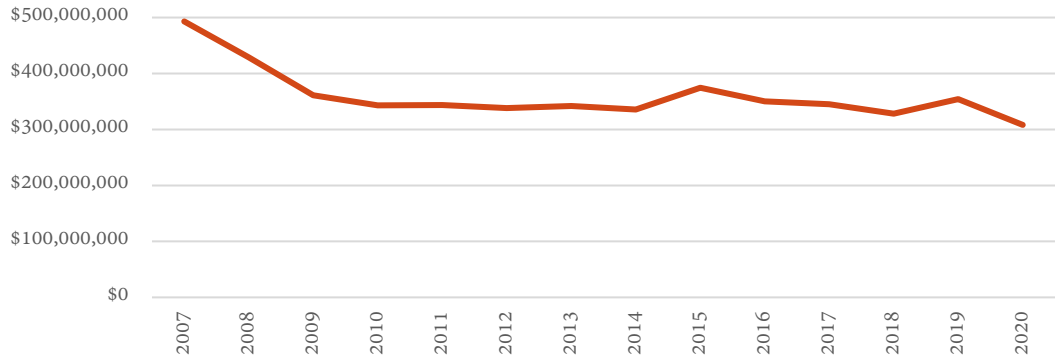
Wholesale trade represented 21.6% of Santa Cruz County GDP in 2019, or $456.7 million. The employment location quotient for wholesale trade was 3.44, nearly three and a half times the national average. Within the wholesale trade, two industries have a high concentration of employment in the county. *Fruit and vegetable merchant wholesalers* (NAICS 424480) have an employment LQ of 147.37, with 120 establishments and an average of 1,355 employees in 2019. This industry is highly concentrated in Santa Cruz County and alone accounted for 6.4% of county employment in 2019. *Wholesale trade agents and brokers* (NAICS 425120) had an employment LQ of 1.88, with 17 establishments and 86 employees. These firms are also involved in foreign trade, including the fresh produce industry.

Retail Trade

Retail trade employment in Santa Cruz County is only slightly more concentrated than the national average, with an employment LQ of 1.34. Within the retail trade, a few industries have a high concentration of employment. This includes *hardware stores* with an LQ of 4.61 (NAICS 444130), *fruit and vegetable markets* with an LQ of 21.64 (NAICS 445230), *clothing accessories stores* with an LQ of 8.81 (NAICS 448150), and *art dealers* with an LQ of 16.59 (NAICS 453920). Overall, *retail trade* represented 7.6% of the county's GDP in 2019, or $159.9 million.

In 2019, Santa Cruz County reported $354 million in gross retail sales. Retail sales in Santa Cruz County have decreased over time, falling by nearly $200 million in gross sales (2019 inflation-adjusted dollars) between 2007 and 2020 (Figure 13). Additional details regarding contraction in the retail industry are presented in the subsequent shift-share analysis.

Figure 13. Santa Cruz County Gross Retail Sales, 2007-2020 (2019 USD)



Source: Arizona Department of Revenue, Taxable Sales by County, Compiled by Arizona Hospitality Research and Resource Center (AHRRC).

Transportation and Warehousing

Transportation and warehousing is highly concentrated in Santa Cruz County, and closely linked with the fresh produce industry and other foreign trade related activities. Within the county, the employment LQ was 3.36 in 2019. *General freight trucking (local)* (NAICS 484110) had an LQ of 2.83, with 20 establishments and 70

employees. *Other specialized trucking (long-distance)* (NAICS 484230) had an LQ of 5.56 with 21 establishments and 71 employees in 2019. *Freight transportation arrangement* (NAICS 488510) had an LQ of 18.65 with 53 establishments and 411 employees. In terms of warehousing, *general warehousing and storage* (NAICS 493110) had an LQ of 4.27 with 30 establishments and 440 employees, while *refrigerated warehousing and storage* (NAICS 493120) had an LQ of 29.22 with 8 establishments and 177 employees. Refrigerated warehousing is especially important for imports of fresh produce. Overall, *transportation and warehousing* represents 11.2% of county GDP in 2019, or $235.8 million.

Information

Employment in *information* is less concentrated than the national average, with an employment LQ of 0.29 in 2019. *Information* represented 0.7% of county GDP in 2019, or $14.1 million.

Finance, Insurance, Real Estate, Rental, and Leasing

Employment in *finance, insurance, real estate, rental, and leasing* is less concentrated than the national average, with an employment LQ of 0.35. The industry presented 2.2% of county GDP in 2019, or $46.4 million. The industry accounted for 15.1% of county GDP, or $318.4 million in 2019. Though a relatively large share of county GDP, the industry's employment LQ is 0.56, about half as concentrated as the national average.

Professional, Scientific, and Technical Services

Professional, scientific, and technical services represented 4.4% of county GDP in 2019, or $93.2 million. The overall employment LQ for this industry was 0.21 in 2019, significantly less concentrated than the national average. Though roughly around a value of 1, the LQ for *process and logistics consulting* is 1.13 (NAICS 541614), with 5 establishments and 14 employees in the county. These firms are likely connected with the foreign trade industry cluster.

Management of Companies and Enterprises

Though there is no employment LQ available for this industry, the establishment LQ is 0.25, less concentrated than the national average.

Administrative and Support and Waste Management and Remediation Services

There is no employment LQ available for this industry, however the establishment LQ is 0.6. Within this industry, *packaging and labeling services* (NAICS 561910) had an LQ of 4.95 in 2019 with 3 establishments and 28 employees. This is likely connected with the foreign trade industry cluster.

Educational Services

Private *educational services* in Santa Cruz County accounted for 0.2% of county GDP in 2019, or $4.1 million. The employment LQ for this industry was 0.27, only including private enterprises. Public *educational services* had an employment LQ of 1.57 in 2019.

Health Care and Social Assistance

Health care and social assistance employment in Santa Cruz County is less concentrated than the national average, with an employment LQ of 0.37 in 2019. This suggests the county is importing health care and social assistance

services from outside the county, for example, individuals may travel to nearby metro areas such as Tucson for healthcare. Health care and social assistance accounted for 2.7% of county GDP in 2019, or $56.0 million.

Arts, Entertainment, and Recreation

The *arts, entertainment, and recreation* industry accounted for 0.2% of county GDP in 2019, or $3.6 million. The employment LQ was 0.12 in 2019, significantly lower than the national average. However, within this area, the county has a high LQ of 10.38 for *nature parks and other similar institutions* (NAICS 712190) with one establishment and 15 employees.

Accommodation and Food Services

Accommodation and food services accounted for 2.7% of county GDP in 2019, or $56.0 million. The employment LQ was 1.07 in that year, consistent with the national average. Within this industry, *hotels and motels, except casino hotels* (NAICS 721110), had an LQ of 2.27 with 11 establishments and 346 employees.

In 2019, Santa Cruz County saw the following reported gross sales for accommodation and food service-related industries:

Table 7. Taxable Sales, Establishments, & Employees in Restaurants & Bars, Amusement, and Hotels & Motels, Santa Cruz County, 2019

Category	2019 Gross Sales	Establishments	Employees
Restaurants & Bars	$63,553,167	68	1,008
Amusement	$4,273,661	8	15
Hotel / Motel	$15,010,860	16	365

Source: Arizona Department of Revenue, Taxable Sales by County, Compiled by Arizona Hospitality Research and Resource Center (AHRRC); BLS QCEW, 2019

Other Services (except Public Administration)

Other services accounted for 1.7% of county GDP in 2019, or $35.2 million, and had an employment LQ of 0.46, lower than the national average. *Other services* includes activities like automotive repair, industrial machinery repair, and laundry services, among others.

Government & Government Enterprises

There is a very high concentration of federal employment in Santa Cruz County related to the port of entry and the international border. The employment LQ was 11.65 for *federal government* in 2019, and 1.86 for *local government*. This includes *federal police protection* (NAICS 922120) with an LQ of 98.19, 3 establishments, and 1,288 employees, and *other justice and safety activities* (NAICS 922190) with an LQ of 107.15, with 1 establishment and 254 employees. Other federal employment includes *administration of conservation programs* (NAICS 924120) with an LQ of 3.53 with 2 establishments and 25 employees, and *urban and rural development administration* (NAICS 925120) with an LQ of 104.2, 1 establishment, and 11 employees. *Government and government enterprises* represented 23.2% of Santa Cruz County's county GDP in 2019, or $488.8 million.

Shift-Share Analysis of Employment Growth

Shift-share analysis is a method to compare employment growth at a local level – a county for example – with employment growth in the nation as a whole. It also measures how local employment growth is affected by the

composition of industries in the area and how those industries compare to their counterparts in the rest of the country. It is frequently used by regional scientists, geographers, and urban planners. Shift-share analysis has a long history of applications in the study of regional economic growth dating back to the 1940s (Creamer 1943; Dunn, 1960; Perloff et al., 1960; Curtis, 1972). Here, we present the traditional, accounting-based approach. Although more sophisticated (and complex approaches) have been developed (Barff and Knight III, 1988; Knudsen, 2000), the traditional approach has advantages of ease of application and interpretation by those less steeped in statistical and regional science methods.

Traditional shift-share analysis divides local employment growth into three components: a ***national growth*** component, an ***industry mix*** component, and a ***regional shift*** component. It also considers job growth comparing employment between a beginning and an ending year. The national growth component is the rate of job growth one would expect in a county if its rate of job growth exactly matched the national average for all industries. Job growth in individual industries does not exactly match the national average for all jobs. The industry mix component accounts for the fact that a county may have faster or slower overall job growth than the national average because it just happened to have a larger mix of fast-growing or slow-growing (or declining) industries. The regional shift component, also called the competitive effect, measures how jobs in particular industries in a county grew relative to national average job growth in those same industries. This regional effect is often interpreted as the local region having some sort of comparative advantage or disadvantage that favors higher or lower growth in particular industries. This might be *attributed* to the natural resource base, local labor force characteristics, or state or county policies that may promote or hinder job growth. We caution though that shift-share analysis alone cannot provide an explanation of *why* specific industries are growing more slowly or rapidly than the national average. One should also keep in mind that localities cannot all have above-average employment growth.

To provide some intuition, suppose you were asked to estimate or predict how much employment grew in a particular county over a particular span of time. Now also suppose you knew nothing about this particular county. This, at first, appears to be a daunting task. But you do have information about the national economy that could help. Depending on the beginning and end dates of your estimate, you would know whether the national economy was at high point or a low point. Going into a recession (2002-2008) or coming out of one (2009-2019). Although each county is different, they are all subject to changes in the national business cycle, national fiscal policy, and monetary policy, as well as pervasive demographic and technological changes. So, one might, as a first approximation, assume that jobs in the county you are to estimate grew at the same rate of overall jobs in the U.S. economy (17.88%) (Table 8). This is exactly what the ***national growth effect*** in shift-share analysis does.

But job growth in individual counties and individual industries is not the same as national average job growth. Employment in some industries grows faster or slower than others and the mix of industries within each county can affect job growth within the county. So, if a county had a mix of industries that nationally experienced more rapid job growth, one might expect job growth in that county to be faster than average. Conversely, if a county had a preponderance of jobs in slow growing industries, one might expect that county to have slower than average job growth. For example, job growth in *construction* (28.64%), *health care* (21.01%), and *real estate* (27.66%) grew at a faster rate than the national average (17.88%) from 2010-2019 (Table 8). So, one might expect counties that

started with relatively more jobs in these industries to experience faster than average job growth. Conversely, job growth was lower than average in *manufacturing* (12.22%) and *federal civilian* (-5.14%) and *military* (-7.33%) jobs actually declined over this period (Table 8). So, one might expect counties that concentrated on manufacturing and had a large military and other federal job presence to have lower than average growth.

Table 8 below shows the percentage change in U.S. jobs from 2010 to 2019, broken down by major industry. Nationally, over this period, the total number of jobs for all industries increased by 17.88%. Job growth in some industries (such as *construction*, *real estate & rental & leasing*, and *health care and social assistance*) was greater than this average. Other industries (such as *manufacturing*, *retail trade*, and *wholesale trade*) experienced slower than average growth. Still others experienced negative growth (a net loss of jobs) over this period (*farm employment*, *federal civilian* jobs, and *military* employment). So, counties with a greater mix of jobs in high-growth industries may experience faster than average growth.

Going back to the task of predicting that particular county's job growth, suppose now that you were given information about the mix of industries in that county. You would then know if the county had a lot of jobs in fast-growing or slow-growing industries. With this new information, you could adjust your original estimate based on national average growth up or down to get a better estimate. This adjustment is exactly the ***industry mix effect*** in shift-share analysis

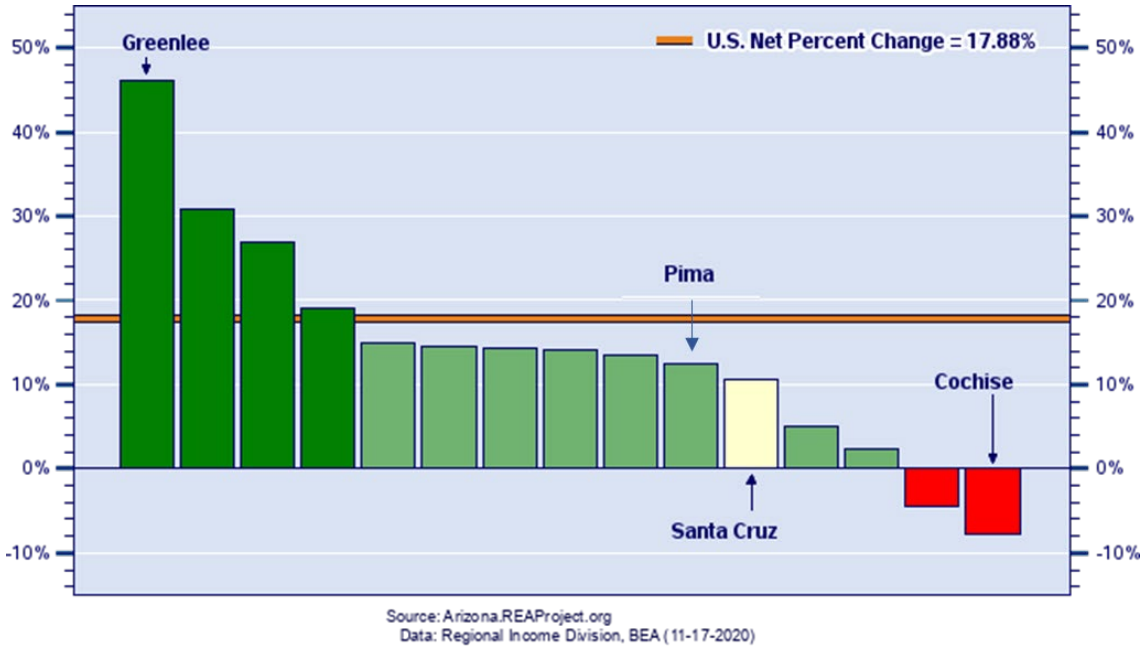
Table 8. Net Job Growth by Major Industry, United States, 2010-2019

Major Industry	Percent Job Growth Nationally
Farm Employment	-1.33
Construction	28.64
Manufacturing	12.22
Wholesale Trade	8.25
Retail Trade	8.61
Information	7.70
Finance & Insurance	19.12
Real Estate & Rental & Leasing	27.66
Educational Services	17.29
Health Care & Social Assistance	21.01
Arts, Entertainment, & Recreation	28.47
Accommodation & Food Services	27.65
Other Services (except Public Administration)	20.55
Federal Civilian	-5.14
Military	-7.33
State Government	1.85
Local Government	1.94
All Industries	17.88
Source: Arizona Regional Economic Analysis Project (AZ-REAP) and the U.S. Department of Commerce, Bureau of Economic Analysis	

While using information about local industry mix might improve your estimate of job growth in your county, your estimate may still be off. Industries in individual counties may deviate from national industry averages. While *health care and social assistance* experienced strong job growth nationally, your county might have had a rural hospital that closed down. While *federal government* jobs might have declined nationally, some federal agency might have built a large new facility in your county. So, at the industry level, local jobs can buck national trends. These two cases are examples of the ***regional shift effect***. These are local job changes that deviate from what you would expect from national growth and industry mix effects.

We begin by comparing Santa Cruz County's employment growth over the past decade with the national average and neighboring counties. Data come from the Bureau of Economic Analysis (BEA), compiled by the Arizona Regional Economic Analysis Project (Arizona REAP). Coming out of the Great Recession, the national average growth rate of employment for all industries was 17.88% from 2010 to 2019. Eleven of Arizona's 15 counties, including Santa Cruz County, had employment growth below the national average (Figure 14). Employment in Santa Cruz County grew by 2,021 jobs, from 19,015 jobs in 2010 to 21,036 jobs in 2019 (Table 9). Santa Cruz County's employment growth rate of 10.6% ranked 11th in the state, trailing ten counties and surpassing four (Figure 14). Employment growth in neighboring Pima County was slightly higher at 12.5%, but still below the national average. Employment growth in Santa Cruz County faired substantially better than Cochise County, which ranked last in the state, with overall employment *losses* of -7.9%. Santa Cruz County's employment growth trailed the nation as a whole by 7.25% (10.63% – 17.88%). Shift share analysis helps assess which factors account for this slower than average employment growth.

Figure 14. Santa Cruz County Employment Growth from 2010 to 2019 Ranked among Arizona's 15 Counties



Job growth in Santa Cruz County from 2010 to 2019 can be written as the sum of the three effects introduced above:

Actual Job Growth = National Growth Effect + Industry Mix Effect + Regional Shift Effect

This can be expressed in terms of either the growth rate (% change) or the change in the absolute number of jobs. The ***national growth effect*** is the change in jobs in Santa Cruz County that would have occurred (hypothetically) if every single industry grew at the national average growth rate for all jobs of 17.88%. The ***industry mix effect*** is the change in employment if jobs in every industry in Santa Cruz County changed at the national average for those same industries. For example, it measures what would happen if Santa Cruz County jobs in wholesaling grew at the national average for *wholesale trade* or if county jobs in *construction* grew at the national average rate for U.S. construction as a whole. This captures the fact that some industries grow faster than the average, others slower. Counties will have different mixes of fast-growing industries and slow-growing industries. The ***regional shift effect*** measures differences in local job changes in particular industries compared to national averages for the same industries. This measures local growth not explained by overall national job growth or a county's mix of industries.

Examining job growth from 2010 to 2019, the summary shift-share formula for Santa Cruz County is:

Actual Job Growth		National Growth		Industry Mix		Regional Shift
10.63%*	=	17.88%	+	-2.74%	+	-4.51%
(2,021 jobs)		(3,399 jobs)		(-521 jobs)		(-857 jobs)

*Percent growth figures may not add due to rounding by a factor of ± 0.01%.

This formula says that, from 2010 to 2019, Santa Cruz County had an increase in 2,021 jobs, a 10.63% increase. If county employment had grown at the same pace as the national average though, there would have been 3,399 additional jobs. Some of this was because the county had relatively more jobs initially in slower job growth industries starting in 2010. This industry mix effect accounts for 521 fewer jobs than the national average growth rate would have entailed. To return to our prediction exercise, if you had no information about Santa Cruz County, but knew that total jobs in the United States grew by 17.88%, your first guess might be that jobs in Santa Cruz County grew at this same rate. Next, if you were given information about industry-specific growth rates, you would know that the county had a mix of industries skewed toward slower-growing industries. With this information you would adjust your initial guess downward by 521 jobs. However, even with this downward adjustment, you would still be overestimating actual job growth. Specifically, you would be off, with an overestimate of 857 jobs. That remaining difference is the regional shift effect. This means that some particular industries in the county had lower job growth than the same industries in the rest of the country.

Figure 15. Summary of Shift-Share Analysis Results Santa Cruz County Employment Growth, 2010-2019

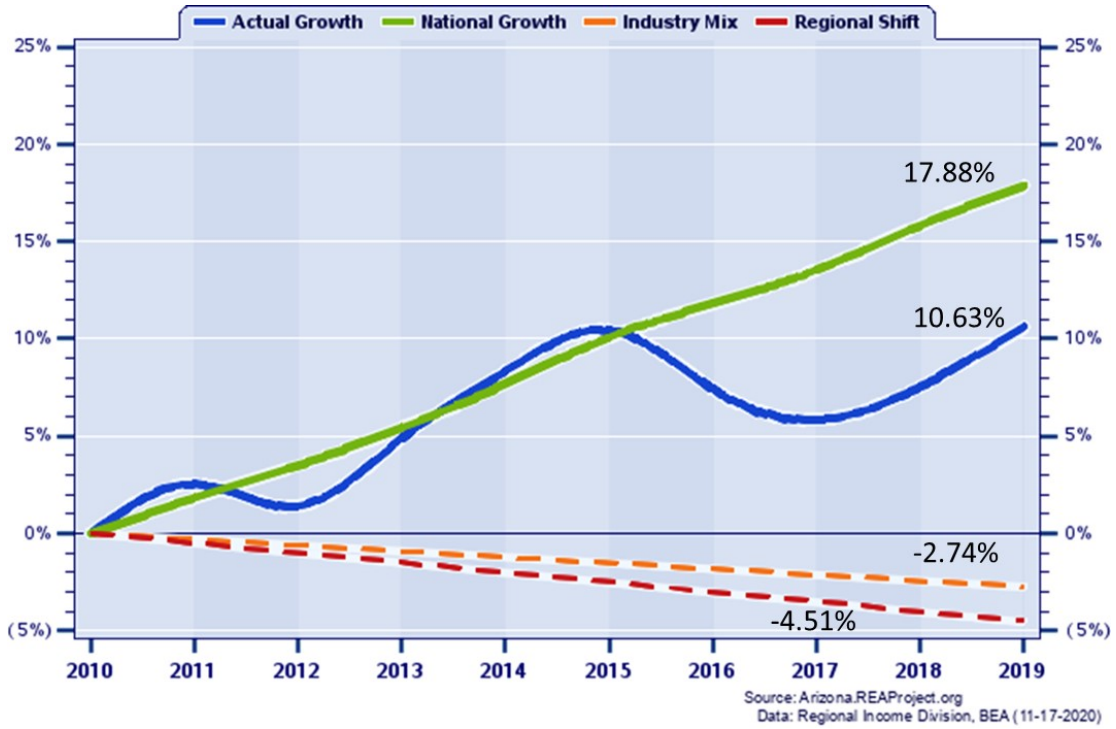


Figure 15 presents these same results graphically. The green line shows what employment growth would have been if it exactly matched national average growth. The orange line shows the negative effect of the county having relatively more slow-growing industries, while the red line shows the negative effect of county industries growing less than comparable industries elsewhere. The blue line tracks actual job growth over the decade.

Table 9. Employment Growth by Major Industry, Santa Cruz County, 2010-2019 Compared to Average National (Standardized) Growth

	Actual Santa Cruz County Employment						Standardized Employment Based on National Averages		
	2010		2019		Growth		Growth[2]		Employment[3]
Major Industry	Level	Share[1]	Level	Share	Percent	Net	Percent	Net	2019
Farm Employment	219	1.2	481	2.3	119.63	262	-1.33	-3	216
Construction	667	3.5	750	3.6	12.44	83	28.64	191	858
Manufacturing	667	3.5	614	2.9	-7.95	-53	12.22	81	748
Wholesale Trade	1,880	9.9	2,260	10.7	20.21	380	8.25	155	2,035
Retail Trade	3,044	16.0	2,520	12.0	-17.21	-524	8.61	262	3,306
Information	124	0.7	139	0.7	12.10	15	7.70	10	134
Finance & Insurance	472	2.5	592	2.8	25.42	120	19.12	90	562
Real Estate & Rental & Leasing	932	4.9	897	4.3	-3.76	-35	27.66	258	1,190
Educational Services**	157	0.8	186	0.9	18.47	29	17.29	27	184
Health Care & Social Assistance	942	5.0	1,105	5.3	17.30	163	21.01	198	1,140
Arts, Entertainment, & Recreation	203	1.1	226	1.1	11.33	23	28.47	58	261
Accommodation & Food Services	1,284	6.8	1,633	7.8	27.18	349	27.65	355	1,639
Other Services (except Public Administration)	877	4.6	1,129	5.4	28.73	252	20.55	180	1,057
Federal Civilian	1,597	8.4	1,730	8.2	8.33	133	-5.14	-82	1,515
Military	104	0.5	99	0.5	-4.81	-5	-7.33	-8	96
State Government	149	0.8	134	0.6	-10.07	-15	1.85	3	152
Local Government	2,134	11.2	1,960	9.3	-8.15	-174	1.94	41	2,175
Other/Suppressed Industries*	3,563	18.7	4,581	21.8	28.57	1,018	29.79	1,062	4,625
Total Employment	**19,015**	**100.0**	**21,036**	**100.0**	**10.63**	**2,021**	**15.14**	**2,878**	**21,893**

1 Share: percentage of total employment by industry.

2 Standardized Growth: This estimates how much Santa Cruz County employment in the industry would have grown if it grew at the national average for that industry.

3 Standardized Employment, 2019: What 2019 industry employment in Santa Cruz County would have been if job growth from 2010-2019 were the same as the national average rate of job growth for that industry.

* "Other/Suppressed Industries" are a combined total of those industries where data were reported due to confidentiality restrictions. Those industries for Santa Cruz County included: Forestry, Fishing, and Related Activities; Mining; Utilities; Transportation and Warehousing; Professional, Scientific, and Technical Services; Management of Companies and Enterprises; Administrative and Waste Services

**Educational services are private services. Public school and education jobs are counted in local government.

Note: Percent growth figures may not add up due to rounding.

Source: Arizona Regional Economic Analysis Project (AZ-REAP) and the U.S. Department of Commerce, Bureau of Economic Analysis

Table 9 compares net job growth in major industries in Santa Cruz County with national average (or standardized) growth in those industries. The four industries contributing most to job growth from 2010-19 were *wholesale trade* (380 jobs added), *accommodation and food services* (349 jobs added), and *farm employment* (262 jobs added). Data come from the BEA. The job counts include full- and part-time employees and proprietors of unincorporated businesses. If a person holds two or more jobs, then each of these jobs is counted as an individual job. The BEA estimates are a count of jobs, not the number of people employed. Employment data are by place-of-work, so people working in Santa Cruz County, but commuting in from other counties are included in this count. People living inside Santa Cruz County but working in another county are excluded.

Table 9 breaks down the contribution of different major industry groups in the county to the (overall negative) regional shift effect. To illustrate, *farm employment* jobs grew by 262, from 219 jobs in 2010 to 481 jobs in 2019, with a growth rate of 119.63%. Nationally, though, farm employment declined on average by -1.33% (Table 9). So, if this industry performed as the national average, there would have been a net decrease of 3 Farm Employment jobs in the county (Table 9). The next row down shows employment growth in *construction*. The county added a net of 83 jobs, from 667 in 2010 to 750 in 2019, for a growth rate of 12.44%. Nationally, though, construction jobs grew at 28.64% (Table 9). If construction jobs in the county had kept pace with this national average, *construction* employment would have increased by 191 jobs (Table 9).

Turning to the bottom of the table, if job growth rates in Santa Cruz County industries matched national industry growth rates, we would expect to see 857 more jobs (2,878 – 2,021 = 857) in the county. A major contributing factor to this shortfall is *retail trade*, which actually saw a net loss of 524 jobs in the county. Had retail jobs grown at the national average of retail job growth, there would have been an increase of 262 jobs. That difference (from -524 to +262 jobs) is a shortfall of 786 retail jobs. That is a big swing and 786 / 857 = 92% of the negative regional shift the county employment. *Retail trade* was also a relatively large industry in the county, accounting for 16% of all jobs in 2010, falling to 12% in 2019. Even nationally, though, job growth in *retail trade* was 8.61%, less than the average of 17.88% for all industries. Other notable major industries with lagging job growth in Santa Cruz County were *construction*, *real estate and rental and leasing*, *manufacturing*, and *state and local government*.

Some industries in the county (highlighted in blue) created jobs more quickly than industry national averages, notably *farm employment*, *wholesale trade*, and *federal civilian* employment. While *military* employment fell, it fell at a lower rate than the national average. Regional economists often suggest that large positive regional shift effects suggest a locality has a natural comparative advantage in a particular industry. This can be seen in the *wholesale trade* numbers where, the county job growth rate (20.21%) is more than double the national average (8.25%). This reflects the unique position of Santa Cruz County on the U.S.-Mexico border and the role of the city of Nogales as a major port of entry for imports from Mexico.

Shift-share analysis addresses two questions pertinent of Santa Cruz County. First, how much of the county's lower job growth, relative to the national average, is because the county had a preponderance of jobs in slower-growing industries? Second, how much of the county's slower job growth is because local industries had slower net job growth than the same industries in the rest of the country? Further, shift-share analysis quantifies the relative importance of these two factors.

Table 10. Shift-Share Components for 2010-2019

	Actual Santa Cruz County Growth		National Growth Effect[1]		Industry Mix Effect[2]		Region Shift Effect[3]	
Major Industry	**Percent**	**Net**	**Percent**	**Net**	**Percent**	**Net**	**Percent**	**Net**
Farm Employment	119.63	262	17.88	39	-19.20	-42	120.96	265
Construction	12.44	83	17.88	119	10.76	72	-16.19	-108
Manufacturing	-7.95	-53	17.88	119	-5.66	-38	-20.16	-134
Wholesale Trade	20.21	380	17.88	336	-9.63	-181	11.96	225
Retail Trade	-17.21	-524	17.88	544	-9.27	-282	-25.82	-786
Information	12.10	15	17.88	22	-10.18	-13	4.40	5
Finance and Insurance	25.42	120	17.88	84	1.24	6	6.30	30
Real Estate and Rental and Leasing	-3.76	-35	17.88	167	9.78	91	-31.41	-293
Educational Services	18.47	29	17.88	28	-0.58	-1	1.18	2
Health Care and Social Assistance	17.30	163	17.88	168	3.14	30	-3.71	-35
Arts, Entertainment, and Recreation	11.33	23	17.88	36	10.59	22	-17.14	-35
Accommodation and Food Services	27.18	349	17.88	230	9.78	126	-0.47	-6
Other Services (except Public Administration)	28.73	252	17.88	157	2.68	23	8.18	72
Federal Civilian	8.33	133	17.88	285	-23.02	-368	13.47	215
Military	-4.81	-5	17.88	19	-25.21	-26	2.53	3
State Government	-10.07	-15	17.88	27	-16.02	-24	-11.92	-18
Local Government	-8.15	-174	17.88	381	-15.94	-340	-10.09	-215
Total Employment	**10.63**	**2,021**	**17.88**	**3,399**	**-2.74**	**-521**	**-4.51**	**-857**

1 National Growth: The change in Santa Cruz County employment that would have occurred for a specific industry if it had grown at the national average growth rate for all industries.
2 Industry Mix: The additional gain (or loss) in local jobs that would have occurred for a specific industry because that industry nationally had faster (or slower) job growth than the national average for all industries combined.
3 Regional Shift: The additional gain (or loss) in local jobs for a specific industry beyond the national growth and industry mix effects because, the local industry had faster (or slower) job growth than the same industry nationally.
* "Other/Suppressed Industries" are a combined total of those industries where data were not reported due to confidentiality restrictions. Those industries include: Forestry, Fishing, and Related Activities; Mining; Utilities; Transportation and Warehousing; Professional, Scientific, and Technical Services; Management of Companies and Enterprises; Administrative and Waste Services
Note: Percent growth figures may not add due to rounding
Source: Arizona Regional Economic Analysis Project (AZ-REAP) and the U.S. Department of Commerce, Bureau of Economic Analysis

Table 10 breaks the relative contribution of three effects – national growth, industry mix, and regional shift – on county job growth. The columns under Actual Santa Cruz County Growth show the percentage and absolute job changes in the country from 2010-2019. The next two columns under National Growth Effect show the net change in jobs in the county if every industry grew at the national average for all industries, 17.88%. The two columns under the Industry Mix Effect adjusts this 17.88% average job growth up or down based on the national average job growth in that particular industry. For example, nationally *retail trade* jobs grew more slowly (9.27 percentage points lower) than 17.88%. Accounting for this industry-specific lower rate would cause us to adjust

our expectation of local job growth. Having a preponderance of jobs in nationally slower-growing industries or industries with negative growth (such as *federal civilian* or *military* employment) have a negative contribution, while having initial jobs in fast-growing industries (such as *arts, entertainment, and recreation* or *accommodation and food services*) makes a positive contribution to county job growth.

The last two columns under Regional Shift Effect represent local deviations from national overall average and national industry-specific trends. Regional economists attribute these deviations to county-specific factors. While shift-share analysis cannot identify what these factors are, it can measure their effects. It can also identify which industries to examine further to try to explain local effects. For example, the industry with the largest absolute job growth was *wholesale trade*, adding a net of 380 jobs from 2010-2019, with jobs growing by more than 20%. Nationally, *wholesale trade* was a slower-growing industry, with a national average growth rate of 8.25% (Table 8). This was 9.63 percentage points lower than the national average of 17.88% (Table 8). All else equal, one might expect having jobs in *wholesale trade* to be a drag on employment growth at the local level as it was at the national level. But *wholesale trade* was not a drag on local job growth. Indeed, it was a major source of job growth in the county. This is measured by the Regional Shift Effect of 225 net jobs. Table 10 indicates that there is something different about Santa Cruz County leading to fast job growth in *wholesale trade* than what one would expect from national overall or industry-specific trends. As noted above, importation of produce from Mexico is an important source of jobs in the county. According to recent Department of Labor data, *fruit and vegetable wholesaling* accounts for nearly three-quarters of all wholesale trade jobs in the county (QCEW, 2021).

Table 8 also shows that nationally, *arts, entertainment, and recreation* and *accommodation and food services* (two sectors associated with tourism) had much higher job growth rates than average. Nationally, jobs grew at rate of 28.47% for *arts, entertainment, and recreation* and 27.65% for *accommodation and food services*, both substantially higher than the 17.88% national average. Job growth in *accommodation and food services* in the county (27.18%) (Table 9) nearly matched the high national growth rate. While overall job growth in *arts, entertainment, and recreation* in the county (11.33%) (Table 9) lagged behind the national average (27.65%) (Table 8), it exceeded the overall average job growth rate for the county. *Farm employment* is another interesting case. While this employment declined overall nationally. It actually increased in Santa Cruz County. Not only that, *farm employment* in the county (while only accounting for a small number of jobs), doubled over the past decade.

Table 10 also raises questions about *retail trade*. While job growth in *retail trade* was slower than other industries nationally, the number of retail jobs declined significantly in Santa Cruz County. Table 11 provides a more detailed breakdown in changes within the retail sector, using data from the Department of Labor's Quarterly Census of Employment and Wages (QCEW). The QCEW collects and reports data somewhat differently than the BEA, so job changes in Table 11 differ from earlier tables. For example, the BEA includes proprietors, while the QCEW only includes wage and salary workers. QCEW also only collects information on establishments required to pay unemployment insurance taxes. Still, the numbers are generally similar to those of the BEA. Both show similar job losses in *retail trade* in Santa Cruz County from 2010-2019.

The largest areas of job losses were in *clothing and clothing accessories stores* and *gasoline stations* (which includes gas stations with convenience stores). Together, these industries lost 367 jobs, accounting for more than three-fourths of the job losses in the county (Table 11). *Clothing and clothing accessories stores* also saw the largest

reduction in the number of establishments, 21. This raises questions (beyond the scope of this study) about what accounted for the decline in clothing stores. Was there a reduction in shoppers coming from Mexico? Are people buying relatively more clothing online or out-of-county (in Tucson for example)? While clothing stores accounted for a large share of total retail job losses, there were job losses across all retail industries, except *sporting goods, etc.* and *general merchandise stores*. This suggests there are local factors affecting retail trade in general, and not just clothing stores.

Table 11. Changes in Retail Trade Establishments and Employment, 2010-2019

		All Employees				Number of Establishments			
NAICS Code	Industry	2010	2019	Change	Percent Change	2010	2019	Change	Percent Change
441	Motor Vehicle & Parts Dealers	190	160	-30	-15.8%	20	15	-5	-25.0%
442	Furniture & Home Furnishings Stores	23	23	0	0.0%	10	9	-1	-10.0%
443	Electronics & Appliance Stores	18	NR	NR	NR	7	2	-5	-71.4%
444	Building Material & Garden Equipment & Supplies Dealers	218	189	-29	-13.3%	12	11	-1	-8.3%
445	Food and Beverage Stores	349	333	-16	-4.6%	24	21	-3	-12.5%
446	Health and Personal Care Stores	95	55	-40	-42.1%	11	9	-2	-18.2%
447	Gasoline Stations	279	144	-135	-48.4%	17	14	-3	-17.6%
448	Clothing & Clothing Accessories Stores	364	132	-232	-63.7%	55	34	-21	-38.2%
451	Sporting Goods, Hobby, Musical Instrument, & Book Stores	26	34	8	30.8%	8	6	-2	-25.0%
452	General Merchandise Stores	720	758	38	5.3%	16	19	3	18.8%
453	Miscellaneous Store Retailers	122	84	-38	-31.1%	36	24	-12	-33.3%
454	Nonstore Retailers	7	NR	NR	NR	3	5	2	66.7%
	Total	**2411**	**1926**	**-474**	**-19.7%**	**219**	**169**	**-50**	**-22.8%**

To sum up, the four industries contributing most to job growth from 2010-19 were *wholesale trade* (380 jobs added), *accommodation and food services* (349 jobs added), *farm employment* (262 jobs added), and *all other services* (252 jobs added). *Finance and insurance* had a relatively high rate of job growth, but started from a lower base number of jobs, so its contribution to total job growth was limited. Santa Cruz County bucked the national trends of below-average growth in *wholesale trade* and declining *farm employment*. In the pre-COVID decade of 2010-2019, *accommodation and food services* had higher than average job growth, both nationally and locally, in the county. We note here that, in traditional shift-share analysis, results can be sensitive years selected for analysis. For example, measures of job growth in *accommodation and food services* from 2010 to 2020 would tell a very different story, as COVID-19 lowered employment in these industries substantially in 2020. The results here reflect pre-COVID trends. Jobs in *arts, entertainment, and recreation* grew faster than the all-industry average nationally, but grew slower than this average in the county. Yet, *arts, entertainment, and recreation* jobs in the county grew at a faster rate than for the county as whole. Areas of weakness, experiencing net job losses, were in *retail trade* and *local government*.

Natural Resources

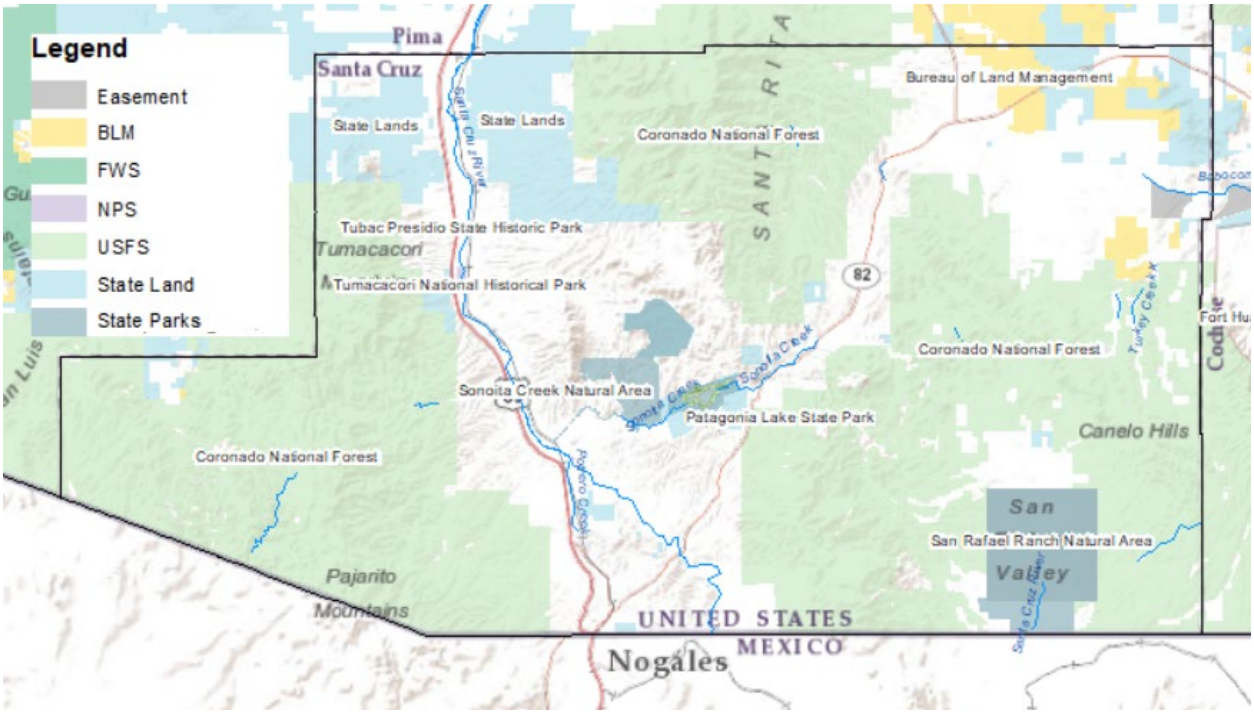
Land

More than half of Santa Cruz County's land area falls under the jurisdiction of the U.S. Forest Service (USFS). All USFS land in Santa Cruz County is part of the Coronado National Forest, which includes non-contiguous holdings throughout Southern and Southeastern Arizona, as well as a portion of Southwestern New Mexico. An additional third of the county's land area is private land, and the remainder consists of other state and federal lands (Table 12).

Table 12. Santa Cruz County Surface Management Agencies & Acreage

Category	Acres	Percent
Bureau of Land Management	13,728	1.73%
International Boundary Water Commission	252	0.03%
Local or State Parks	9,485	1.20%
National Park Service	363	0.05%
Private	284,219	35.88%
State Land	61,497	7.76%
AZ Game & Fish	3,641	0.46%
U.S. Forest Service	419,020	52.89%
TOTAL	792,203	100.00%

Figure 16. Map of Santa Cruz County by Surface Management Agencies



Agriculture

On-farm agriculture accounts for a relatively small share (1%) of Santa Cruz County's GDP, but accounts for nearly 3% of private employment in the county, higher than the national and state averages (BEA, 2020). It also occupies approximately one-quarter of county land area. Santa Cruz County accounts for 1% of Arizona's total agricultural cash receipts (USDA, 2019). Ranching is prominent within the county, but there is also significant greenhouse production and a robust grape-growing and wine-making industry in the eastern part of the county near Sonoita.

There were 219 farms in Santa Cruz County in 2017, covering 1,398 acres of cropland (89% irrigated) and 191,118 acres of pastureland (<1% irrigated) (USDA, 2019). The average farm size was 903 acres, larger than the national average of 441 acres, with the top 12% of farms accounting for 83% of county land area (USDA, 2019).

Of 219 total farms, 72 had less than $1,000 in sales and 4 farms had more than $500,000 in sales (USDA,2019). A slight majority of county farms (58%) are family- or individually-held, while 15% are partnerships, 14% are family-held corporations, 4% are other corporations, and 10% have other forms of legal organization (USDA,2019).

Farms are classified by the type of agricultural products they produce. When a farm or ranch produces more than one agricultural product, they are classified by the product that constitutes more than 50% of their sales. The most common type of operation in Santa Cruz County is beef cattle ranching and farming (111 farms), followed by aquaculture and other animal production (51 farms) (Table 13).

Table 13. Santa Cruz County Farms by Industry, 2017

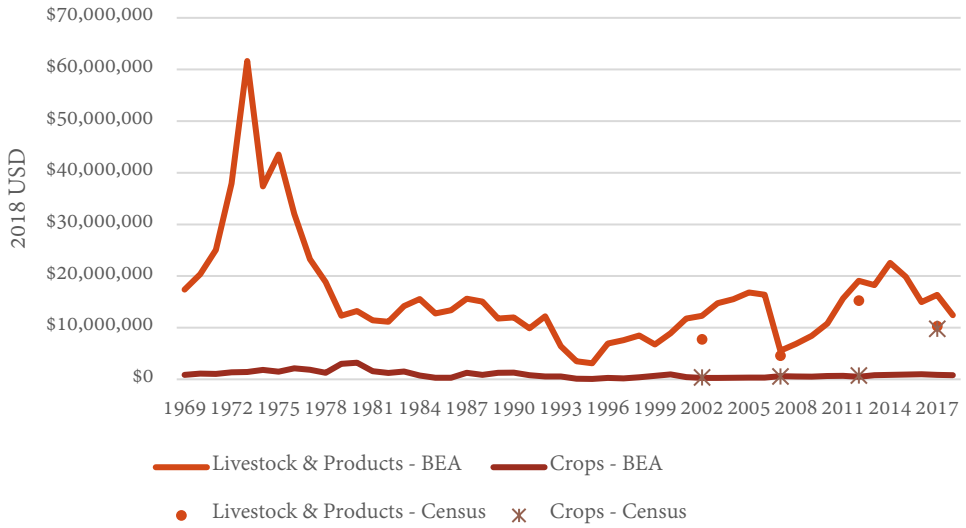
Category	Farms
Total farms	*219*
Oilseed and grain farming	0
Vegetable and melon farming	15
Fruit and tree nut farming	24
Greenhouse, nursery, and floriculture production	7
Other crop farming	4
Cotton farming	0
Sugarcane, hay, & all other crop farming	4
Beef cattle ranching and farming	111
Cattle feedlots	1
Dairy cattle and milk production	0
Hog and pig farming	0
Poultry and egg production	0
Sheep and goat farming	6
Aquaculture and other animal production	51

Source: 2017 Census of Agriculture

In past years, Santa Cruz County has been a livestock-dominant county (Figure 17), meaning that the county produces more livestock by value than crops, though the 2017 Census of Agriculture reports an increase in crop

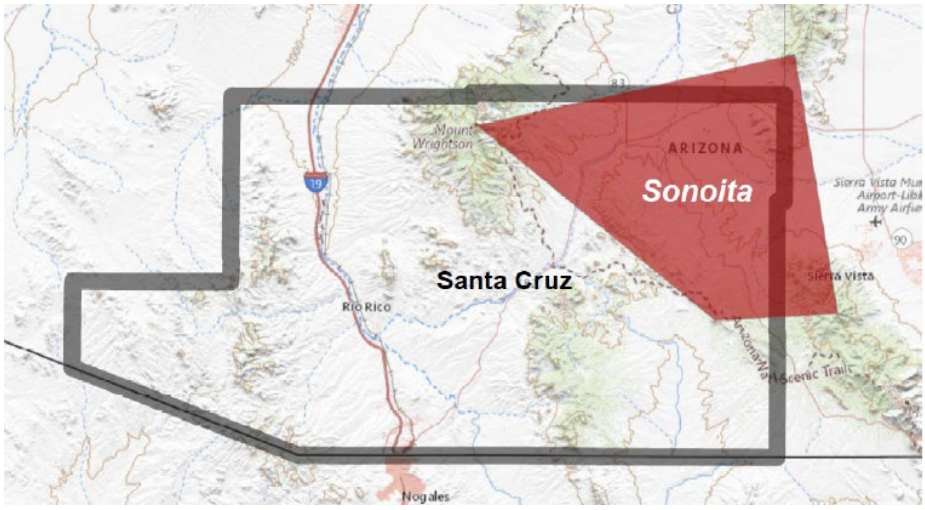
production between 2012 and 2017. According to the 2017 Census of Agriculture, major agricultural commodities by sales include cattle and calves ($9.6 million) and nursery, greenhouse, floriculture, and sod (sales data not disclosed to prevent identifying individual operations). One farm in the county reported sales of organic production.

Figure 17. Santa Cruz County Agricultural Cash Receipts for Crops & Livestock, 1969-2018



Like its neighbor Cochise County, Santa Cruz County has a growing wine industry. The northeastern part of the county is home to the Sonoita American Viticultural Area (AVA), Arizona's first designated AVA (Figure 18). An AVA is an area that has been designated and recognized as a wine grape-growing region. In 2017, the county had 229 acres of grape production by 25 growers (USDA, 2019). This represents an increase from 2012 when there were 19 growers with 191 acres of grape production.

Figure 18. Sonoita American Viticultural Area Map



Based on 2015 US Geological Survey (USGS) estimates of water use, agriculture accounted for 39.6% of Santa Cruz County water withdrawals (Dieter, et al, 2018). Agricultural irrigation water use in Santa Cruz County is dominated by production of crops, with irrigation water almost exclusively sourced from groundwater. In 2015, an estimated 5,870 acre-feet (AF) was sourced from groundwater for crop production (Dieter, et al, 2018). An acre-foot is the amount of water required to cover one acre one-foot-deep in water. Irrigated crop production is concentrated along the Santa Cruz River running south to north across the county. Groundwater use decreased between 2010 and 2015. Meanwhile, total irrigated acreage remained constant and relied primarily on gravity-flow irrigation. There were roughly 1,770 acres of agricultural land irrigated with surface irrigation in 2015 and 150 acres irrigated with microirrigation (Dieter, et al, 2018).

Parks & Natural Areas

Santa Cruz County is home to a number of state and national parks, and other protected areas. The following section presents a short description of each and available data on visitation.

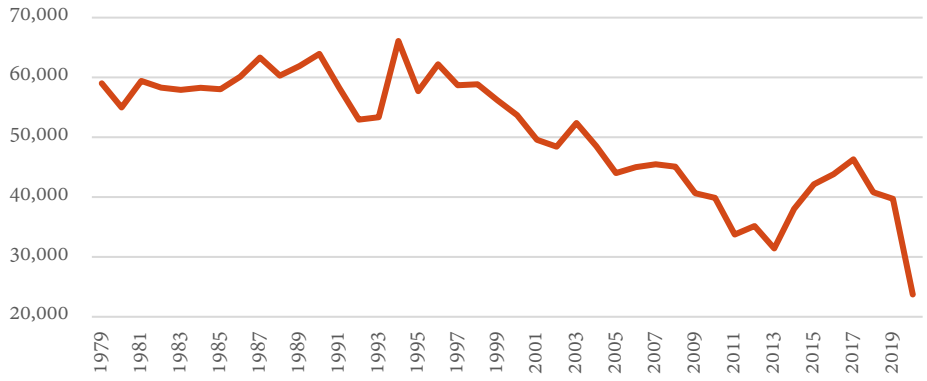
Federal Lands

Tumacácori National Historic Park

Tumacácori National Historic Park preserves the site where European Jesuit missionaries constructed the San José de Tumacácori mission. The mission is part of a circuit of missions established in the area known as the Pimería Alta by the Jesuit missionary Eusebio Francisco Kino between 1687 and 1711 (NPS, 2021). The area's history is marked by interaction, cooperation, and conflict amongst a number of cultures, including the Spanish, the O'odham, the Yaqui, and the Apache. The park includes the historic mission structure, surrounding buildings, a cemetery, and gardens, and access to the Anza Trail and Santa Cruz River.

Since a peak in the mid-1990s, annual recreation visits to Tumacácori National Historic Park have fallen steadily. Visits rebounded following the 2009 financial crisis, however, visits fell significantly during 2020 due to the COVID-19 pandemic (Figure 19).

Figure 19. Annual Recreation Visits to Tumacácori National Historic Park, 1979-2020



Source: National Park Service (2021)

Las Cienegas National Conservation Area

Las Cienegas National Conservation Area is located in both Santa Cruz and Pima counties and is managed by the Bureau of Land Management. The 41,972-acre area includes a working ranch, the historic Empire Cattle Ranch, which is managed by the Empire Ranch Foundation. Las Cienegas National Conservation Area is a location for outdoor recreation, including wildlife viewing, birdwatching, camping, hiking, mountain biking, equestrian activities, and hunting (BLM, 2021).

Coronado National Forest

The Coronado National Forest is located throughout Southern and Southeastern Arizona, as well as a small portion in Southwestern New Mexico. The forest consists of a series of non-contiguous districts encompassing large mountain ranges in the region. Coronado National Forest land located in Santa Cruz County is managed through both the Nogales Ranger District and the Sierra Vista Ranger District. The Nogales Ranger District covers the San Luis, Pajarito, Tumacácori, and Santa Rita Mountains, and the Sierra Vista Ranger District overs the Canelo Hills, and the Patagonia, Whetstone, and Huachuca Mountains. Madera Canyon and Mount Wrightson are particularly popular destinations in this area of the forest.

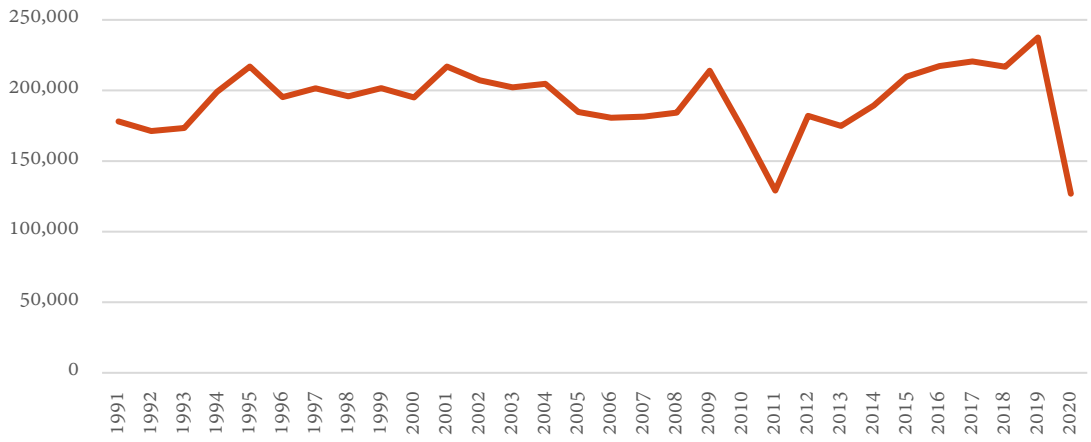
The entire Coronado National Forest received an estimated 1,417,000 visits in 2017. This includes other portions of the forest throughout southern Arizona and southwestern New Mexico.

State Lands

Patagonia Lake State Park

Patagonia Lake State Park, in Santa Cruz County, was built in the 1960s and became a state park in 1975 (Arizona State Parks, 2021). The park is one of the state's most popular state parks, ranking 4th in visits in 2019, and offers water-based recreation, hiking, and camping. Visitation to Sonoita Creek State Natural Area is included in visits to Patagonia Lake. Over the past 30 years, visitation has remained relatively steady around 200,000 annual visits. Visitation was increasing over the past 5 years but fell in 2020 due to the COVID-19 pandemic (Figure 20). Monthly visitation is highly seasonal, with the highest number of visits seen during summer months, and lower visits during winter months.

Figure 20. Annual Visits to Patagonia Lake State Park, 1991-2020

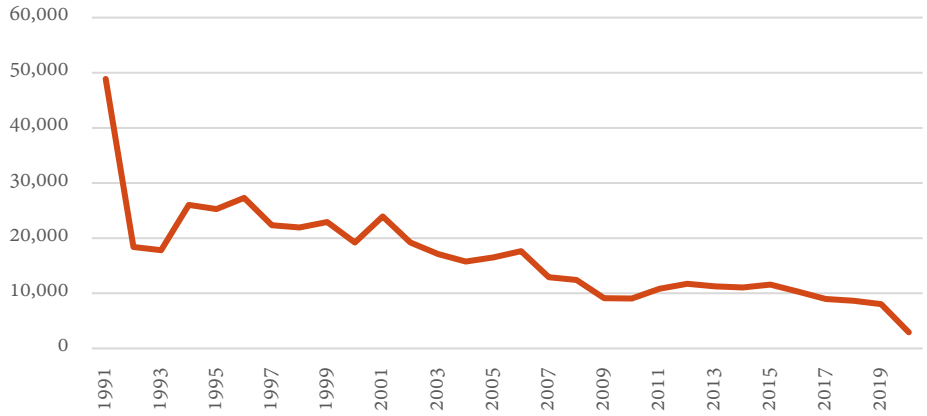


Source: Arizona State Parks

Tubac Presidio State Historic Park

Tubac Presidio State Historic Park was established to preserve the ruins of the San Ignacio de Tubac presidio, the oldest Spanish presidio in Arizona, constructed in 1752. The park is located in Santa Cruz County and offers museum exhibits, gardens, trails, and day use areas. In recent years, the park has been operated by the Tubac Historical Society, with some limits on operating hours. Annual visitation to the park has slowly declined over time and was steady around 10,000 annual visitors between 2010 and 2019 (Figure 21). Visits in 2020 fell significantly due to the COVID-19 pandemic.

Figure 21. Annual Visits to Tubac Presidio State Historic Park, 1991-2020



Source: Arizona State Parks

Sonoita Creek Natural Area

Sonoita Creek State Natural Area (SCSNA) is a protected area surrounding Lower Sonoita Creek, which supports a segment of prime riparian habitat. The land was first purchased by the Arizona State Parks Board in 1993 and since has been expanded through acquisitions as well as through management partnerships. Sonoita Creek Natural Area is contiguous with Patagonia Lake State Park and is managed through a series of cooperative agreements, including with Arizona Game and Fish Department and U.S. Fish and Wildlife Service, among others. Visitation to Sonoita Creek Natural Area is captured in visitor counts to Patagonia Lake State Park. An estimated 30,700 Arizonans report spending time recreating along Sonoita Creek, with a total of 96,000 visitor days spent there (Southwick Associates, 2019).

San Rafael Ranch Natural Area

The San Rafael Natural Area is located in the San Rafael Valley and surrounds the San Rafael Ranch. The area is ecologically important because it represents a healthy, un-fragmented native grassland. The area is managed through a partnership with the State Parks Board, The Nature Conservancy, and local ranchers. Currently this area is not open to the public.

Bog Hole Wildlife Area

Bog Hole Wildlife Area, operated by Arizona Fish and Game in cooperation with the U.S. Forest Service, is a wetland area popular for hunting and wildlife viewing. The area is located 8 miles southeast of Patagonia.

Private

Tucson Audubon Society's Paton Center for Hummingbirds

Located along Sonoita Creek, the Paton Center for Hummingbirds is a destination for birdwatching, conservation, and education.

The Nature Conservancy's (TNC) Patagonia-Sonoita Creek Preserve (PSCP)

This 873-acre preserve is dedicated to protection of riparian habitat along Sonoita Creek. The preserve offers opportunities for birding, wildlife viewing, and hiking.

Borderlands Wildlife Preserve

This preserve is located along Sonoita Creek and protects a critical wildlife corridor.

Biodiversity

Santa Cruz County is part of the ecoregion known as the Madrean Archipelago, sometimes referred to as the Sky Islands (Griffith, et al, 2014). The area is characterized by a wide range of elevations, ecosystems, and rich biodiversity. The sky islands are located at the nexus of six distinct ecological regions – the Rocky Mountains, the Sierra Madre Occidental, the Sonoran Desert, the Chihuahuan Desert, the Great Plans, and the Neotropics (Vaughn & Gosline, 2021). The intersection of ecological regions and the isolated nature of high elevation mountain habitats give rise to many endemic species, as well as species at the far extent of their range (Wilson & Simon, 2019).

Of Arizona's 15 counties, Santa Cruz County has the highest concentration of federally-listed threatened and endangered species, as well as Species at Risk (NatureServe G1-G3 species) (Vaughn & Gosline, 2021). Threatened and endangered species in the county include the Western yellow-billed cuckoo (threatened), the Gila topminnow (endangered), the Mexican garter snake (threatened), the Huachuca water umbel (endangered), and the Chiricahua leopard frog (threatened) (Borderlands Restoration Network, 2020). In particular, Santa Cruz County is known for its diversity of birds. The county is among the counties with the highest diversity of birds with 453 species and is home to 8 Important Bird Areas, covering 48% of the county's land area (Vaughn & Gosline, 2021). Important Bird Areas are regions identified as being of important significance to conservation of the world's birds (Audubon Society, 2021) and in Santa Cruz County include the San Rafael Grasslands, the Santa Rita Mountains, the Patagonia Mountains, the Patagonia-Sonoita Creek TNC Preserve, the Sonoita Creek State Natural Area and Patagonia Lake, the Upper Santa Cruz River, the Appleton-Whittell Research Ranch, and the Atascosa Highlands (Vaughn & Gosline, 2021).

Beyond birds, Santa Cruz County represents an important region for mammals. Jaguars and ocelots are sighted in the county, and 43 other species of mammals have range in the county, including pronghorn antelopes, brown bears, bobcats, and mountain lions (Vaughn & Gosline, 2021). Critical stretches of habitat support the county's biodiversity by enabling migration between isolated mountain ranges, protected natural areas, and riparian areas. Two main wildlife migratory corridors are located in the county. The Santa Cruz River and Sonoita Creek also serve as corridors for migratory birds.

Water Resources

Average annual precipitation in Santa Cruz County from 1980 to 2020 was 18.45 inches (NOAA, 2021). Within the county, there is considerable variability depending on elevation and location. For example, Mount Wrightson, the highest point in the county, receives and average of 36.9 inches of precipitation per year, roughly double the county average (Borderlands Restoration Network, 2020). Precipitation can vary significantly from year to year, as well, ranging from a low of 5.6 inches in 2020 to a high of 24.17 inches in 1983 (NOAA, 2021). Considering this variability, and the region's natural aridity, water resource management is of critical importance within the county.

Santa Cruz County contains portions of two of Arizona's five Active Management Areas (AMAs) established under the 1980 Groundwater Management Act. AMAs were created in an effort to halt the depletion of groundwater in portions of the state where groundwater overdraft and land subsidence were problematic. In AMAs, expansion of irrigated agricultural land is not permitted, and new groundwater uses must be offset by a corresponding reduction in use elsewhere in the AMA, or by recharge in those areas of the state with access to Central Arizona Project (CAP) water.

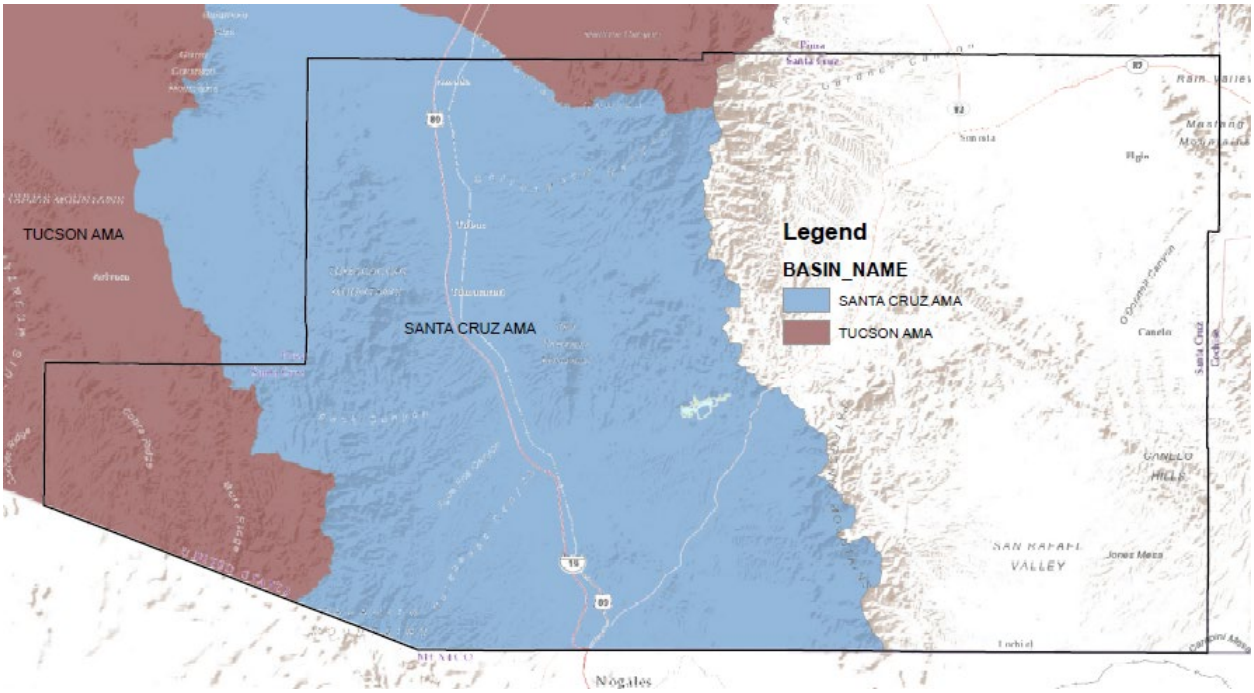
Santa Cruz County contains portions of the Santa Cruz AMA (46.2% of the county's area) and the Tucson AMA (9.4% of the county's area) (Table 14). The remainder of the county does not fall within any AMA, and groundwater use is not regulated in that portion of the county.

Table 14. County Land Area in Arizona Groundwater Active Management Areas

Active Management Area	ACRES	PERCENT
SANTA CRUZ AMA	365,741	46.2%
TUCSON AMA	74,732	9.4%
NO AMA	351,730	44.4%
TOTAL	792,203	100.0%

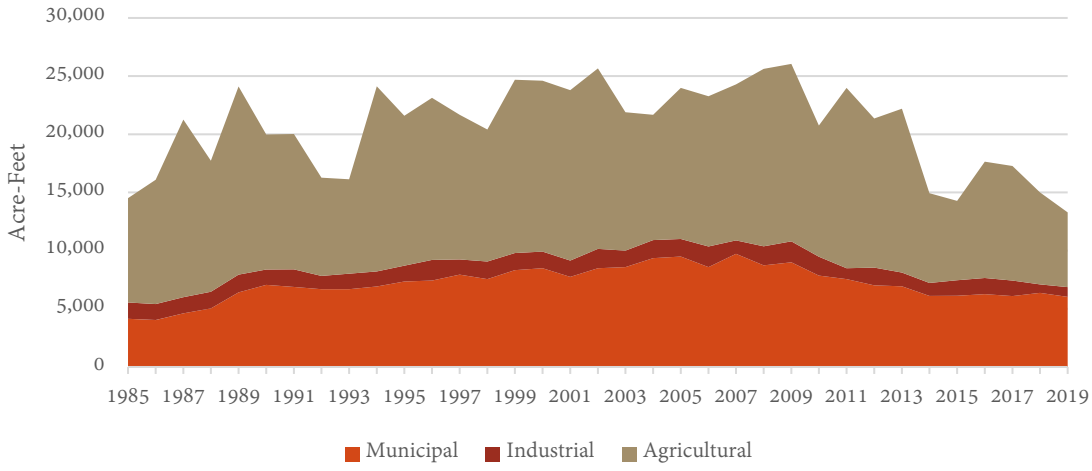
Areas that fall within the AMAs include Nogales, Rio Rico, Tumacácori, and Amado, and are principally concentrated around a 45-miles stretch of the Santa Cruz River. The river in this region is generally ephemeral or intermittent with some perennial reaches supported primarily through effluent discharge through the Nogales International Wastewater Treatment Plant (ADWR, 2020). Areas falling outside the Santa Cruz AMAs include Patagonia, Sonoita, and Elgin (Figure 22).

Figure 22. Map of Santa Cruz County by Arizona Groundwater Active Management Areas (AMAs)



Water demand in the Santa Cruz AMA reached a peak in 2009 and has since fallen. This has occurred through decreases in all water uses, including agricultural water use, industrial use, and municipal use (Figure 23).

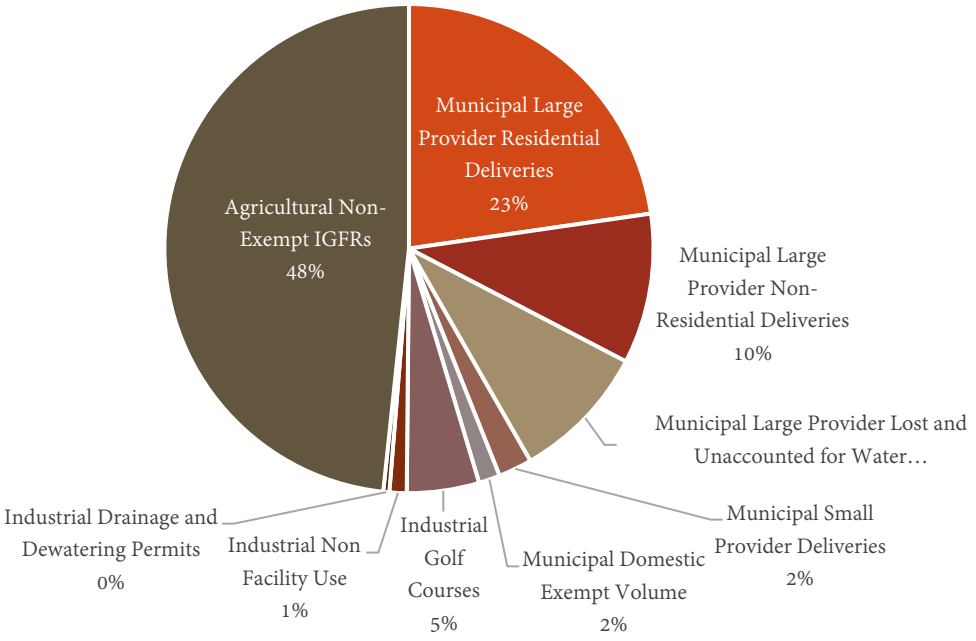
Figure 23. Santa Cruz AMA Water Demand by Type, 1985-2019



Source: ADWR

As of 2019, 48% of Santa Cruz AMA's water demand was from agricultural non-exempt irrigation grandfathered rights, 23% was residential demand fulfilled through large municipal providers, and an additional 10% was non-residential deliveries through large municipal providers. The remainder of demand falls under various municipal and industrial categories (Figure 24).

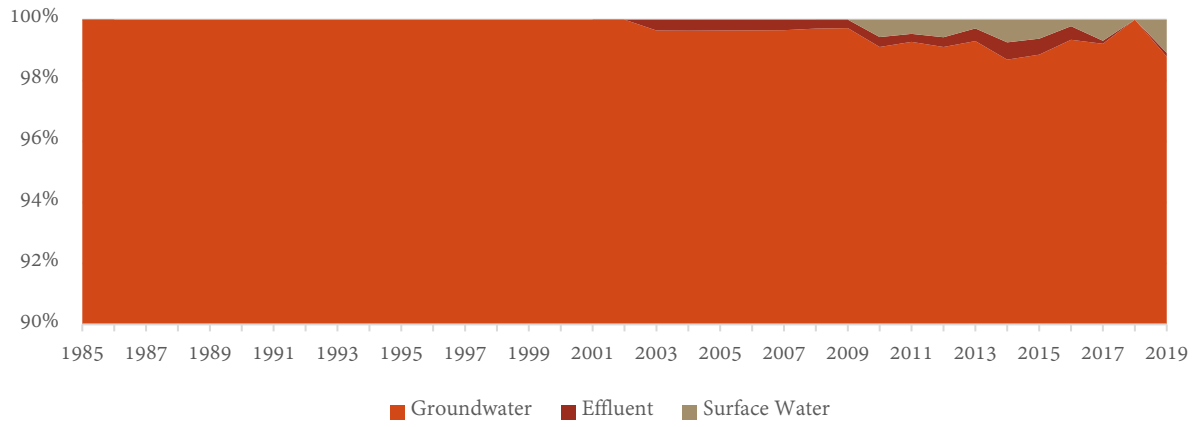
Figure 24. Santa Cruz AMA Water Demand by Category, 2019



Source: ADWR

Water demand within the Santa Cruz AMA is almost exclusively sourced from groundwater. A small amount of reclaimed wastewater (effluent) began to be used in the early 2000s, however, it has stayed under less than 1% of supply. A small share of surface water began to be used starting in 2009 but has stayed very small since that time (Figure 25).

Figure 25. Santa Cruz County AMA Water Supply by Source, 1985-2019

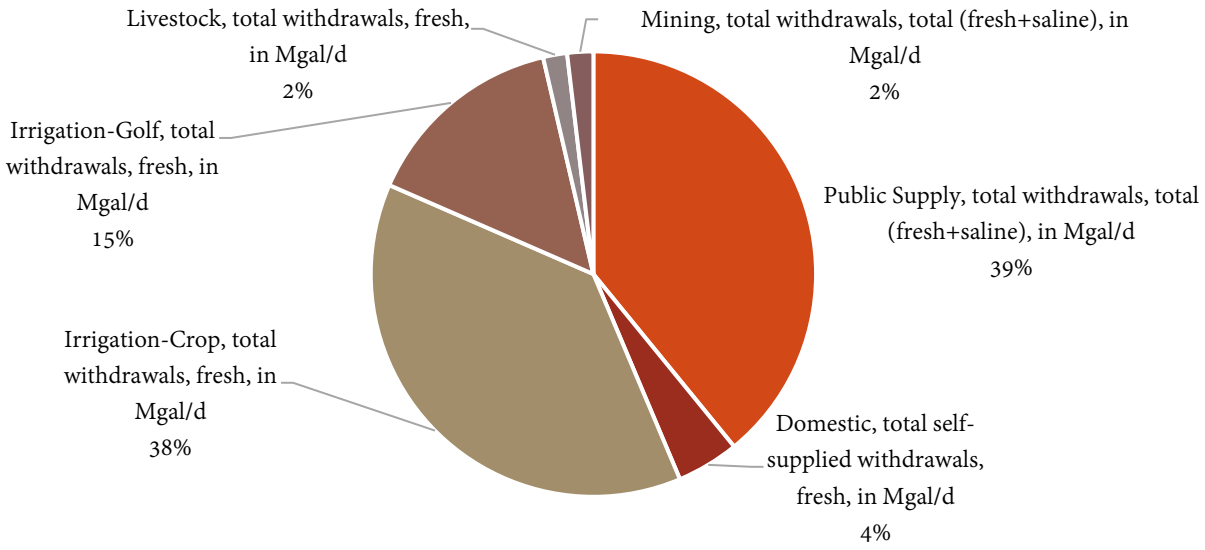


Source: ADWR

County-wide, including areas within and outside of AMAs, the share of water withdrawals by use closely reflects water use occurring in the Santa Cruz AMA. Crop irrigation accounts for 38% of county water use and livestock production accounts for 2% of water use. The single largest use county-wide is public supply (municipal) which

accounted for 39.1% of use. An additional 4% of use was self-supplied withdrawals for domestic use. Golf course irrigation used 15%. Finally, mining accounted for 2% of use in 2015. Estimated total use in the county in 2015 was 14,808 acre-feet according to the USGS. This compares closely with the estimated Santa Cruz AMA demand in 2015 of 14,273 acre-feet. While county-wide water use estimates may be inexact due to lack of careful accounting of water use outside of AMAs, these estimates do suggest that the vast majority of county water use occurs within the Santa Cruz AMA, in the western portion of the county.

Figure 26. Santa Cruz County Water Withdrawals by Use, 2015



Source: USGS (Dieter, et al, 2018)

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Part II. Defining the Nature-Based Restorative Economy (NBRE)

Introduction

Ecological economics, the study of relationships between ecosystems and economic systems, has long recognized the connection between the physical, natural system and the social, economic system (Costanza, 1989). Historically, economics has considered the economic system (and the human welfare that is generated by it) to be solely dependent on the accumulation of physical capital (machinery, equipment, tools, etc.) and human capital (abilities and quality of labor such as education, skills, experience, etc.). Most economists now consider there to be a third form of capital, natural capital, which is crucial to the social, economic system (Barbier, 2012). Natural capital, broadly defined, is the world's stock of natural resources or assets. These natural resources are a key input in the production processes that stimulate economic growth, enhance quality-of-life, and are ultimately the underpinnings which make human life possible (Barbier, 2012; World Forum on Natural Capital, 2017).

An understanding of how natural capital contributes to human well-being is critical to the effective and efficient allocation and sustainable use of those resources. Ecosystem services are diverse and affect human well-being in many ways. Some can be easily monetized, particularly those that involve market transactions (buying or selling a good or service), while others are difficult or impossible to monetize, such as the spiritual value of nature. Ecosystem services that involve market transactions often involve industries that directly use or appreciate nature-based goods and services. Quantifying industries that are sustained through natural resources often relies on a type of study known as an economic contribution analysis. An economic contribution analysis examines the economic activity of an industry, event, or policy in a region's economy and accounts for the additional economic activity stimulated in other industries via economic multiplier effects (Watson et al., 2007).

This is a limited approach to valuing nature and the ecosystem services provided by nature because it only includes those that can be: (1) directly used and (2) bought and sold in a market. In reality, humans derive benefits or value from nature in ways beyond their direct use. For example, another component of economic value is ***non-use value***. Non-use values include ***existence value***[2], ***bequest value***[3], and ***option value***[4]. Furthermore, even though many benefits can be directly "used", they are not bought and sold in a market, and they do not necessarily consume natural resources, though some may. Recreation is an example of benefit that can be directly "used" but that does not always have a monetary value assigned to it. In this case, value is derived from visiting and "using" the natural resource, but there may have been no monetary transactions for the enjoyment for the resource. Thus,

[2] Existence value is the value that an individual places on the maintenance and protection of the resource. In this case, even though the individual doesn't use the resource, it has value solely because of its existence.

[3] Bequest value is the value that an individual places on an environmental resource for the preservation of the resource for future generations. The individual may not currently use the resource, but places value on it because they would like future generations to have the opportunity to enjoy it as well.

[4] Option value derives from the preservation of a resource for future use. Even though there may be a low likelihood that an individual will use the resource, they place value on preserving the resource because then they have the option of using it in the future.

an examination of the market transactions within nature-based industries does not account for the full economic value of nature and ecosystem services it provides.

Nevertheless, natural resources and ecosystem services do contribute to the health of a regional economy via the industries that depend on them. Nature-based industries support jobs, income, and economic development. At the same time, how these natural resources are used can build or degrade the natural capital within a region and can either positively or negatively affect the regional economy. For example, environmental restoration efforts are an example of humans driving positive change in ecosystems to promote a healthier environment (and ultimately secure the continued provision of ecosystem services in the future). These efforts, while not recognized as a formal industry, also contribute to the regional economy. Collectively, we refer to this group of industries as the ***nature-based restorative economy (NBRE)***.

While perhaps conceptually simple, defining the nature-based restorative economy (NBRE) in a way that is consistent and meaningful for an economic contribution analysis is quite challenging. There is no official definition of the NBRE and, of available previous research, past studies often employ different definitions, in many cases including and omitting different industries. While literature provides useful examples of what has been done in the past (for example, Tidwell and Brown, 2011; Kellon and Hesselgrave, 2014; Ben-Dor, et al. 2015; Petrakis et al., 2020), each region is distinct in its natural resources and economic characteristics, making broad application of individual definitions impractical. Given these challenges, this study relied on key Santa Cruz County stakeholders and the project steering group (*Santa Cruz County Economic Study with a Focus on the Nature-Based Restorative Economy)* to develop a definition of the NBRE that fits the intent and context of this study.

Ecosystems Services Framework

The unifying principle of the NBRE is the concept of ecosystem services. This concept has been gaining recognition over the past few decades as a framework for describing the comprehensive set of benefits that people receive from nature. Broadly, ecosystems services can be characterized as goods or services that are provided by a healthy, functioning environment and that directly and indirectly contribute to human social well-being (USDA, 2017).

The Millennium Ecosystem Assessment (MA) (2005) is the most well-known and prominent conceptual framework for ecosystem services. It defines ecosystem services as "the benefits people obtain from ecosystems" (26) and categorizes them into four types: (1) provisioning, (2) regulating, (3) supporting, and (4) cultural. ***Provisioning services***, according to the MA (2005), are "the products people obtain from ecosystems, such as food, fuel, fiber, freshwater, and genetic resources" (p. 29). Essentially, provisioning services are the tangible products that ecosystems produce that are for direct human use and consumption (USDA, 2017). ***Regulating services*** are the benefits that humans receive from ecosystem processes, such as flood and disease control, crop pollination, water filtration, or climate stabilization (MA, 2005; USDA, 2017). ***Cultural services*** are the "nonmaterial benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences" (MA, 2005, p. 29). Finally, ***supporting services*** are those processes that are essential for the production of all other services and refer to the underlying processes that maintain conditions for life on Earth (USDA, 2017). Examples of supporting services are nutrient cycling, soil formation, and production of oxygen

(MA, 2005). The Millennium Assessment's conceptual framework hinges on the complex interactions between humans and ecosystems. Its focus is centered on human well-being but also describes how humans directly and indirectly drive changes in ecosystems and how changes in ecosystem, in turn, affect the services and benefits they provide.

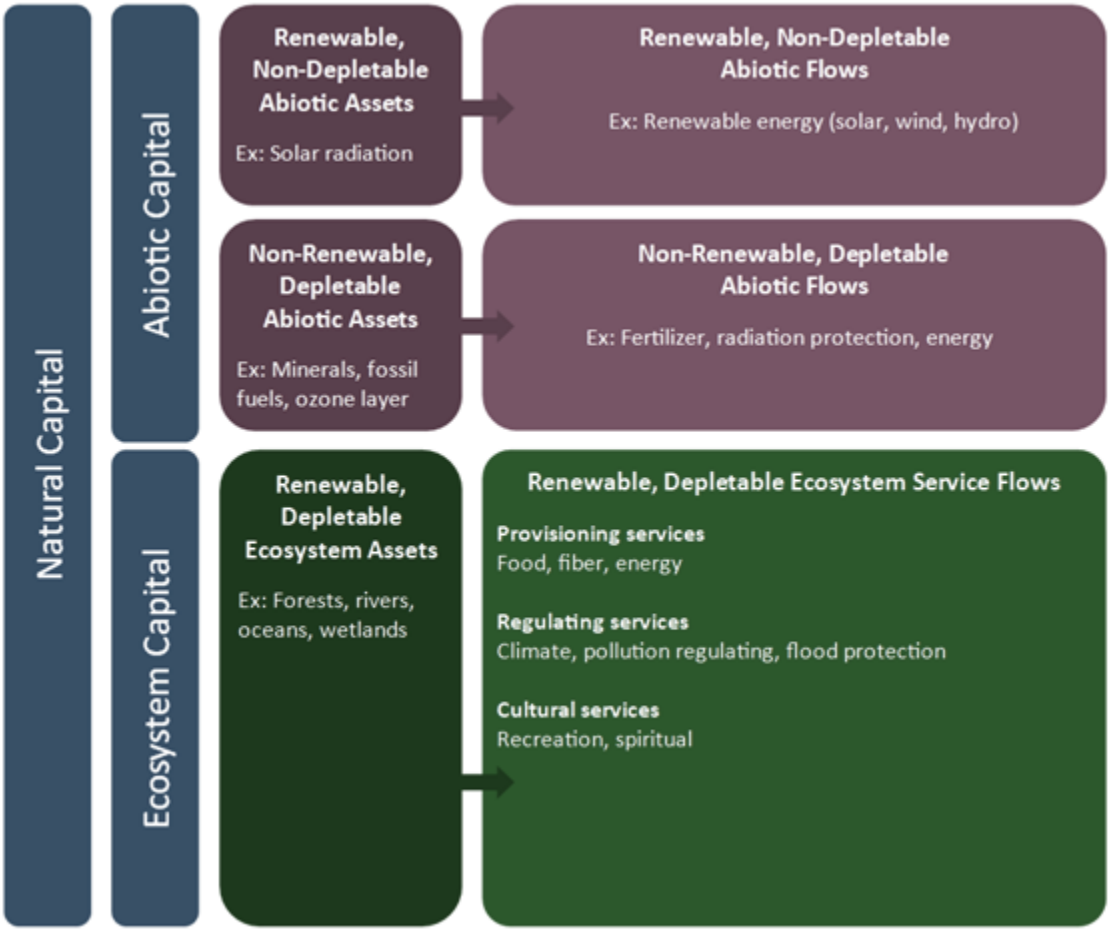
While the MA is considered groundbreaking due to its originality, many researchers argue that the MA provides a limited conceptual framework and lacks the capacity to be used in an operational setting. More recent research has proposed alternative definitions of ecosystem services to clarify the concept, reduce overlap and double-counting of ecosystem services (particularly in relation to supporting services), and develop a more rigorous analytical and accounting framework (Boyd and Banzhaf, 2007; Fisher et al., 2008 and 2011; Haines-Young and Potschin, 2013; Natural Capital Coalition, 2016; Newcomer-Johnson et al., 2020). Although there is broad consensus that ecosystems are natural assets that support human wellbeing, there has not been a consensus on the "best conceptual approach for describing and classifying the diverse processes, functions, stocks, flows, goods, services, and benefits embedded within or provided by ecosystems" (Newcomer-Johnson et al., 2020). Ever evolving, two of the most prominent, recent classification systems of ecosystem services come from the Common International Classification of Ecosystem Services (CICES) V5.1[5] and the National Ecosystem Services Classification System (NESCS) Plus[6] (Natural Capital Coalition, 2016).

One of the primary differences between CICES and NESCSP Plus is the extent to which abiotic stocks and flows are considered ecosystems services. NESCS Plus and many other conceptual frameworks define ecosystem services as the goods and services generated by natural resources, or all biophysical components of nature, that are directly used of valued by people. This includes natural resources such as timber and aquatic resources, mineral and energy resources, soil resources, and water sources (Newcomer-Johnson et al., 2020; Haines-Young and Potschin, 2018). CICES, in contrast, defines ecosystems services as the contributions that ecosystems make to human wellbeing that arise from *living* (biotic) *processes*. While still considered a component of natural capital, CICES considers abiotic assets and flows as non-ecosystem based natural flows and are not included as ecosystem services (Figure 27). Abiotic assets and flows do not depend on ecological processes but arise from fundamental geological processes and include renewable abiotic energy sources (wind, hydro, solar, etc.) and abiotic materials including metal, mineral, and oil and gas resources (Figure 27) (Haines-Young and Potschin, 2013; Natural Capital Coalition, 2016).

[5] The Common International Classification of Ecosystem Services (CICES) V 5.1 is an update of the Common International Classification of Ecosystem Services (CICES) V4.3 (Haines-Young and Potschin, 2018).

[6] The National Ecosystem Services Classification System (NESCS) Plus builds upon and replaces the 2013 Final Ecosystem Goods and Services Classification System (FEGS-CS) and the 2015 National Ecosystem Services Classification System (Newcomer-Johnson et al., 2020).

Figure 27. Components of Natural Capital



Source: Adapted from Maes et al., 2013.

Another distinction between CICES and NESCS Plus arises when conceptualizing the interface between the environment and the economy. CICES considers final ecosystem services as inputs to the social/economic system, in which people use the final ecosystem services to create products and experiences and, ultimately, derive value (Haines-Young and Potschin, 2013). NESCS Plus, on the other hand, focuses on distinguishing between *economic* goods and services and *ecosystem* goods and services and argues that confusion between these two concepts runs the risk of double counting (Newcomer-Johnson et al., 2020). NESCS Plus argues that the MA and CICES include some categories that are economic goods (for example, the amount of cotton harvested) instead of ecosystem goods (for example, the health of soils). In the former, final ecosystem services (or ecological end products as redefined in NESCS Plus) are inputs that are combined with human labor and capital to produce an economic good, not an ecosystem service. While the terminology and classification schemes continue to evolve and differ in application, the foundational concept is that natural capital and the assets and flows that are derived from it sustain our social-economic system as we know it and that all people depend, either directly or indirectly, on them (TEEB, 2010).

The extent to which a business is dependent on natural capital or a particular ecosystem service and/or abiotic flows, however, varies depending on the industry in which they operate, their role in the value chain, and the geographic location of their operation (Natural Capital Coalition, 2016).

In the simplest classification, industries can be classified as primary, secondary, or tertiary sectors (Natural Capital Coalition, 2016). Primary sectors (such as agriculture, forestry, and fisheries) "both depend upon and facilitate the supply of essential provisioning services, such as food, water, and fiber" (Natural Capital Coalition, 2016). Secondary sectors rely on natural raw materials for manufacturing and processing operations. Tertiary sectors (for example, retail, financial services, etc.) have indirect dependencies on natural capital that often arise from supplier or client relations (Natural Capital Coalition, 2016).

Little research has been done to explicitly investigate the extent to which businesses are dependent on ecosystem service flows (Watson and Newton, 2018). Watson and Newton (2018) explore business dependencies from the perspective of businesses within those industries. Using a survey of businesses in the county of Dorset in Southwest England, Watson, and Newton (2018) find that the perceived degree of dependence on ecosystem services[7] differed significantly between economic sectors. The agricultural and forestry sector was associated with the highest dependence on ecosystem services (76% selecting "high dependence" or "entirely dependent"), followed by ecological consultancy (74%), fishing (65%), education (62%), and tourism and travel (60%). This result is in part due to the perception that cultural and provisioning ecosystem services (as defined by the MA) have more obvious and "visible" links to human wellbeing (Watson and Newton, 2018).

Defining the Nature-Based Restorative Economy

This phase of the project set out to define the NBRE within the context of the Santa Cruz County economy, as a prerequisite step to quantifying the size of the NBRE in Part III of the project. A primary goal of this phase was to establish an operational definition of the NBRE that meets the intent of the overall project entitled *Santa Cruz County Economic Study with a Focus on the Nature-Based Restorative Economy*. Sub-sectors identified initially in the request for qualification and proposal included tourism, agriculture, and conservation and ecological restoration. Consultation and collaboration with key stakeholders, including the project steering committee[8], was of critical importance.

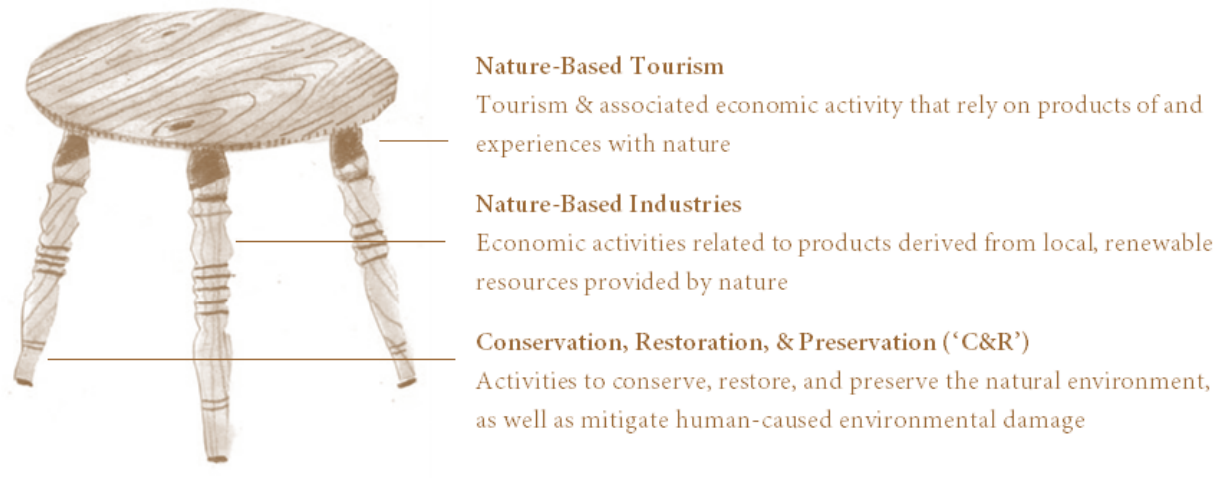
As a framework for guiding the discussion, the project steering committee developed the concept of a three-legged stool to describe the NBRE. Broadly, the NBRE's three-legged stool is comprised of: (1) nature-based industries, (2) nature-based tourism, and (3) ecological restoration and conservation (Figure 28). Within the ecosystem services framework, nature-based industries are considered to be industries that rely on provisioning services. More specifically, these industries rely on products derived from nature. Nature-based tourism corresponds with cultural services and includes industries that rely on products of or experiences with nature. Finally, ecological restoration and conservation include economic activities related to conservation, restoration, preservation, and

[7] Ecosystem services were defined as provisioning, regulating, habitat and supporting, and cultural services.

[8] The project steering committee was comprised of individuals from various organizations that are stakeholders in Santa Cruz County's NBRE. Members of the project steering committee are listed in the acknowledgements.

education related to nature and environmental issues. These activities support all components within the ecosystem services framework (provisioning, regulating, supporting, and cultural).

Figure 28. Three-Legged Stool Concept of the Nature-Based Restorative Economy



IMPLAN Exercise Workshop

As a first step in defining the NBRE and to gauge consensus among the group, each member of the project steering committee was asked to participate in a mapping exercise. The project steering committee was supplied with a list of 546 industries from IMPLAN (Appendix A), an input-output software program that characterizes a regional economy, and was asked to assign each industry as (1) wholly included in the NBRE, (2) wholly excluded from the NBRE, or (3) a hybrid/mixed sector with some activities within and some outside of the NBRE. The only information provided to the committee was the IMPLAN industry name and sector number.

Understandably, this was a challenging exercise for most participants as a formal definition of the NBRE had not yet been developed. This was further complicated by the fact that there is not a single IMPLAN industry that encompasses "tourism" or "ecological restoration and conservation". Instead, nature-based tourism involves a collection of industries (for example, the hotel, restaurant, and retail industries), but not all the economic activity within those industries can be attributed to nature-based tourism. Similarly, there is no single industry for ecological restoration and conservation, with restoration activities taking place in design and engineering, construction, and other industries. Because of this, capturing economic activity related to these two legs of the stool requires other estimation methods.

Additional considerations and complications in assigning industries were based on the extent to which the industry was directly tied to nature as well as the extent to which the industry negatively affected natural resources. For example, there was relative consensus that agriculture should be included within in the NBRE but there were questions about whether to include industries further down the supply chain, such as food and fiber processing industries. There were also questions about including industries that negatively impact natural resources. In the strictest definition, industries that supported conservation and regeneration of natural resources would be included in the NBRE, industries that resulted in irreversible degradation of natural resources would be

excluded, and industries that depleted natural resources but could be sustainably managed would be assigned to the hybrid/mixed category.

The results of the exercise were tallied and summarized for areas of consensus. Broadly, there was general consensus to include:

1. All agricultural industries
2. All renewable electricity generation
3. Wineries
4. Some portion of food, fiber, and wood processing
5. Some portion of services, education & medical, arts & recreation, hotels & restaurants

Based on conversations with the project steering committee, items #1 through #4 were intended to capture economic activity related to the first leg of the stool, nature-based industries. Industries included in item #5 were intended to capture economic activity related to nature-based tourism and ecological restoration & conservation. Notably, industries related to mineral and non-renewable energy resources were not selected for inclusion in the NBRE by the project steering committee. This is consistent with the original RFQ, suggesting the project steering committee was focused on capturing industries that rely on ecosystem service flows and *non-depletable* abiotic flows (refer to Figure 27)

Refining the NBRE Definition and Proposed Estimation Methods

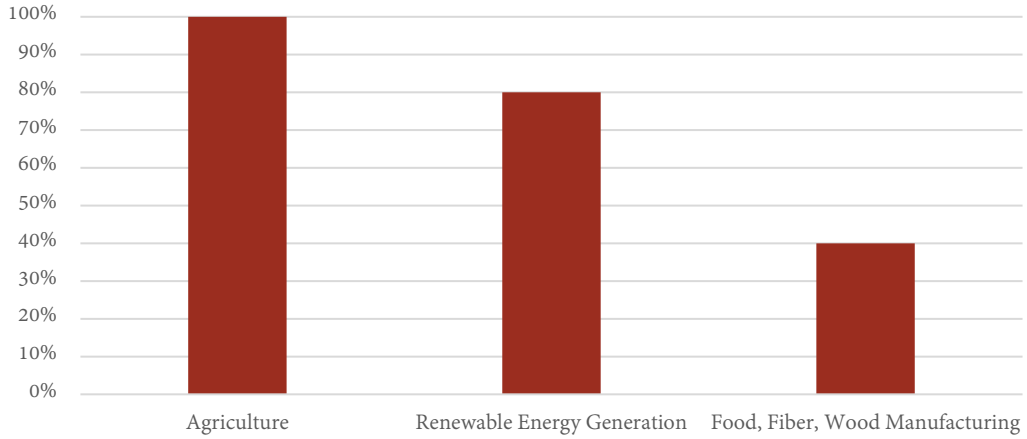
Following the IMPLAN exercise, a document was developed to present the consensus areas of the project steering committee (Appendix B). Given the relatively small size of Santa Cruz County, many of the 546 IMPLAN industries were not present within the county.

Estimate of the economic activity occurring within nature-based industries (the first leg of the stool) were derived from secondary data, including federal statistics, such as the U.S. Department of Agriculture, and baseline IMPLAN data. To ensure that the consensus areas selected in items #1 through #4 were an accurate representation of the nature-based industries within the NBRE in Santa Cruz County, the project steering committee was asked to vote on three questions:

1. Should the NBRE include all agricultural activity (crop, livestock, and agricultural support activities)?
2. Should the NBRE include all renewable electricity generation?
3. Should the NBRE include all food, fiber, and wood manufacturing?

The results of the vote are presented in Figure 29. All respondents (5 out of 5) expressed that agriculture should be wholly included within the nature-based industry component of the NBRE. Four (4) out of five (5) expressed that renewable energy generation should be included in the NBRE, but only two (2) indicated that food, fiber, and wood manufacturing should be included in the NBRE. This result suggests that the project steering committee was committed to capturing industries that closely align with the natural assets of the county. Whereas, conceptually, it would be acceptable to include food, fiber, and wood manufacturing within the NBRE, products manufactured by industries present in the county are not likely to be tied to local production of agricultural products and are therefore excluded from the analysis.

Figure 29. Industry Selection Vote for NBRE



An important note about this process is that the discussion of what to include within the NBRE was motivated primarily by which industries currently exist in the county. For example, the project steering committee elected to include wineries (#3) within the NBRE because part of the county is home to one of Arizona's three American Viticultural Areas (AVAs), a designated wine grape producing region. Considering wineries' deep connection with the region's cultivation of wine grapes, an agricultural industry, and the existence of and opportunities for agri-tourism to the county's vineyards and wineries, the committee elected to include wineries, a manufacturing industry. Little discussion occurred about the inclusion of breweries and distilleries due to their general absence from the region. If these industries existed within the region, it is possible that they would have been included as well.

The discussion settled on the following nature-based industries:

- Agriculture (all crop, livestock, and related agricultural support activities)
- Wineries and other manufacturing using locally-sourced renewable materials, and
- Renewable energy generation.

It was decided that food, fiber, and wood manufacturing industries would not be included as a whole, though a small number of manufacturing businesses involved in processing locally-sourced renewable materials into value-added products would be included.

There is no single IMPLAN industry that encompasses "nature-based tourism" or "ecological restoration and conservation". Therefore, other methods must be used to estimate the economic activity related to these components of the NBRE. Economic activity related to nature-based tourism is estimated using available visitor count data and existing visitor spending patterns. Economic activity related to ecological restoration and conservation is estimated primarily from interviews and focus groups with local and non-local conservation organizations with work in the region.

Economic Contribution Analysis Applications

One method commonly used to demonstrate the importance of an industry to a regional or local economy is an economic contribution analysis. An economic contribution analysis is a descriptive study that examines the size of an industry of interest and the linkages it has with other industries in the local economy. An input-output model establishes these linkages and tracks the flow of goods and services between industries within the region. It is through these linkages that sales, income, and jobs in other industries are supported. These are called economic multiplier effects.

Economic multiplier effects can be categorized as ***direct effects***, ***indirect effects***, or ***induced effects***. Direct effects are the jobs, incomes, and economic activity that are directly supported by the industry of interest. Indirect multiplier effects are the economic activity generated through business-to-business transactions, or when businesses within the industry of interest purchase goods and services from other local businesses as inputs or supplies. Induced multiplier effects are the economic activity generated when households spend their income earned from employment in the industry and purchase goods and services from local businesses. Additional rounds of indirect and induced effects are generated as those businesses and employees purchase things from other local businesses.

These economic multiplier effects are limited by leakage. Leakage occurs when businesses source their inputs or households purchase items from outside of the local economy. The "local" economy could be a county, state, or even the nation, depending on the study area. In general, the smaller the study area, the greater the probability of leakage and the lower the multiplier effects. This could be due to a lack of availability of goods and services within the region or a variety of other reasons.

Using an input-output model allows for a greater understanding of the economic activity supported within a region by a given industry and is often employed to demonstrate the importance of an industry. Components of the NBRE have historically been examined independently. To our knowledge, this is the first study to combine nature-based industries, nature-based tourism, and the restoration/conservation industry into one study. The following section provides a brief review of studies that have employed economic contribution analyses for industries within the NBRE.

Nature-Based Industries

Agriculture

There are numerous studies across the country that examine the contribution of agriculture to a region's economy. In Arizona, these studies are generally conducted at the county- or state-level. Some studies focus on individual agricultural industries, such as the tree nut industry (Duval et al., 2019), the small grains industry (Duval et al., 2017), or the beef industry (Kerna et al., 2014), while others include all on-farm production and their support services (Bickel et al., 2020), and others include the entire agribusiness system – including on-farm production, agricultural input manufacturing, agricultural processing, and agricultural marketing and distribution (Bickel et al., 2017).

Renewable Energy

While most previous economic impact and contribution studies have focused on the impacts of shifting from more traditional energy sources to renewable sources at the national level, a growing area of research is on the regional economic contributions or impacts (Jenniches, 2018). In Arizona, much of this research focuses on solar energy due to the high number of annual sunny days (Bae and Dall'erba, 2016; Frisvold, et al., 2009). The economic contribution or impact of renewable energy sectors is generally comprised of two phases: (1) economic activity associated with capital investments for construction and (2) economic activity associated with annual operating and maintenance expenditures. As would be expected, the construction phase contributes significantly more to the regional economy than the operation & maintenance phase (Frisvold et al., 2009).

Bioeconomy

A different, yet related approach to capturing industries associated with nature are studies that have examined the bioeconomy. Like the restoration economy, activities in the bioeconomy span across multiple industries and disciplines and there is no broad consensus on the definition of the bioeconomy (Frisvold et al., 2021). European studies generally use a broad definition and include economic sectors "that produce or fundamentally rely on biologically produced materials" (p. 12), including agriculture and food manufacturing among others (Frisvold et. al., 2021). North American studies, on the other hand, have placed a greater emphasis on biotechnology applications.

Nature-Based Tourism

A significant area of research and application of input-output models is capturing economic activity related to tourism. Tourist destinations attract visitors, often from outside the local area, who spend money on lodging, meals, and incidental expenditures. This spending supports local sales, jobs, and incomes within the local economy. Many studies distinguish between economic impacts and economic contributions. Spending by visitors from outside the local area represents new money circulating in the local economy and is considered an *economic impact*. An *economic contribution*, on the other hand, accounts for all visitor spending (whether spent by local or non-local visitors) that takes place in the region. In other words, an economic contribution does not distinguish between *new* economic activities stimulated in the region and existing economic activity supported by the local population.

Studies that examine the economic activity of nature-related tourism often focus on particular outdoor activities such as wildlife viewing or water-based outdoor recreation (Southwick Associates, Inc., 2019; Tucson Audubon Society, 2013; Southwick Associates, Inc., 2002) or on a particular region or land management agency, such as Arizona State Parks (Duval, et al., 2021). These studies can be conducted for various geographies, including the nation, state, and county. Critical to the estimation of the economic impacts is data on the number of visitors to the region and a representative spending pattern. To get the most accurate results, studies often employ visitor intercept studies to develop visitor spending patterns.

Conservation, Restoration, & Preservation

A newer application of input-output models pertains to the restoration economy. Again, there is no single industry that captures the economic activity related to preservation, conservation, and restoration. Complicating factors, there are many stakeholders involved in the restoration economy, with participants in both the private and public sectors

(Petrakis et al., 2020, Cullinane Thomas et al, 2016). The private sector is often involved in conservation through the protection of open space from land use changes, particularly development (Petrakis et al., 2020). These occur through trusts, easements, and other land management activities. The public sector (federal, state, and local governments) often partners with and funds non-profit organizations to conduct on-the-ground restoration work. Moreover, private companies may be hired to implement restoration projects (for example, construction companies) or provide supplies for restoration projects (for example, gravel companies).

Previous studies have usually focused on specific projects, a localized geography, or individual funding sources, most commonly using case studies (BenDor et al., 2015; Cullinane Thomas et al, 2016). Studies have generally taken two approaches to estimate the economic activity associated with conservation and restoration. One approach is to use a top-down strategy by identifying industries or firms that perform various roles in restoration work and ask what proportion of their revenues are derived from this type of work (BenDor et al., 2015). A bottom-up strategy uses actual cost data from restoration projects and applies the spending to the appropriate industry sector (Wagner et al., 2009; Neilsen-Pincus and Moseley, 2010; Cullinane Thomas et al, 2016).

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Part III. Profile & Trajectory of the Nature-Based Restorative Economy

Introduction

Part III of this study characterizes the nature-based restorative economy (NBRE) in Santa Cruz County, Arizona and measures its direct economic contribution within the county in 2019. Unlike some industries which are captured in government statistics in their entirety, for example, automotive manufacturing or physicians' offices, the NBRE cuts across different industries, including some activities while excluding others. Furthermore, organizations involved in the NBRE in Santa Cruz County may be based in other locations outside the county, but nonetheless are involved in projects or investments that stimulate economic activity in the county. Additionally, the NBRE in Santa Cruz County supports jobs and economic activity outside of the county. That, however, is beyond the scope of this analysis. For these reasons, it's necessary to estimate the size of the NBRE inside Santa Cruz County using a variety of primary and secondary data sources. The methods used to do so are presented in this section of the report.

The estimates presented in this report build on the definition of the nature-based restorative economy (NBRE) developed in Part II of this project. We provide estimates of sales for the various components of the NBRE, as well as estimated operating costs for the different segments which are used in Part IV of the study to estimate economic multiplier effects attributable to the NBRE.

In addition to characterizing and quantifying the NBRE, this portion of the report summarizes the results of a series of focus groups and informal interviews aimed at understanding the strengths, weaknesses, opportunities, and threats confronting NBRE stakeholders in Santa Cruz County. The results of these conversations are presented as a SWOT analysis (Strengths, Weaknesses, Opportunities, and Threats). Finally, based upon the results of the SWOT analysis and existing demographic and economic forecasts, medium- and long-term outlooks for the NBRE are generated for Santa Cruz County.

Profile of Santa Cruz County's Nature-Based Restorative Economy

This profile of Santa Cruz County's NBRE is structured according to the definition developed in Part II which uses the three-legged stool analogy to describe the three main components of the NBRE: nature-based industries, nature-based tourism, and conservation, restoration, and preservation (referred to as C&R for brevity). Figure 30 illustrates the three-legged stool definition of the NBRE.

Figure 30. Three-Legged Stool Definition of NBRE

Nature-Based Industries

This portion of the study quantifies those industries in Santa Cruz County that derive products from the natural environment of Santa Cruz County, and in some cases transform those products into value-added goods. Within the framework of ***ecosystem services***, products of ecosystems used for human consumption are considered as ***provisioning services***.

The selection of industries to be included as nature-based industries was the focus of the second phase of this project. Of the three-legged stool definition, nature-based industries were perhaps the most challenging to define. The definition ultimately settled on industries that derive renewable products from nature within Santa Cruz County, and those that process locally-sourced products into value-added goods. Effectively, this encompasses agricultural industries, renewable energy generation, wineries, and some food, fiber, and wood manufacturing businesses.

Working from the established definition of nature-based industries, we rely on statistics from the 2017 Census of Agriculture (USDA, 2019), the Bureau of Economic Analysis (2020), and the Bureau of Labor Statistics (2021), among other sources, to estimate economic activity within these industries. We estimate sales for each industry, where feasible, as well as operating expenses for the industry. Operating expenses by expenditure category are used to estimate economic contributions using the IMPLAN model in Part IV of the study.

The following sections provide estimates of sales and operating expenses for 'nature-based industries' (agriculture, wineries, manufacturing, and solar power generation) in Santa Cruz County in 2019.

Agriculture

On-farm agricultural production is included in its entirety as part of the NBRE[9]. The most recent estimate of the value of agricultural production at the county level is available through the Bureau of Economic Analysis's

[9] On examination of agricultural data for the county, it is apparent that economic activity captured by federal statistics in the agricultural support services industry is likely associated with the county's fresh produce industry. Give that this activity is

Regional Economic Accounts Farm Income and Expenses tabulation (Bureau of Economic Analysis, 2020). This data source also provides estimates of production expenses. Though expenses are not separated by crop production and livestock production as sales figures are, the input expenditures can still serve to estimate agriculture's economic contribution in its entirety. Table 15 presents estimated sales and other income for agriculture in Santa Cruz County in 2019.

Table 15. Santa Cruz County Agricultural Cash Receipts & Other Farm-Related Income, 2019

Item	2019 Value
Cash receipts from marketings	$27,754,000
Cash receipts: Livestock and products	$12,868,000
Cash receipts: Crops	$14,886,000
Other income	$2,341,000
Government payments	$229,000
Imputed and miscellaneous income received	$2,112,000
Gross Farm Income	**$30,095,000**

Source: Bureau of Economic Analysis, 2021

Table 16 presents production costs for crop production and livestock production combined in Santa Cruz County in 2019. From Tables 15 and 16, net farm income in the county was roughly $3 million.

Table 16. Santa Cruz County Agricultural Production Expenses, 2019

Expense Category	2019 Value
Feed purchased	$1,294,000
Livestock purchased	$3,308,000
Seed purchased	$1,524,000
Fertilizer and lime (incl. ag. chemicals)	$662,000
Petroleum products purchased	$885,000
Hired farm labor expenses	$4,754,000
All other production expenses	$14,665,000
Total Production Expenses	**$27,092,000**

Source: Bureau of Economic Analysis, 2021

Wineries

Wineries, while technically classified as part of the manufacturing sector, are treated here separately because there are recent data available on their operations within Arizona. Based on the Arizona Farm Wineries database of wineries in Arizona, there were 18 wineries in Santa Cruz County in 2019 (Bickel, et al, 2021; TTB, 2021). Meanwhile, there were a total of 125 wineries statewide in Arizona. Based on estimates from a recent study of wineries in Arizona (Bickel, et al, 2021), we estimate average sales and production expenses for Santa Cruz County wineries using the average sales and expenditures per winery in the state and apply that average to the 18 wineries located in Santa Cruz County. Based on that calculation, estimated winery sales were roughly $3.3 million in 2019

not likely tied to local production of agricultural products, it is not included as part of the NBRE. Any economic activity associated with this sector is captured in economic multiplier effects in Part IV of the report.

and production costs were $5.8 million in 2019 (Table 17). Production costs exceed sales in 2019 because Arizona's wine industry is growing, with new wineries entering into businesses, and new wine grape acreage being planted. Because there are lags between when grapes are planted, when wine is produced, and when the wine is actually sold after aging, sales in 2019 represent production from previous years when the industry was smaller. For that reason, production costs exceed sales in 2019.

Table 17. Estimated Wine Sales & Wine Production Costs in Santa Cruz County, 2019

Item	Value
2019 AZ Winery Sales	$23,129,073
2019 AZ Wine Production Costs[1]	$40,300,000
Wine Sales per Winery	$185,033
Production Costs per Winery[1]	$322,400
Estimated Santa Cruz County Wine Sales, 2019	$3,330,587
Estimated Santa Cruz County Wine Production Costs, 2019	$5,803,200

1 Wine production costs include the costs of production for wine not yet sold, including the cost of labor and inputs.

Manufacturing

This study includes the production of manufacturers that transform locally-sourced renewable materials into value-added products. Based upon that strict definition, one manufacturer of wood products qualified as belonging to the NBRE, beyond wineries. The operation's estimated annual sales are $361,000 (Data Axle, 2021). Operating costs are estimated using IMPLAN.

Additionally, agricultural producers in Santa Cruz County engage in production of processed or value-added agricultural products. This activity totaled $2.3 million in 2017 (USDA, 2019). This value added activity is not reflected in cash receipts for crops and livestock, and is therefore included as food manufacturing. Table 18 presents total estimated sales and operating costs for manufacturing qualifying as part of the NBRE in Santa Cruz County.

Table 18. Estimates Sales & Operating Costs for Santa Cruz County NBRE Manufacturers, 2019

Component	Sales	Operating Costs
Food Manufacturing	$2,284,000	$1,715,685
Wood Manufacturing	$361,000	$273,422
Total	$2,645,000	$1,989,107

Solar Power

Renewable energy was included as an industry within the NBRE. While companies involved in residential solar installation are limited within the county and there are no solar manufacturers in the county (Bureau of Labor Statistics, 2021), there is one utility-scale solar power plant in the county.

The Rio Rico Solar project is a 6-megawatt photovoltaic solar power plant located in Santa Cruz County that went online in 2014 (SEIA, 2021). In 2019, the installation produced 11,362,719 kWh of power (ACC, 2019). According

to estimates of operating costs for utility-scale photovoltaic solar installations, average levelized lifetime operational expenditures were roughly $17 per kilowatt-year for projects built in 2019 (Wiser, et al, 2020). For projects built in 2014, the year the Rio Rico Solar project went online, average operating expenses per kilowatt-year were roughly $27, in 2019 inflation-adjusted dollars (Wiser, et al, 2020). Annual operational expenses were estimated based on an expenditure pattern presented by Wiser, et al (2020), operating costs of $27 per kilowatt-year, and a 6-megawatt solar photovoltaic array (Table 19). Sales of generated electricity were not estimated due to lack of information about where any resulting sales would occur.

Table 19. Estimated Operational Expenses for Santa Cruz County Solar Power Plant, 2019

Cost	% of Total Costs	Estimated Operating Costs
Insurance	7%	$10,881
Asset management	7%	$10,881
PPA security	7%	$10,881
Inverter replacement accumulation	10%	$16,925
O&M	37%	$60,448
Property tax	14%	$22,970
Land Lease	18%	$29,015
Total	100%	$162,000

Summary of Nature-Based Industries

Table 20 presents a summary of estimated sales and operational expenses for nature-based industries in 2019 in Santa Cruz County. Both sales and operational spending exceed $35 million.

Table 20. Summary of Estimated Sales and Operational Expenses for Nature-Based Industries in Santa Cruz County, 2019

Nature-Based Industry	Estimated 2019 Sales	Estimated 2019 Operational Expenses
Agriculture	$30,095,000	$27,092,000
Wineries	$3,330,587	$5,803,200[1]
Manufacturing	$2,645,000	$1,989,107
Solar Power	N/A	$162,000
Total	$36,070,587	$35,046,307

1 Winery expenses include vineyard establishment and production of wine not yet sold.

Nature-Based Tourism

This portion of the study quantifies the economic activity in Santa Cruz County in 2019 associated with nature-based tourism. Within the framework of ***ecosystem services***, the value that people derive from the experience of visiting nature is considered as a part of ***cultural services*** – non-material benefits derived from ecosystems such as spiritual enrichment, cognitive development, or recreation (MA, 2005). The inherent value of cultural services may be difficult to quantify, though methods to estimate these ***non-market values*** do exist (MA, 2003). That said,

demand for cultural ecosystem services can generate regional economic activity via nature-based tourism. When people visit natural areas, parks, and other nature-based attractions, they often incur expenses for travel. This can include expenditures on lodging, meals, and incidental expenses, among other categories. For communities with a high concentration of natural amenities, nature-based tourism can represent a critical driver of the local economy by supporting local businesses and employment.

Part I of this study characterized the abundant natural amenities and rich biodiversity found in Santa Cruz County. Following from the inventory presented in that section of the study, we present estimates of visitation to nature-based amenities and attractions, estimate visitor spending attributable to those sites, and present estimates of total nature-based tourism spending in the county.

To estimate the economic contribution of nature-based tourist visitor spending in Santa Cruz County, we compile existing visitor counts for locations and attractions where visitation is monitored. This includes national and state parks, and some privately owned natural areas. Where visitation data is not available, we develop estimates where feasible, as is the case for National Forest visits and hunting. As an economic contribution analysis, this study reflects spending by all individuals, including those that reside in Santa Cruz County, as well as those who do not. Therefore, visitor counts and estimates are not adjusted to account for local versus non-local visitors.

Because visitor counts are captured at different locations, there is the potential that some visitors may be double-counted if they visit multiple locations on a single trip. Similarly, there may also be overlap between locations and activities, namely, visitors to Coronado National Forest and visitors who hunt. Meanwhile, the inventory of locations and activities is not exhaustive, and individuals may visit locations where visits are not monitored. While it is not possible to capture all nature-based tourism activity, any overestimate due to overlap or underestimate due to lack of coverage will have offsetting effects. The extent to which these effects offset each other is uncertain.

To estimate visitor spending, we compiled existing visitor spending patterns relevant to the area and or outdoor activity, as available. All spending patterns were adjusted for inflation to 2019 dollars. Visitor spending patterns were applied to corresponding visitation estimates to calculate an estimate of nature-based tourist spending in the county.

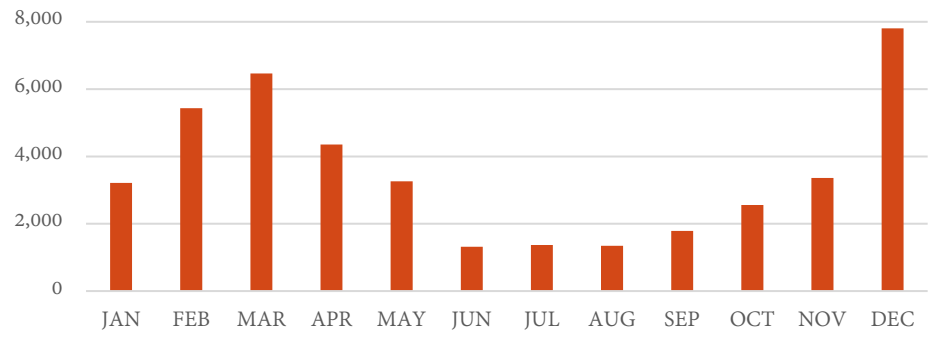
Nature-Based Tourist Visits in Santa Cruz County

A comprehensive accounting of total nature-based tourism in Santa Cruz County does not exist. Therefore, to estimate the economic activity associated with nature-based tourism in the county, it's necessary to compile as many available estimates as possible. While not exhaustive, a focus on the most popular destinations around the county likely captures a large proportion of tourist activity.

National Parks

Santa Cruz County is home to one national park, Tumacácori National Historic Park. Visitation to the park is highly seasonal with the fewest visitors during summer months. The park typically receives its highest number of visitors in December when the park holds holiday-related special events, followed by spring months (Figure 31).

Figure 31. Average Monthly Visits to Tumacácori National Historic Park, 2017-2019



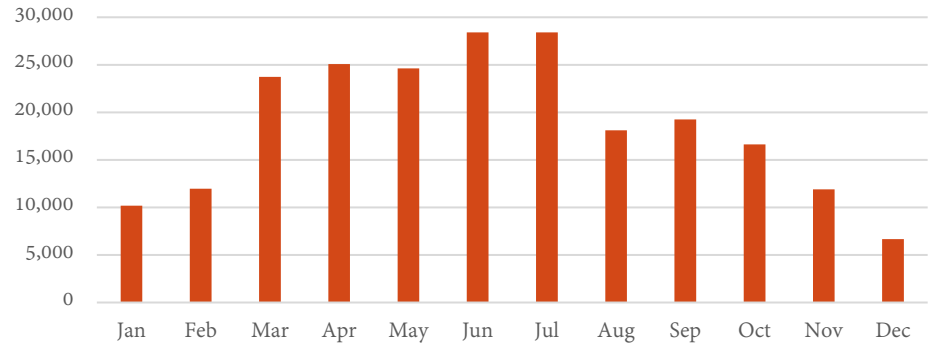
Source: National Park Service

Data on visitation to Tumacácori NHP is available to the public as far back as 1920. In 2019, the park received 39,704 visits (National Park Service, 2021).

State Parks

Santa Cruz County is home to two state parks, Patagonia Lake State Park and Tubac Presidio State Historic Park. Patagonia Lake State Park is one of the most popular parks in the Arizona State Park System, receiving 237,504 visits in 2019. Visitation to Patagonia Lake State Park also includes visitors to Sonoita Creek State Natural Area, a popular birding location. The park receives the highest number of visitors during late spring and summer months when temperatures are at their highest and visitors seek water-based recreation opportunities (Figure 32).

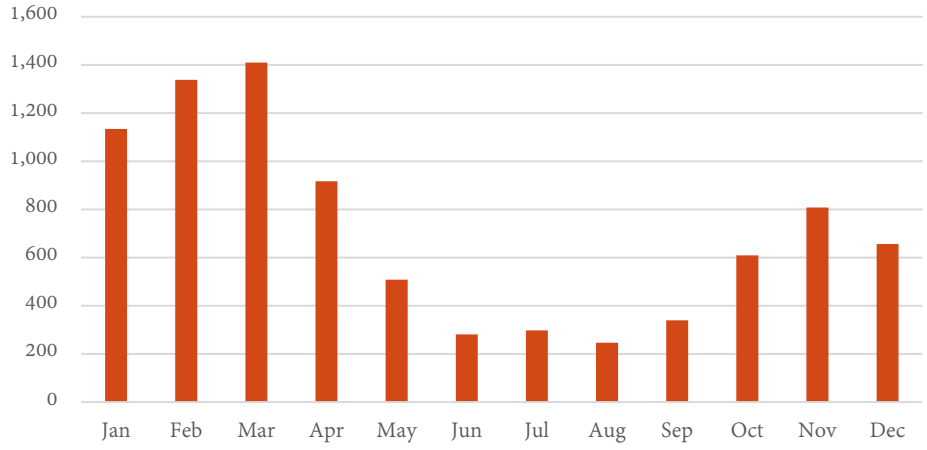
Figure 32. Average Monthly Visits to Patagonia Lake State Park, 2017-2019



Source: Arizona State Parks & Trails

Visits to Tubac Presidio State Historic Park follow a pattern similar to Tumacácori NHP, with visits highest in spring months, and lowest during summer months (Figure 33). The park received a total of 8,031 visits in 2019.

Figure 33. Average Monthly Visits to Tubac Presidio State Historic Park, 2017-2019



Source: Arizona State Parks & Trails

Forest Service Lands

Visitor use estimates are available for the Coronado National Forest in its entirety. Santa Cruz County encompasses portions of the Nogales and Sierra Vista Ranger Districts of the Coronado National Forest, however, published visitation estimates are not available at the ranger district-level. An estimate of visitation within Santa Cruz County therefore had to be developed.

The U.S. Forest Service's National Visitor Use Monitoring (NVUM) program reports a visitation estimate for Coronado National Forest for fiscal year 2017 (USDA Forest Service, 2021). They report an estimated 1,417,000 visits to the forest in FY2017 and an average group size of 2.4 individuals per party. For FY2012 they report 2,433,000 visits and for FY2007 they report 2,082,000 (USDA Forest Service, 2021b; USDA Forest Service, 2021c). Based on reports by the Coronado National Forest District Office (A. Milnor, personal communication), the FY2017 visitation estimate under-represented visitation to the forest, therefore we use an average of the three most recent NVUM visitation estimates, and apply the average group size of 2.4 individuals per party from the 2017 NVUM report.

Based on a count of developed recreation sites within the various ranger districts (USDA Forest Service, 2018), and communication with the Coronado National Forest District Office (A. Milnor, personal communication), it was estimated that roughly 25% of visits occur within Santa Cruz County. Therefore, visitation occurring within Santa Cruz County was estimated as 25% of the total for the entire forest, or 494,333 visits for 2019.

Off-highway vehicle (OHV) use is represented within NVUM visitation estimates, therefore we assume OHV use in the county is covered by the Forest Service estimates. Several popular birding locations are located on the Coronado National Forest within Santa Cruz County, such as Madera Canyon. Therefore, this estimate of visitors to the national forest includes a portion of birding activity in the county.

Other Lands

Other areas of the county attract visitors for recreation including lands along the Santa Cruz River and Sonoita Creek. Along Sonoita Creek, conservation organizations operate a variety of preserves, many of which are open to the public for recreation. These include the Paton Center for Hummingbirds, The Nature Conservancy's Patagonia-Sonoita Creek Preserve, and the Borderlands Wildlife Preserve. All three of these locations represent popular birding locations. Recreation sites along the Santa Cruz River and Sonoita Creek are located across a patchwork of land ownership, and therefore are not captured in visitation to Arizona State Parks, National Parks, and Forest Service lands.

The Paton Center for Hummingbirds is owned by the Audubon Society and received a total of 24,261 visits in 2017. Staff report that visitation in 2018 and 2019 was similar to 2017.

The Borderlands Wildlife Preserve is open for recreation and tracks visitors through a trailhead sign-in sheet. In 2019, the preserve recorded 903 visitors who signed in at the trailhead. Sign-in sheets, whether voluntary or mandatory, are known to only capture a portion of total visitors due to imperfect compliance (Watson, et al, 2000). The rate of compliance for this location is unknown, therefore we applied a conservative expansion factor of 1.5, which is to say for every two individuals who signed in, one did not. Using that expansion factor, we estimate there were a total of 1,355 visitors in 2019.

The Nature Conservancy's Patagonia-Sonoita Creek Preserve is also open for recreation. The Sonoita Creek Watershed Conservation Plan (2020) reports an estimate of 10,000 annual visitors in 2019.

A 2019 study (Southwick & Associates) estimates water-based outdoor recreation in Arizona with detailed estimates for individual rivers and lakes in different counties. The study estimates 95,900 Arizona resident days were spent visiting Sonoita Creek, not including Patagonia Lake State Park. Due to potential double counting and in lieu of individual preserve visitation estimates, we opt to use the overall estimate for Sonoita Creek of 95,900 Arizona resident visitor days.

Similarly, the Southwick & Associates study (2019) provides an estimate of visitation to the Santa Cruz River in Santa Cruz County, which would encompass visits to the river along the Anza Trail and other access locations. The study estimated 199,000 Arizona resident days were spent visiting the Santa Cruz River.

Agritourism

In Santa Cruz County, agritourism activities are focused around the region's vineyards and wineries. The county is home to the Sonoita American Viticultural Area (AVA) and wine tourists from around the state and world are attracted to the area to visit tasting rooms. A recent survey of Arizona wineries estimates that Arizona winery tasting rooms receive a median of 8,300 visitors per year (Bickel, et al, 2021). There were 15 wineries located within Santa Cruz County in 2019 that had on-site sales to customers (Arizona Department of Liquor, 2019). We apply the median number of visitors to the total number of wineries with on-site sales in the county for an estimate of 124,500 visitors annually.

A 2017 study of Arizona's wine tourism industry provides estimates of the share of visitors by region who visit just for the day versus those who stay overnight. For the southern region of Arizona, 75.5% of wine tourists are day visitors (AHRRC, 2011). Based upon this breakout, estimated annual wine tourist visits in Santa Cruz County would include 93,998 day visitors and 30,503 overnight visitors.

Hunting

Statistics on hunting are published through Arizona Fish and Game, the agency that oversees licensing the take of game animals in Arizona. Data are available by game unit, however, because game units are determined geographically based upon features such as roads, game units do not coincide perfectly with counties or other jurisdictions. It is therefore necessary to estimate the number of hunters and hunt days occurring within Santa Cruz County.

Hunter and hunt day counts were aggregated by game unit for 2019 based off Arizona Game and Fish 2019 Harvest Summaries (Arizona Game and Fish, 2021) (Table 21).

Table 21. Reported Hunters and Hunt Days in Game Units within Santa Cruz County

	Javelina		Deer - General		Deer - Archery		Pronghorn		TOTAL	
	Hunters	*Days*	*Hunters*	*Days*	*Hunters*	*Days*	*Hunters*	*Days*	*Hunters*	*Days*
34A	44	57	1,968	7,769	1,087	6,497	1	6	3,100	14,329
34B	0	0	448	1,798	385	2,052	0	0	833	3,850
35A	4	7	1,105	4,747	561	3,597	5	5	1,675	8,356
35B	0	0	1,175	4,916	307	1,643	0	0	1,482	6,559
36B	0	0	2,486	9,933	946	4,947	0	0	3,432	14,880
Total	48	64	7,182	29,163	3,286	18,736	6	11	10,522	47,974

Source: Arizona Game & Fish, 2019

Counts for bear and mountain lions were excluded from this count because no information on the number of hunt days was provided. However, these numbers are very small. Based on an examination of hunting seasons between general deer hunts and archery deer hunts, it was determined that overlap between the two seasons, if any, should be minimal. There could be some overlap between javelina and pronghorn hunt days and deer hunt days, however, due to the relatively small number of hunt days for these two species, we assume no overlap between hunt days. The area is also a major destination for quail hunting, however, due to lack of data, this was not included in our estimates.

To estimate the number of hunters and hunt days occurring within Santa Cruz County, we apply the simplifying assumption that hunting activity occurs uniformly across entire game units. We calculate the share of each game unit located in Santa Cruz County (Table 22) to estimate the number of hunters and corresponding hunt days occurring within Santa Cruz County (Table 23).

Table 22. Percent Area of Arizona Game Units Located in Santa Cruz County

Game Unit	Area in Santa Cruz County
34A	56%
34B	4%
35A	25%
35B	100%
36B	60%

Source: Author calculations

Table 23. Estimated Hunters and Hunt Days Based on Percent of Game Unit in Santa Cruz County

	Hunters	Days
34A	1,724	7,969
34B	32	150
35A	425	2,119
35B	1,482	6,559
36B	2,056	8,915
Total	5,719	25,712

Source: Author calculations

Based upon these estimates, there were 25,712 hunting days that occurred in Santa Cruz County in 2019.

Nature-Based Visitor Spending Estimates

National Parks

To estimate visitor spending attributable to Tumacácori NHP, we use a visitor spending pattern published by the National Park Service (National Park Service, 2021b). This spending pattern is specific to the park for 2019. Table 24 presents estimated spending by visitors to Tumacácori NHP.

Table 24. Spending by Visitors to Tumacácori NHP, 2019

Spending Category	Visitor Spending
Camping	$70,080
Gas	$314,640
Groceries	$134,640
Hotels	$756,000
Recreation Industries	$215,040
Restaurants	$554,640
Retail	$282,240
Transportation	$72,720
TOTAL	**$2,400,000**

Source: Author calculations

State Parks

Our estimates of visitor spending attributable to Arizona State Parks located in Santa Cruz County rely on a recent study of the economic contribution of state parks to Arizona's state economy (Duval, et al, 2021). Using spending patterns that include all visitors, both local and non-local, we derive the following estimates of visitor spending by park and expenditure category (Table 25).

Table 25. Spending by Visitors to Patagonia Lake State Park & Tubac Presidio State Historic Park, 2019

Spending Category	Patagonia Lake State Park	Tubac Presidio State Historic Park	TOTAL
Admission, recreation, and entertainment fees	$794,050	$76,660	$870,710
Camping fees and charges	$3,448,632	$32,739	$3,481,370
Lodging	$273,980	$424,372	$698,352
Groceries	$2,726,563	$76,349	$2,802,912
Food & beverage	$952,663	$210,387	$1,163,050
Retail shopping	$1,166,635	$111,221	$1,277,856
Auto expenses	$1,670,365	$54,512	$1,724,877
Any other expenses	$475,134	$81,068	$556,202
TOTAL	$11,508,023	$1,067,307	**$12,575,330**

Source: Author calculations

Forest Service

Coronado National Forest visitor spending in Santa Cruz County was estimated using a national lower-bound non-local day visitor spending pattern (White, 2017). This spending pattern was chosen because it closely matched the total estimated spending per party per trip reported in the NVUM estimates for Coronado National Forest (USDA Forest Service, 2021). Adjusting estimated total visits for an average group size of 2.4, we arrive at total estimated spending of $11.8 million in 2019 (Table 26).

Table 26. Spending by Visitors to Coronado National Forest in Santa Cruz County, 2019

Spending Category	Spending
Restaurant	$2,343,600
Groceries	$1,890,195
Gas & oil	$5,545,646
Other transportation	$20,151
Entry fees	$749,629
Recreation & entertainment	$564,237
Sporting goods	$511,844
Souvenirs & other expenses	$183,377
Total	**$11,808,679**

Source: Author calculations

Other Lands

Our estimates of visitor spending attributable to Sonoita Creek and Santa Cruz River recreation rely on the visitation estimates of water-based recreation from Southwick Associates (2020). These estimates account for Arizona residents only (Southwick Associates, 2020) and therefore represent a conservative estimate of visitation to these locations. To estimate visitor spending linked to visits to Sonoita Creek and the Santa Cruz River, we apply a non-local day trip spending pattern for U.S. Forest Service visitors (White, 2017). Table 27 presents estimated spending by category for visitors to Sonoita Creek and the Santa Cruz River.

Table 27. Visitor Spending by Water-Based Recreation Visitors to Sonoita Creek and Santa Cruz River in Santa Cruz County, Arizona, 2019

Category	Santa Cruz River	Sonoita Creek	Total
Restaurant	$492,659	$237,417	$730,076
Groceries	$603,292	$290,732	$894,023
Gas & oil	$1,371,667	$661,019	$2,032,687
Other transportation	$5,186	$2,499	$7,685
Entry fees	$268,802	$129,538	$398,340
Recreation & entertainment	$63,095	$30,406	$93,501
Sporting goods	$324,118	$156,196	$480,313
Souvenirs & other expenses	$33,708	$16,244	$49,953
Total	$3,162,527	$1,524,052	**$4,686,579**

Source: Author calculations

Agritourism

To estimate spending by visitors to wineries in Santa Cruz County, we use a spending pattern developed for winery visitors in southern Arizona (AHRRC, 2011). Adjusting estimated visits for average group size, we apply the per-party average spending pattern for both overnight and day visitors. Table 28 presents estimated spending by wine tourists in Santa Cruz County by visitor type.

Table 28. Spending by Wine Tourists in Santa Cruz County by Visitor Type, 2019

Spending Category	Day Visitor Spending	Overnight Visitor Spending	Total Spending
Lodging-Camping	$0	$918,889	$918,889
Restaurant-Grocery	$836,432	$701,090	$1,537,522
Transportation including gas	$669,145	$143,875	$813,020
Shopping	$908,126	$135,926	$1,044,052
Recreation, tours, entrance, permit fees	$334,573	$147,054	$481,627
Other	$955,922	$530,190	$1,486,112
Total	**$3,704,197**	**$2,577,024**	**$6,281,221**
Estimated Visitors	93,998	30,503	124,501
Average Spending per Visitor	$39.41	$84.48	$50.45

Source: Author calculations

Hunting

In-state residents account for 90% of hunting days in Arizona (U.S. Census Bureau, 2018), therefore we apply the in-state resident spending pattern for hunting to estimate visitor spending attributable to hunters in Santa Cruz County. The spending pattern is presented on a per-day basis, and the count of hunters could potentially double-count some individuals who participate in multiple hunts, therefore we use the estimated number of hunt days to calculate spending by hunters in Santa Cruz County (Table 29).

Table 29. Spending by Hunters in Santa Cruz County, 2019

Spending Category	Spending
Food and lodging	$627,076
Transportation	$778,696
Other trip costs	$151,162
Total	**$1,556,934**

Source: Author calculations

Summary of Nature-Based Tourist Visitor Spending

Table 30 presents aggregated nature-based tourist visitor spending by category.

Table 30. Summary of Nature-Based Tourism Spending by Category in Santa Cruz County, 2019

Spending Category	Spending
Lodging	$2,686,779
Camping	$3,551,450
Restaurant	$6,328,889
Grocery	$6,035,308
Gas & transportation	$11,310,122
Retail	$3,829,635
Entrance Fees	$3,373,084
Other	$2,193,476
Total	$39,308,742

Source: Author calculations

Residential Real Estate Influences

The draw of Santa Cruz County's natural beauty, biodiversity, and opportunities for outdoor recreation are motivating factors in peoples' decisions to invest in second homes within the county. This can bolster residential property values and contribute to the local property tax base, among other impacts. Therefore, we conducted a simple analysis to estimate the number of properties in the county that may be second homes. While the analysis does not estimate the total property value attributable to NBRE-connected seasonal residents, it does provide a starting point for understanding the magnitude of this effect within the county. To conduct the analysis, we used county assessor parcel data (Santa Cruz County, 2021) for the entire county and evaluated if mailing address zip

codes were in-county zip codes. The parcel database was filtered to remove any duplicate entries, and to only include properties with improvement values greater than zero, effectively excluding vacant land, and with assessment ratios equal to 10%, which limits the data to property class 3 (residential), class 4 (residential rental), and class 8 (certain historic properties) (Arizona Department of Revenue, 2017). Any property with an out-of-county mailing address was considered as having a non-local owner. An estimated 11% of properties county-wide meeting the criteria above had mailing addresses with out-of-county zip codes. The rate of non-local ownership varied by area. For example, non-local ownership was lowest in areas around Nogales and Rio Rico (3% to 7% non-local ownership), and highest in the Tubac & Tumacacori area (17%), the Sonoita & Elgin area (20%), and the Patagonia area (29% - 33%). This analysis presents a rough estimate of the percent of residential properties in the county that may be second homes. However, the estimate is based on data that may include some properties used solely as investment properties, or group residential facilities owned by out-of-county entities. A proper assessment of the value of residential real estate in the county attributable to the presence of natural amenities would require a survey of property-owners and a much more detailed analysis of property values. Such an analysis should also consider higher effective property tax rates assessed on owners of second homes in Arizona (Arizona State Board of Equalization, 2021) and the implications of second home ownership on property tax revenues in the county.

Conservation, Restoration, & Preservation (C&R)

Santa Cruz County has a long history of conservation, restoration, and preservation (herein 'C&R') activities taking place in the county. In 1966, The Nature Conservancy purchased its first property in Arizona, protecting three miles of Sonoita Creek and establishing the Patagonia-Sonoita Creek Preserve. Since then, and especially in recent years, C&R activities have increased significantly. This is due both to the incredible natural and cultural resources in the region and the formal designation of the region as an important area for biodiversity, wildlife habitat and migration, as well as its cultural and historic significance. In fact, the Santa Cruz Valley, which extends along the Santa Cruz River from Santa Cruz County north through Pima County, was recently recognized in 2019 by the National Parks Service as a National Heritage Area. This designation, made by Congress, recognizes regions that have nationally distinct landscapes with rich natural, cultural, historic, and recreational resources (Santa Cruz Valley National Heritage Area, 2021).

There is limited information about how C&R activities affect the local economy. This is generally the case across the country because there is no single industry that captures all these activities in existing government statistics. Estimating the economic activity associated with these efforts is challenging because of the complex composition of the "restoration economy" (Cullinane Thomas et al, 2016; Baker, 2005). The "restoration economy" is comprised of federal, state, and local government agencies, public land managers, private landowners, nonprofits, research scientists, private contractors and consultants, tribes, and others. Oftentimes multiple entities work together through partnerships to preserve, conserve, and restore natural and cultural resources. The complex nature of this collaborative work can make the task of estimating jobs and economic activity in local economies challenging.

This portion of the study describes the structure of the NBRE that has developed in Santa Cruz County, listing various actors and entities involved. It provides a description of some of the activities that have taken place in the county and quantifies the direct economic activity attributable to C&R activities that took place in 2019.

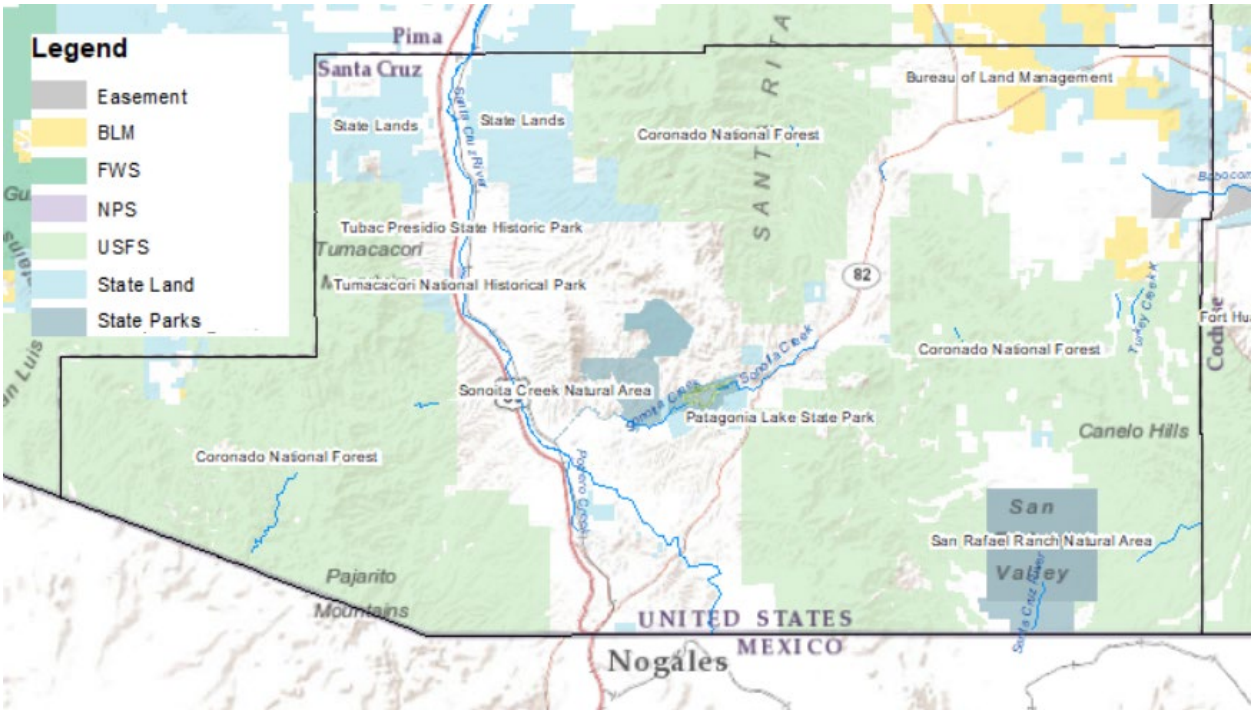
Before doing so, however, it's important to define the types of activities included in this analysis. Given the rich ecological, cultural, and natural resource assets within Santa Cruz County, we use a relatively broad definition of C&R efforts. Often used synonymously, and closely related, are ***conservation*** and ***preservation***. ***Preservation*** is the "the act, process, or result of preserving something: such as the activity or process of keeping something valued alive, intact, or free from damage or decay" (Merriam-Webster, 2021). This could include the preservation of state parks and monuments, old traditions, and wildlife and natural habitat. According to the National Parks Service, preservation "seeks *protection* of nature *from use* [emphasis added]" and notes that it is generally associated with "protection of buildings, objects, and landscapes" (National Park Service, 2019b). ***Conservation***, on the other hand "seeks the *proper use of nature* [emphasis added]" and is generally associated with protection of natural resources (National Park Service, 2019b). Conservation inherently includes activities and processes embedded in natural resource management. Finally, ***restoration*** or more specifically ecological restoration is the "process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed" (Society for Ecological Restoration, 2021). This study only includes C&R efforts physically taking place within Santa Cruz County and therefore excludes activities occurring in neighboring counties and Sonora, Mexico.

Overview of Conservation, Restoration, & Preservation (C&R) in Santa Cruz County

C&R efforts are organized by such factors as geography, ecological assets, and land ownership, as well as regulatory, financial, and institutional structures that support these efforts. This section provides a brief overview of the types of C&R activities occurring within Santa Cruz County, roughly categorized by whether the activity aligns more with preservation, conservation, or restoration and where the activity takes place. While this section will not present a compendium of all activities (both past and present) in the county, it provides a foundation for understanding the restoration economy within the county.

Efforts to preserve the county's intersection of natural and cultural resources take place primarily along the Santa Cruz River. There are several historic sites in the county where natural resources and cultural traditions mix. The most prominent of these is Tumacácori National Historic Park. The National Park Service's mission is to "conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations" (National Park Service, 2021d). Located along the Santa Cruz River, Tumacácori represents the only publicly owned land along the river course in the county. With direct access to the historic Anza Trail, nature-based tourism has become a much more significant part of the park's mission in recent years (A. Badertscher, personal communication). The first established section of the Anza trail connects Tumacácori with another important historic landmark, Tubac Presidio State Historic Park (National Park Service, 2019). Owned by Arizona State Parks and operated by a volunteer organization, Tubac Presidio State Park was the first state park in Arizona and is home to three historic buildings, including the Presidio San Ignacio de Tubac (Friends of Tubac Presidio & Museum, 2021; S. Stone, personal communication).

Figure 34. Map of Santa Cruz County by Surface Management Agencies

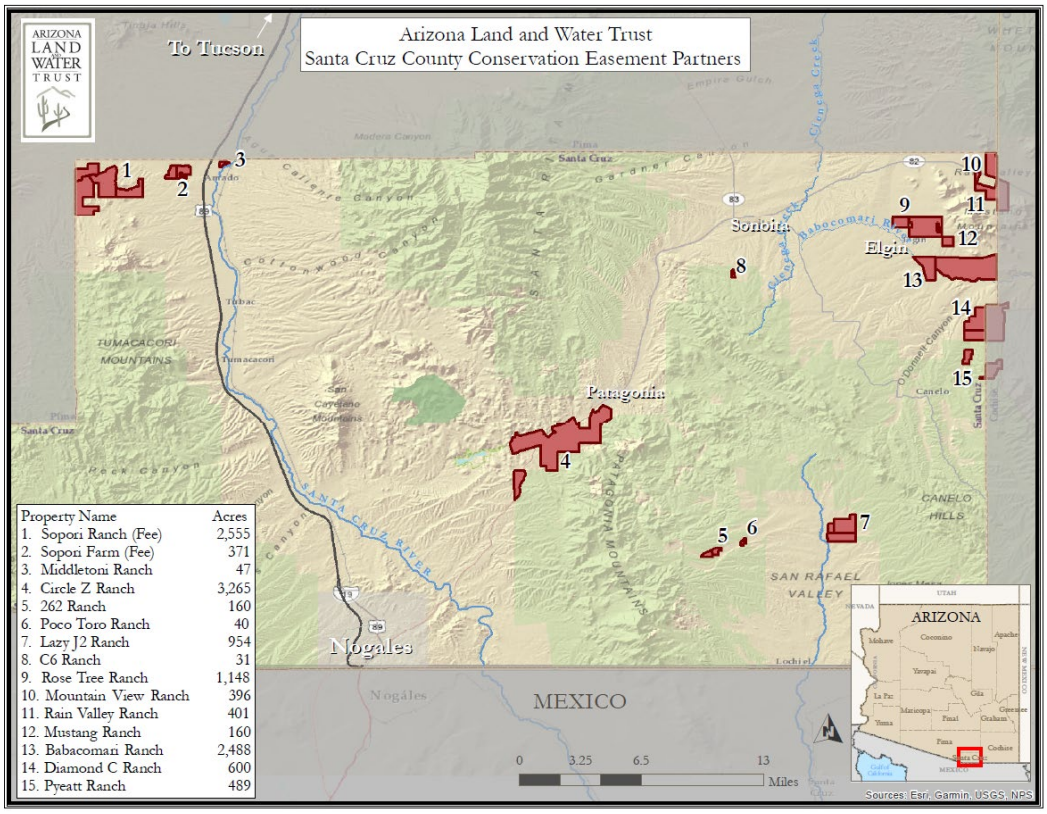


Conservation activities occur throughout Santa Cruz County through a variety of land management agencies and programs. First and foremost, public lands comprise a large proportion of the county's land area and play a significant role in the conservation of lands in Santa Cruz County. In fact, only about 36% of the county's land area privately owned. The remainder of the county's land area is either state or federal land, the majority of which belongs to the U.S. Forest Service's Coronado National Forest (Figure 34). Public lands are managed differently according to the agency managing them. State trust land is managed to generate revenues for education through land sales, leases, or permitted recreational activities (Arizona State Land Department, 2021). Federal lands, specifically U.S. Forest Service lands, are managed "to improve the health, diversity, and productivity of the nation's forests and grasslands to meet the needs of current and future generations" (U.S. Forest Service, 2021). The presence of federal lands and their conservation has implications for county and state budgets. Annual payments are made to local governments to compensate for loss in property taxes due to presence of federal lands, known as Payment in Lieu of Taxes (PILT).

On private lands, conservation may take place through private activities or through publicly funded programs, an example of which is federally funded Farm Bill conservation programs. Farms and ranches may utilize conservation programs to develop and implement conservation measures on their operations. Another conservation practice used on private lands is conservation easements. There are several conservation easements throughout the county, in particular within the eastern portion of the county and near Patagonia within the Sonoita Creek watershed. Conservation easements are legal agreements through which a private landowner can voluntarily donate or sell their development rights on a given tract of land (Arizona Land and Water Trust, 2021). Under the agreement the land is protected from development into perpetuity. An organization active in this area

in Santa Cruz County is the Arizona Land and Water Trust. Figure 35 presents the conservation easements held by the Arizona Land and Water Trust and their partners.

Figure 35. Map of Arizona Land and Water Trust Santa Cruz County Conservation Easement Partners, 2021



Source: Arizona Land & Water Trust (2021)

Within Santa Cruz County, restoration activities have generally been concentrated in two regions: along the Santa Cruz River, between Nogales and Amado, and within the Sonoita Creek watershed, situated in the valley between the Patagonia and Santa Rita Mountains near the town of Patagonia. This is, in large part, due to the significant ecological and social value of these intermittent and ephemeral water bodies. Restoration efforts in these areas generally focus on watershed and habitat restoration including installing erosion control structures such as berms, gabions, and small rock dams, removing invasive species, and planting native grasses, shrubs, and trees. All of these efforts are designed to increase infiltration, stabilize watercourse banks, and restore natural stream flow.

The Santa Cruz River's headwaters begin in the San Rafael Valley in Arizona, flow south across the U.S.-Mexico international border, complete a 25-mile U-turn in Mexico and flow back north into the United States east of Nogales, Sonora and Nogales, Arizona (Figure 36) (Sonoran Institute, 2021; Friends of Santa Cruz River, 2021). Surface flow through Santa Cruz County is almost exclusively dependent on effluent discharged from the bi-national Nogales Wastewater Treatment Plant (NIWTP) (Friends of Santa Cruz River, 2021). The National Audubon Society has designated the Upper Santa Cruz River, from Tumacácori National Historic Park to north of Tubac at the Tucson Audubon's conservation easement at Esperanza Ranch, as an important bird area (Audubon Society, 2021). Between 1984 and 2009, there were approximately 18 restoration projects along the Santa Cruz

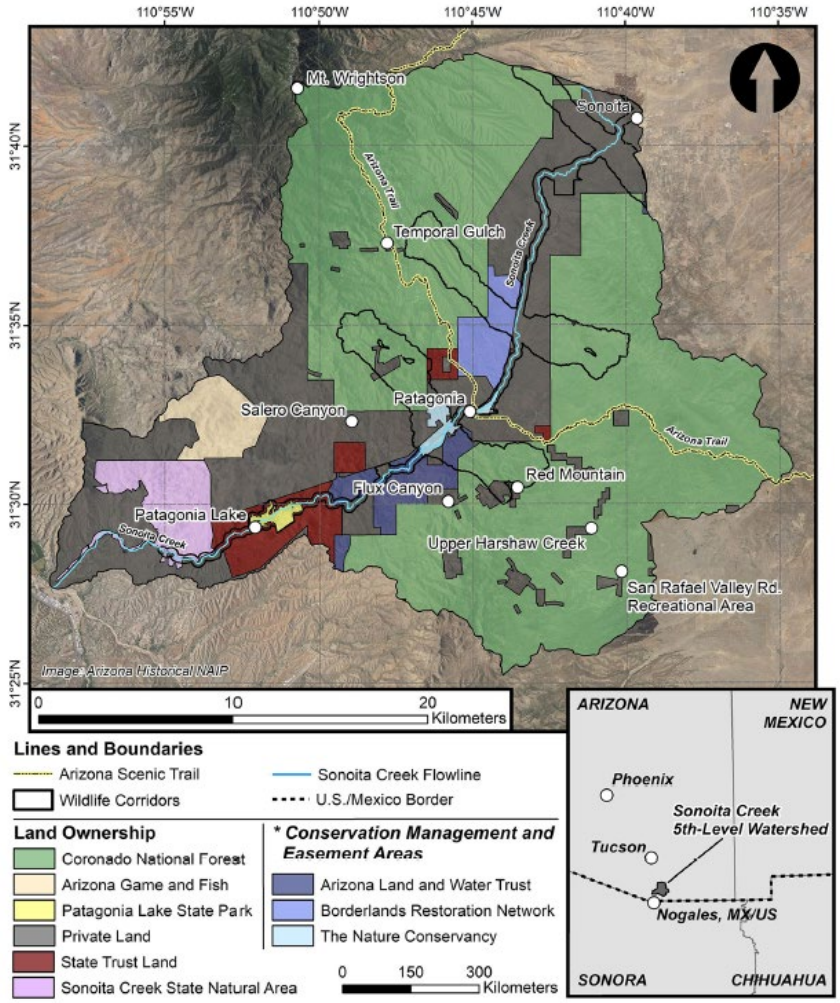
River, two of which occurred within Santa Cruz County (Fabre and Cayla, 2009). These include a 300-acre conservation easement and restoration project at Esperanza Ranch managed by the Tucson Audubon Society (located between Amado and Tubac) and an erosion control and riparian restoration project on the Santa Fe Ranch (located near Nogales, Arizona).

Figure 36. The Santa Cruz River Watershed

Source: Sonoran Institute, 2021b.

Another area with a high concentration of C&R activities is the Sonoita Creek watershed. Various agencies and organizations own and manage land within the Sonoita Creek watershed (Figure 37). The U.S. Forest Service (Coronado National Forest) manages the majority (60%) of the land in the watershed (Petrakis et al., 2020). State-owned lands include Arizona State Parks' Patagonia Lake State Park and Sonoita Creek State Natural Area, state trust land, and Arizona Game and Fish lands. Several conservation-based organizations also own or manage land within the watershed, including Arizona Land and Water Trust, Borderlands Restoration Network, and the Nature Conservancy (Figure 37). In 2006, this region was identified by an Arizona Game and Fish-funded study as an important corridor for wildlife moving between northern Mexico and Arizona, including the endangered jaguar (Sky Islands Borderlands Restoration Network, 2021). Tucson Audubon's Paton Center for Hummingbirds is also located in the Sonoita Creek watershed along the creek.

Figure 37. Map of Ownership and Land Management within Sonoita Creek Watershed



Source: Petrakis et al., 2020

While watershed and riparian habitat restoration comprise a significant share of the activities in the region, there are also efforts to protect and preserve native grasslands. A prime example of this is the San Rafael State Natural Area in southeastern Santa Cruz County, along the U.S.-Mexico border (Figure 34). The San Rafael Valley was proposed as a natural area in the early 1970s because it was identified as one of the "finest stands of native grassland in the state" (Arizona State Parks and Trails, 2021). Unlike other parts of Arizona, the grasslands in the San Rafael Valley had not yet been invaded by non-native grasses, shrubs, and cactus. In 1999, Arizona State Parks and The Nature Conservancy partnered to purchase and protect the 22,000-acre San Rafael Ranch (The Nature Conservancy, 2021).

Actors Involved in Conservation, Restoration, and Preservation (C&R) in Santa Cruz County

As alluded to in the previous section, there is a wide variety of organizations and individuals involved in C&R efforts in Santa Cruz County. It's important to note, however, that many of these organizations have a geographic scope broader than Santa Cruz County and conduct activities in surrounding areas, on both sides of the U.S.-

Mexico border. Santa Cruz County falls within the Madrean Archipelago Ecoregion (Madrean), which is globally recognized as a rich and diverse ecosystem, comprised of "sky island" mountain ranges surrounded by desert "seas" (Norman et al., 2021). Home to several threatened and endangered species, including the only known wild jaguars and ocelots in the United States, and over half of all bird species found in North America, the region provides important wildlife habitat and is also recognized by Conservation International as one of 36 "biodiversity hotspots" in the world[10] (Norman et al., 2021).

Within this broader geographic scope, a coalition of restoration practitioners, scientists, public land managers, landowners, and residents came together to create the Sky Island Restoration Collaborative (SIRC). SIRC is a committed and growing group of government agencies, nonprofit organizations, and private landowners that have developed a thriving landscape-restoration initiative in southeast Arizona and northern Mexico (Norman et al., 2021). Formally established in 2014, SIRC has created an open network of resources (staff, financial, and volunteer) to leverage and maximize efforts to restore the Madrean (Norman et al., 2021). Among the goals of SIRC are to merge science with the practice of restoration ecology, develop a restoration economy (and ultimately improve the quality of life for citizens living along the U.S.-Mexico border), and make restoration initiatives self-sustaining. Over the course of 5 years, participation in SIRC has quadrupled from 26 people from 14 organizations to more than 100 people. According to recent SIRC annual reports, more than $2 million in funding has gone toward restoring the Madrean annually (Norman et al., 2021).

While not a complete accounting of all the actors involved in C&R in Santa Cruz County and the surrounding region, the following section provides an overview of the various actors and entities involved by their organization type. Many projects and initiatives have numerous partners and not all partners may be listed. In fact, Fabre and Cayla (2009) find that restoration projects taking place on the Santa Cruz River have on average four sponsors per project. While a complete accounting of all the nonprofit organizations that have ever been involved in these regional efforts would be incredibly challenging, Appendix C presents a list of agencies and organizations that have been identified as being involved in recent initiatives and projects.

U.S. Federal Government

The U.S. federal government plays a large role in C&R activities in the U.S.-Mexico borderland (GNEB, 2014). Public lands innately conserve and, in some cases, preserve the natural environment, and the U.S. Department of Interior (DOI) and its agencies are also engaged in a range of restoration activities on public lands. This includes managing invasive species and fuel loads, planting native species, and managing natural resources. Agencies that have worked in Santa Cruz County and that fall under the DOI include the Bureau of Land Management (BLM), the National Park Service (NPS), the U.S. Fish and Wildlife Service (USFWS)[11], and the U.S. Geological Survey

[10] A biodiversity hotspot is defined as an area that has a high percentage of plant life but has lost 70% of its original natural vegetation (Norman et al., 2021)

[11] The U.S. Fish and Wildlife Service is an agency within the Department of Interior that is "dedicated to conservation, protection, and enhancement of fish, wildlife and plants, and their habitats" and is responsible for implementing the Endangered Species Act, among other regulations (USFWS, 2021). One of the programs implemented by the USFWS is the Partners for Fish and Wildlife Program that provides technical and financial assistance to landowners seeking to restore or enhance habitat on their property (USFWS, 2021b). USFWS data indicate that there are some Santa Cruz County landowners that participate in this program.

(USGS). Other federal agencies that assist private landowners in designing and implementing conservation plans fall under the U.S Department of Agriculture, such as the U.S. Forest Service (USFS), the Natural Resources Conservation Service (NRCS)[12], and the Farm Service Agency (FSA)[13].

Federal agencies may be involved in restoration work either by conducting restoration activities themselves or by contracting with other entities, usually non-profit organizations (Baker, 2005). Some agencies, such as the USGS, are involved in restoration-related research. Given that restoration is a dynamic process, ongoing monitoring and research is critical to project-based and large-scale restoration efforts (GNEB, 2014).

A unique feature of Santa Cruz County is its location on the U.S.-Mexico border and the binational management of the Santa Cruz River. The Nogales International Wastewater Treatment Plant (NIWTP) provides treatment for wastewater generated in both Nogales, Arizona and Nogales, Mexico. The treated effluent is released into the Santa Cruz River, supporting riparian habitat along the river (GENB, 2014). The facility is located within Santa Cruz County, is owned by the U.S. Section of the International Boundary and Water Commission (USIBWC) and the City of Nogales, Arizona. The facility is operated by the USIBWC, and operations are funded by the USIBWC, Mexico, and the City of Nogales, Arizona (USIBWC, no date). Management of the NIWTP has a large impact on the Santa Cruz River as "careful management of wastewater infrastructure and treatment plant effluent is needed to restore ecological conditions within the Santa Cruz River" (GENB, 2014, p. 50).

State and Local Agencies

A number of state and local government agencies are involved with C&R efforts in the county. Arizona State Parks operates Patagonia Lake State Park and the adjacent Sonoita Creek State Natural Area, as well as the San Rafael State Natural Area. Other state and local agencies that have either funded or participated in previous conservation or restoration activities include Arizona Game and Fish, Arizona Department of Water Resources, Arizona Department of Environmental Quality, and the Santa Cruz Natural Resource Conservation District, among others. Both the Arizona Department of Water Resources and Arizona Department of Environmental Quality are involved in measuring and monitoring streamflow and water quality along the Santa Cruz River. Arizona Game and Fish has been involved in numerous grassland monitoring and restoration projects to reestablish habitat for species including the Chiricahua leopard frog and black-tailed prairie dogs. Finally, the Santa Cruz Natural Resource Conservation District is a local organization that works closely with the NRCS and private landowners to address issues related to grazing management, water management, natural resource education, resource

[12] The NRCS is a non-regulatory agency within the U.S. Department of Agriculture that works with private landowners to develop conservation plans and provides technical and financial assistance to implement those plans (GNEB, 2014). The NRCS manages the following Farm Bill conservation programs: Environmental Quality Incentives Program (EQIP), Conservation Stewardship Program (CSP), and Regional Conservation Partnership Program (RCPP).

[13] The Farm Service Agency (FSA) is another federal agency under the U.S. Department of Agriculture that oversees and helps manage a number of voluntary conservation programs geared toward addressing farming- and ranching-related conservation issues. These include the Conservation Reserve Program (CRP) and the Grassland Reserve Program (GRP) among others. The CRP pays an annual rental payment in exchange for farmers removing sensitive land from production and the GRP pays a rental payment in exchange for ranchers limiting future cropland and urban development on their land (FSA, 2021). Neither the CRP nor the GRP have been adopted widely in Santa Cruz County (Hunt, personal communication).

planning assistance and erosion control/flood mitigation (Santa Cruz Natural Resource Conservation District, no date).

Non-Profit Organizations

Non-profit organizations play a critical role in C&R efforts in Santa Cruz County and the restoration economy more broadly. Baker (2005) suggests that non-profit organizations are "a key component of the institutional infrastructure that has developed within the restoration sector" (p. 7). Among other achievements, many nonprofits have excelled at cultivating trust with private landowners, serving as a bridge between initiatives and funding (often finding sources of matching funds that are required for federal grants), and convening groups with shared missions. Many non-profits have also developed ecological expertise that is needed to conduct environmental assessments, prioritize restoration projects, implement and/or oversee restoration projects, and monitor and evaluate the effectiveness of restoration projects. Other expertise comes in the form of knowing how to navigate bureaucratic processes, develop proposals and obtain funding, and develop communication materials that demonstrate their successes.

Non-profits with C&R efforts in Santa Cruz County include local non-profit organizations based in Santa Cruz County (such as Borderlands Restoration Network), but also non-profit organizations located elsewhere in Arizona and in other locations across the country (such as The Nature Conservancy and Tucson Audubon). Some non-profit organizations are more involved in conservation and preservation activities, while others are more involved in on-the-ground restoration. Efforts are not limited to the confines of the county's administrative boundary, with many organizations involved in initiatives taking place in Santa Cruz County, Cochise County, Pima County, Graham County, and across the border in Sonora, Mexico.

Other Actors

In addition to governmental agencies and non-profit organizations, there are a few organizations in the region that work in the C&R space that have alternative tax designations. One of these is Borderlands Restoration L3C, a limited-profit company that grows and sells native plants, offers socio-ecological consulting, and provides habitat restoration services (Biophilia Foundation, 2019a). The L3C designation also allows for investors to make cash investments into the operation. Under this arrangement, investors agree to modest returns, and agree that 80% of net profits will be re-invested into conservation and restoration activities through its non-profit partner Borderlands Restoration Network (Biophilia Foundation, 2019a). Another business involved in the region is Wildlife Corridors LLC. Wildlife Corridors is a limited liability company that purchased land along the Sonoita Creek Wildlife Corridor that had initially been set aside for development. With the intent of preserving a critical wildlife corridor, Wildlife Corridors is permanently preserving land by selling off the development rights within the corridor and selling a limited number of residential lots outside of the corridor (Biophilia Foundation, 2019b). Owned by Wildlife Corridors LLC and managed in partnership with Borderlands Restoration Network, the 1,200-acre area is now known as the Borderlands Wildlife Preserve and the Wildlife Haven residential neighborhood (Borderlands Restoration Network, 2021).

Volunteers

Finally, this study would be remiss to not include mention of the numerous volunteer community members and organizations that work to preserve and protect the natural environment in the region. Within Santa Cruz

County, there are several volunteer-led organizations that are involved in monitoring watershed and habitat conditions, building and maintaining trails, installing erosion control structures, planting native plants, serving as educators regarding the natural and cultural resources in the region, and staffing locations that offer nature-based tourism.

Because of the nature of this study, volunteer time is not reflected in the direct output or economic contribution estimates. This is because an economic contribution analysis measures the flow of money through a regional economy, and therefore is limited to economic activity where a monetary exchange occurs. In that regard, labor that is compensated will be counted, while uncompensated (volunteer) labor will not. While not explicitly measured and included in this study, the value that volunteers bring to the NBRE in Santa Cruz County is significant and demonstrates the value of C&R activities to members of the local community.

Quantifying Direct Economic Activity from Conservation, Restoration, & Preservation (C&R)

Considering the complexity of institutions and organizations involved in C&R and the fact that there is no single economic sector that fully captures this work, this study conducted a series of focus groups and semi-structured interviews to develop a list of organizations and other entities in the region that are involved in or have been involved in C&R activities and to quantify direct economic activity supported by C&R activities within Santa Cruz County. We collected financial expenditure data for those organizations or groups that were actively engaged in C&R activities in Santa Cruz County in 2019 through semi-structured interviews and/or secondary data sources. Organizations based in Santa Cruz County directly support economic activity within the county and therefore all of the organizations' activities are included in the analysis. Activity by organizations based outside of the county was examined on a case-by-case basis and only expenditures occurring within the county were included.

To adhere to the set definition of C&R activities, activities related to historic preservation are included only when intersecting closely with nature. For example, non-nature-based historic preservation activities taking place in the county are outside the scope of the analysis and therefore are not included. Second, given the focus on protection of historic cultural and natural resources, we exclude things like municipal park and recreation programs. Finally, considering the importance of education to the efforts of preservation, conservation, and restoration, we include the costs of these activities when the organization is local.

Table 31 presents a summary of the operational and project-level expenses for entities involved in C&R activities in 2019 in Santa Cruz County. Both operational and project-level expenses exceed $14 million. Appendix C provides a list of agencies and organizations that have been involved in C&R efforts within the region and identify those entities that reported activities and spending in 2019. Given that some entities may have had activities but were unable to provide expense data, this may be an underestimate of the direct economic activity related to C&R activities in Santa Cruz County.

Table 31. Summary of Expenses by Conservation, Restoration, & Preservation Entities Attributable to NBRE in Santa Cruz County, 2019

Entity	Expenses
Federal Agencies	$10,978,700
- Operating and Project-Level Expenses	$9,837,500
- PILT Payments	$1,141,200
State and Local Agencies	$901,000
Non-Profit Organizations and Others	$2,305,900
Total	$14,185,600

Source: Author calculations; source data obtained through various methods as outlined in Appendix C and Appendix D

Total Direct Economic Activity of Santa Cruz County NBRE in 2019

Table 32 summarizes the economic activity attributable to the NBRE in Santa Cruz County in 2019. This direct output totaled $89.6 million in the county in 2019 and reflects spending related to nature-based industry production, nature-based tourism, and C&R activities.

Table 32. Summary of Direct Economic Activity of Santa Cruz County NBRE, 2019

NBRE Component	Direct Output
Nature-Based Industries	$36,070,587
Nature-Based Tourism	$39,308,742
Conservation, Restoration, & Preservation	$14,185,600
Total	**$89,564,929**

Source: Author calculations

Trajectory of Santa Cruz County's Nature-Based Restorative Economy

In addition to quantifying the economic importance of the NBRE in Santa Cruz County, this project involved eliciting qualitative information from nature-based economy stakeholders located in or involved in Santa Cruz County regarding the trajectory of the NBRE. The following section presents results from focus groups and interviews regarding the current circumstances facing Santa Cruz County's NBRE and its stakeholders, as well as its future trajectory. This section also includes projections based upon information from this study, as well as outside economic and demographic projections.

SWOT Analysis for Santa Cruz County Fostering the NBRE

SWOT analyses are a tool commonly used by businesses or organizations for strategic planning. The acronym 'SWOT' stands for 'strengths', 'weaknesses', 'opportunities', and 'threats'. The framework is used to enumerate an organization's internal strengths and weaknesses, and external opportunities and threats (Brandenburger, 2019). The information generated through a SWOT analysis exercise in turn informs strategic planning efforts. While most commonly implemented within a business context, SWOT analysis can be applied broadly for planning purposes. The SWOT analysis is not specific to NBRE stakeholders, but rather includes factors connected with or affecting the NBRE, both internally and externally, inside and outside the county.

A number of focus groups were convened around specific topics, such as nature-based tourism, conservation and restoration, and other topics. An initial group of individuals involved in the NBRE were identified by the project steering committee and were invited to participate in each of these focus groups. We then used snowball sampling methods and asked each of the initial individuals to identify and refer us to additional individuals involved in or who have knowledge of nature-based tourism, nature-based industries, or conservation and restoration activities. For individuals unable to participate in the focus groups, individual meetings were arranged. The focus groups and individual meetings were conducted as informal interviews. Participants were invited to provide information on their involvement in the NBRE and provide their perspective on challenges and opportunities to encouraging this sector of the economy in Santa Cruz County. That information was recorded and compiled into the SWOT framework. In the subsequent sections, a distilled version of the SWOT matrix is presented, followed by more detailed reporting on the four categories.

A total of 48 individuals provided input to the SWOT analysis. While nearly all participants were NBRE stakeholders, the key points summarized in the SWOT analysis are not necessarily in reference to the NBRE specifically, but rather may reference the more general operating environment in the county, external factors and trends beyond county borders, as well as issues internal to the NBRE. Furthermore, the comments summarized here are the views of those individuals interviewed based upon their personal knowledge and experience. Not all viewpoints or local knowledge within the county are represented in this SWOT analysis.

Results Summary

The following SWOT matrix presents a high-level summary of strengths, weaknesses, opportunities, and threats mentioned by focus group participants and individuals interviewed for the study.

Table 33. Results Summary – SWOT Analysis for Santa Cruz County Fostering the NBRE

Strengths	Weaknesses

• Natural attributes
  • Beauty of the landscape
  • Outdoor recreation opportunities
  • Biodiversity
  • Birding & wildlife viewing
• History & heritage
  • Multi-cultural heritage
  • Historic sites
• Wineries & agritourism
• Community involvement in conservation, restoration, & preservation (C&R) efforts
  • Committed volunteers with diverse expertise
• Collaboration & strong partnerships among NBRE
• Growing momentum for C&R efforts
	• Coordination of leadership
	  • Regional coordination
	  • Competitiveness vs. collaboration
	• Presentation of unified vision for county
	  • Developing clear vision for county and its regions
	  • Competing visions
	• Resources
	  • Funding
	  • Existing human resources spread too thin
	• Marketing
	• Tourism infrastructure
	  • Hotels & guest accommodation, restaurants, activities
	  • Staffing at major attractions
	• Business environment
	  • Not adaptive
	• Local government support
	• Retention of young talent ("brain drain")
	• Lack of local supplies/suppliers
	• Aging volunteer force

Opportunities	**Threats**
• Outdoor recreation • Special events & festivals • Ecotourism & agritourism • Preserving working landscapes • Promoting C&R as an industry • Environmental education • Leveraging regional initiatives • Utilizing human resources • Quantifying ecosystem services • Increasing local awareness	• Mining • Development & sprawl • Climate change • Water availability • Land ownership • Border policy • Outside investment • Funding for C&R efforts • Competition amongst organizations

Strengths

Strengths of Santa Cruz County in relation to the NBRE that were mentioned by focus group participants and individual interviewees emphasized four principal themes: natural attributes, agritourism, history and heritage, and people.

Natural beauty and ***biodiversity*** are drivers of outdoor recreation and nature-based tourism for the region. *Birding*, in particular, is popular in the area due to the diversity of species of birds in Santa Cruz County. Birding was mentioned specifically as a strength of the region, drawing visitors from around the country and around the world. Key birdwatching areas include portions of the Anza Trail, Patagonia Lake State Park, Peña Blanca Lake, and areas along Sonoita Creek. With unique natural areas and the biodiversity supported in the region, C&R efforts are very attractive and will continue to be.

The county's ***wine industry*** was a second strength mentioned by focus groups. The county is home to one of Arizona's two existing American Viticultural Areas, the Sonoita AVA. Winery tasting rooms attract visitors from around the state, generating revenues for local businesses.

Another theme within the county's strengths was the region's ***history and multi-cultural heritage***. As a border region, Santa Cruz County is an area with strong cultural and familial ties to both the U.S. and Mexico. Historically, the region has seen significant cultural overlap, including Native American cultures, Spanish missionaries, and finally Anglo settlers engaged in ranching, mining, and homesteading. The region maintains many sites established by Spanish missionaries. Tumacácori National Historic Park is one such example, and its national park designation is an important draw for visitors.

A final theme considered a strength for Santa Cruz County are the ***people***. The county is home to a number of solely volunteer-based C&R organizations. With a majority of volunteers of retirement age, volunteers are described as having very diverse skill sets, knowledge, and experience, contributing unique and important perspectives.

Another heavily emphasized point was the level of ***collaboration*** between C&R stakeholder groups. Over time, agencies and organizations involved with C&R efforts have been establishing strong partnerships and developing collaborative efforts, such as the Sky Island Restoration Collaborative (SIRC). All of these efforts have been building upon each other, creating significant momentum for C&R activities. The variety of agencies, organizations, and businesses involved in C&R efforts was commonly recognized as a strength for the region.

Weaknesses

Weaknesses raised in discussion of Santa Cruz County in relation to fostering the NBRE were coordination of leadership, regional vision, resources, marketing, capacity, business environment, and retention of dollars and young talent. We note that the term "weakness" that we have inherited from the SWOT analysis literature is a somewhat loaded term. Here, weakness is **not** intended to mean some form of inherent failing. Rather, it is more useful to think of it as an area where there could be improvement or where improvement would be particularly beneficial.

Among the weaknesses mentioned in discussions, ***coordination of leadership*** was the most frequently raised issue. Respondents expressed concerns that there is a general lack of coordination between communities in the region. Furthermore, competitiveness and territoriality between communities and organizations hamper collaboration. In some cases, unincorporated communities lack leadership due to not having formally established governing bodies. Generally, respondents expressed they felt there was a lack of regional leadership on issues of the area's economy. Others felt that too strong an emphasis was placed on Nogales within county government, to the detriment of outlying areas. Some expressed that they felt that decisions regarding the economy and growth in the region have been reactive and there is a need to pursue a more proactive, coordinated strategy.

Another frequently mentioned weakness in the region was lack of ***resources***. This includes both financial resources as well as human resources. This was mentioned not only in reference to NBRE-connected non-profits and restoration work, but also in reference to county and local governments. In almost all cases, staff or volunteers were described as being spread too thin and that there wasn't sufficient funding to effectively operate. These issues were also mentioned in relation to marketing. Many respondents, whether non-profits, parks, or other entities, felt that there were insufficient resources for marketing the county and its attractions. Respondents also reported legislative barriers to implementing mechanisms to collect funds that are necessary to develop and implement tourism marketing strategies. They expressed that some marketing of special events is undertaken, however, general marketing of destinations in the county is limited.

Considering the potential for increased marketing, however, respondents also expressed that the county is constrained in its ***tourism infrastructure*** and would struggle to absorb large numbers of visitors for single events. Most reported that existing hotels and resorts are typically fully booked, therefore it would be challenging to house additional visitors for large events. There is also concern that there are not enough restaurants and supporting activities for tourists. Additionally, staffing is limited at some local attractions, and accommodating additional visitors could present challenges considering current staffing levels and funding.

Some respondents expressed that within the county, residents have ***competing visions*** for the regional economy. While some residents support economic growth and the changes that accompany it, others prefer to limit growth and preserve the traditions and character of the county.

A number of respondents commented on the local county ***government***'s support and responsiveness to the needs of businesses and organizations involved in the nature-based restorative economy. In particular, respondents reported that the county government shows a strong emphasis on industries in and around the Nogales area and gives limited attention or support to outlying areas of the county that are more dependent on nature-based tourism, wineries, and other NBRE industries. Others mentioned the county government can be slow to approve permits, or that permitting and zoning reflects the needs and realities of urban areas but not those of small rural communities. Respondents also acknowledged the county government's limited resources, both in terms of financial and human resources.

More generally, respondents reported that '***brain-drain***' is a problem for the county and efforts need to be undertaken to retain young people and attract them from outside. Issues potentially contributing to difficulties

retaining and attracting young people to the county are housing affordability and lack of education and employment opportunities.

Finally, in regard to C&R efforts, there is a concern about the ***availability of local supplies and suppliers***. One particular need for restoration activities is native seed. While there are currently C&R programs and initiatives addressing this issue, demand for native seed currently exceeds supply and demand is expected to increase.

Opportunities

Focus group participants and interviewees offered many opportunities for Santa Cruz County to bolster and grow the NBRE. Promoting opportunities around ***outdoor recreation*** and outdoor activities were frequently mentioned, particularly ***birding***. Other comments included the opportunity to promote ***cycling*** in the county, which is popular for bike touring. The ***Anza Trail*** was mentioned as an asset that could be better promoted. Among promotion of various outdoor recreation opportunities, there are opportunities to reach different demographic groups and promote better awareness of natural areas among locals, particularly along the border and I-19 corridor.

The potential for ***special events*** was a frequently mentioned opportunity for the county. Some individuals associated with specific communities commented that the county does well attracting visitors to special events, though capacity for overnight visitors at resorts and hotels is a constraint. Some examples of potential events mentioned include birding events and conferences, art festivals, and ecotourism-related events. ***Art*** is a strong draw in Tubac, and the potential to integrate more art and art-related events into the community represents and opportunity. A number of individuals reported that prior to the pandemic, interest had been growing in ***ecotourism*** as a potential strategy to grow the region's economy. Some visitor centers also reported getting many inquiries regarding outdoors activities within the region.

In connection with ecotourism, ***agritourism*** was mentioned frequently as a potential opportunity in the county. Of particular interest is the county's ***vineyards and wineries***. Focus group participants commented that more could be done to promote the area's wine industry, and there is also potential to find synergies with the burgeoning wine industry in Baja California. Another agritourism-related activity is ***dude ranching***, and the county has a number of historic dude ranches that could be better promoted through marketing.

A topic that was mentioned in a number of interviews was the ***need to protect and preserve working landscapes***, such as ranches and farms. This is important not only for preserving open space, but also for preserving the ranching heritage and lifestyle of the county. Opportunities to help protect and preserve working landscapes mentioned in interviews included ***successional planning for ranchers*** to help preserve their ranches as open space though tools such as conservation easements, and ***young farmer-rancher groups*** to provide support to future generations of farmers and ranchers in the county. Another interesting example of preservation of a working landscape is the case of the Sentinel Landscape initiative around Ft. Huachuca in neighboring Cochise County. In order to protect their electronics testing facility from encroaching development and preserve their mission in the area, the base has preserved open landscape through the use of conservation easements.

Other focus groups brought up the topic of pursuing ***conservation as an industry***. Some comments included that groups active in the county should approach conservation more within a market economy framework, versus using the not-for-profit model. Some examples of this include pursuing restoration as a vehicle for ***carbon storage***

or sequestration, and receiving payment for carbon credits. Another example is ***mitigation banking***, or engaging in environmental restoration in areas outside of an affected region to offset negative impacts to the environment for business entities in need of mitigation credits. These types of activities help to address the issue of lack of funding for conservation and restoration. Generally, vehicles such as ***carbon and water markets*** could provide funding for conservation and restoration in the county. An example of market-based activity that some respondents brought up was expanding sales of native plant materials already occurring through non-profits in the county. Whereas federal agencies and contractors might traditionally rely on non-native seeds for revegetation activities in conservation projects, production of native seeds allows for restoration without introduction of non-native species into ecosystems. This type of activity could be scaled-up to meet significant unmet market needs. Other respondents mentioned opportunities for conservation and restoration organizations to work together with ranchers to maintain the health of working landscapes. This, as well as the opportunity to provide services to residential customers, is an opportunity for non-profit conservation and restoration organizations to branch out into ***revenue-generating activities***.

Respondents mentioned several ***local and regional initiatives*** that may provide opportunities for collaboration and fostering the NBRE. A prime example is the ***Santa Cruz Valley National Heritage Area*** designation through the National Park Service. As part of the planning process, the National Heritage Area designated a number of themes or priorities, which are promoting tourism, developing heritage education, promoting local foods and traditional products, riparian restoration, preservation of historic structures, and quality of life improvements (National Park Service, 2021c). These are very well aligned with the missions and activities of NBRE stakeholders in the county. Other initiatives that may provide opportunities for collaboration include the ***AZ I-19 Alliance*** which promotes towns and villages along Interstate 19. Other participants mentioned the Sun Corridor concept and the I-11 initiative as factors that may influence the NBRE. Participants also mentioned that an ecotourism conference was recently held in the region, an indicator that there is interest in promoting ecotourism in the region. Finally, recent county-level initiatives have been undertaken to develop a digital infrastructure to support small, independent, local businesses, which could be used by businesses within the NBRE to highlight and promote their businesses to a wider audience. Another regional initiative or ongoing effort that can be leveraged is ***flood control***. Flood control is a major consideration in the county, particularly in the Nogales area. Ongoing investment in infrastructure for flood control represents an opportunity to apply principles of conservation and restoration to such projects, enabling co-benefits such as habitat creation, revegetation, groundwater recharge, etc.

Stemming from comments related to county ***government*** and its serving the needs of NBRE stakeholders, potential opportunities mentioned by participants included creating flexibility around permitting and zoning in order to encourage growth in the wine industry. Participants reported that onerous permitting and zoning requirements in rural areas make it difficult for local small businesses to invest, while tilting the scales in favor of chain retail operations. Creating programs that encourage investment and creativity in rural areas presents an opportunity to steer growth with a vision towards maintaining community character versus passively allowing growth to occur.

A number of participants brought up the topic of ***environmental education***. They see opportunities for the region to become a destination for environmental education activities for youth and adults. One participant mentioned

the trend of volunteering-based vacations, where individuals engage in volunteer work as the focus of their travel. Restoration activities could potentially attract individuals interested in the experience of engaging in restoration work.

One participant mentioned the opportunity to engage ***retirees*** that live in the area and take advantage of the skills and knowledge they possess. Others mentioned that people are moving into the area from elsewhere to work remotely and there may be opportunities to engage relative 'newcomers' to the area as well. In terms of industries, other opportunities mentioned for the county were ***medical tourism***, in particular creating a medical tourism destination linked with the group of dentists located in Nogales, Sonora, Mexico that offer dental services to medical tourists.

As mentioned earlier, the lack of educational options in the area also represents an opportunity for the region to expand current offerings. The University of Arizona has recently implemented the University of Arizona Nogales, which offers and undergraduate transfer degree pathways in a 2+2 format. This allows students to complete the first two years of their bachelor's degree at Pima Community College, then transfer to the University of Arizona Nogales. Pima Community College, in turn has begun offering classes in Nogales, Arizona, in partnership with the Santa Cruz Center.

A more general, conceptual comment was brought up in discussion regarding the amount of information that is left out of analyses that focus solely on dollars and jobs. While dollars and jobs are important metrics informing decision-making, other impacts of conservation and restoration are more challenging to quantify, though no less important. That said, methods exist to estimate and, in some cases, monetize the value of ecosystem services. ***Demonstrating and quantifying the value of ecosystem services*** in Santa Cruz County is an opportunity to better inform planning and policy decisions regarding natural resource use, conservation, and restoration. Additionally, recognizing the strength of volunteer efforts supporting the NBRE, improved tracking and documentation of volunteer hours and participation at the organization level would help the region better communicate the value that residents place on the NBRE. A coordinated strategy to track volunteer effort across organizations could help fill this information gap.

Threats

Overwhelmingly, the most commonly cited threat to Santa Cruz County's NBRE is ***mining***. Focus group participants and interviewees expressed concern over the negative impacts of mining on their community, its character, and on its economy. This was especially a concern for residents of Patagonia and organizations involved in and around the area. Patagonia is located near two proposed mining operations located on private in-holdings surrounded by Forest Service land. Concerns about the impacts of the proposed mines include negative effects on water quantity and quality within the town's watershed and within Sonoita Creek, impacts to ecosystems and biodiversity, negative impacts to nature-based tourism, impacts to the community's tranquility due to truck traffic (noise and road safety impacts), and visual disturbances such as power lines and trucks. Some residents expressed resignation to the idea that mining was inevitable in the area, however, believe that opportunities exist to find ways to coexist with mining operations.

Development and sprawl were also mentioned frequently as a threat to the NBRE in Santa Cruz County. This includes encroachment of housing on agricultural land, making operating farms and ranches difficult. The same challenge applies to dude ranches in that residential encroachment causes challenges for operation and disturbs the natural landscape, making areas less desirable for nature-based tourism. Ranchland conversion to housing is a concern for the preservation of open space and working landscapes in the county. Some operations resort to purchasing adjacent tracts of land to preserve a buffer between their operation and any residential development. Land values in the county are generally high, therefore when ranches are sold, sales prices are generally not conducive to using the land for ranching, but rather to use it for development unless the rancher acts to maintain the land as a working landscape through a conservation easement or other mechanisms. While the expansion of lodging through conversion of housing for short-term rentals helps address tourism infrastructure concerns, it exacerbates the affordable housing issue.

Water availability and quality are an ongoing concern in the county. More generally ***climate change*** and its associated impacts on water are a big concern to focus group participants. Within Santa Cruz County, the western portion of the county is part of the Santa Cruz Active Management Area. Groundwater pumping is regulated and irrigated agriculture cannot expand in the area. Growth within this part of the county will have to offset its water use through reductions by other users. Meanwhile, in the eastern portion of the county, groundwater pumping is not regulated, nonetheless, groundwater users draw on a finite resource. This part of the county is home to the area's wine industry. Though not a high-water use crop, vineyards nonetheless put pressure on the area's groundwater resources. ***Land ownership*** presents challenges to conservation within the county. Focus group participants described a patchwork of land ownership around the Santa Cruz River which can make coordination for conservation difficult. Different landowners may pursue different conservation policies, and some graze cattle near the river. Furthermore, considering the relatively small size of the county compared with other counties in the state, and the predominance of federal lands within the county, there is a finite amount of private land that can be preserved within the county, considering landowners must be willing to conserve their land.

Beyond the topic of conservation, more generally, Santa Cruz County's economy is closely tied to U.S. ***border policy***. Changes in border policy affect the number of visitors arriving from Mexico, and the willingness of U.S. residents to travel to-and-from Mexico. Many participants remarked about the installation of the border patrol checkpoint along Interstate 19 as a defining moment for the county's economy. Many large tour operators no longer travel south of the checkpoint due to the logistical challenges of returning through the checkpoint. An area particularly affected by changes in the number of visitor arrivals from Mexico is the Nogales area. Participants commented that the city's central business district used to cater to Mexican visitors, however, that activity has all but disappeared and the city center is suffering as a result. Beyond changes in the number of visitors, ***public perception*** also has impacts on visitation to the area. Participants commented that many people outside of the region perceive the border region as being dangerous. This is fueled by media portrayals as well as government and other public officials' commentary.

The influence of ***outside investment*** in the area represents a potential threat to the region's ability to steer its own development. Participants noted the influx of residents from California and the East Coast, and increased housing development. They commented that local residents don't want to become like major tourist destinations in the

state. This was also mentioned in reference to areas of the county where wineries are located. Considering a lack of a coordinated strategy to encourage investment in amenities and businesses that cater to wine tourists, outside investment that is inconsistent with the character of local communities may alter the attractiveness of certain destinations to visitors.

Finally, with specific reference to C&R efforts, there is concern about the continued availability of funding to support this work. As funding often relies primarily on government grants and private donations, supportive federal and state policies and broader economic conditions can affect the availability of funding significantly. Furthermore, there are concerns about increasing competition amongst organizations doing this work as they are all vying for the same public and private dollars.

Projections

As part of this analysis, we develop projections for industries included as part of the NBRE at 10- and 30-year timeframes. We start by aggregating existing projections on subject areas relevant to the NBRE, and then incorporate that information with information gleaned from the SWOT analysis process. General projections for the NBRE and its components are presented. While based on available secondary data and primary data collected through this research process, these projections may easily change based on unexpected future conditions. They should thus be interpreted with some caution.

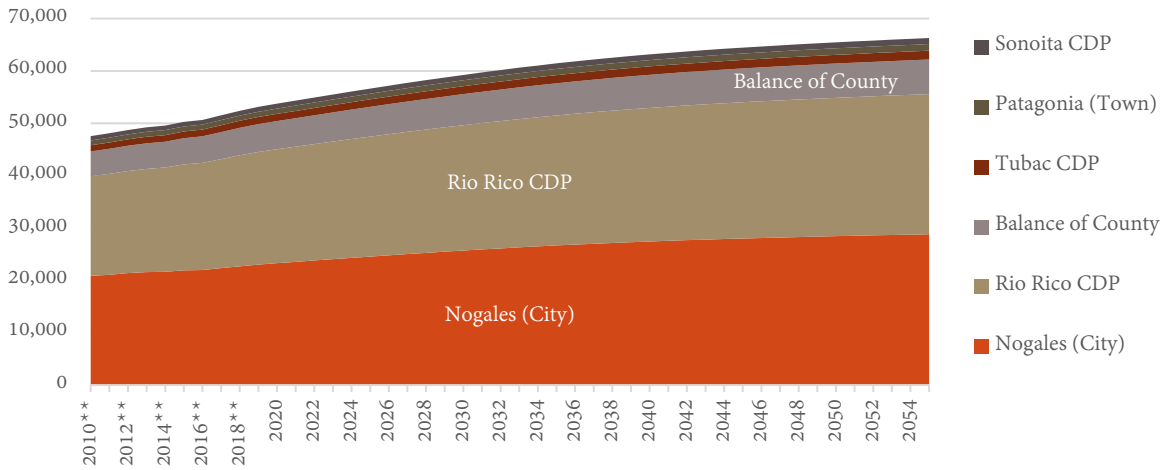
Background Information Informing Projections

The following sections present information germane to NBRE projections, including population, climate and water, and broader industry trends.

Population

Santa Cruz County's population is projected to increase over the next 30 years at a gradually slowing rate (Figure 38).

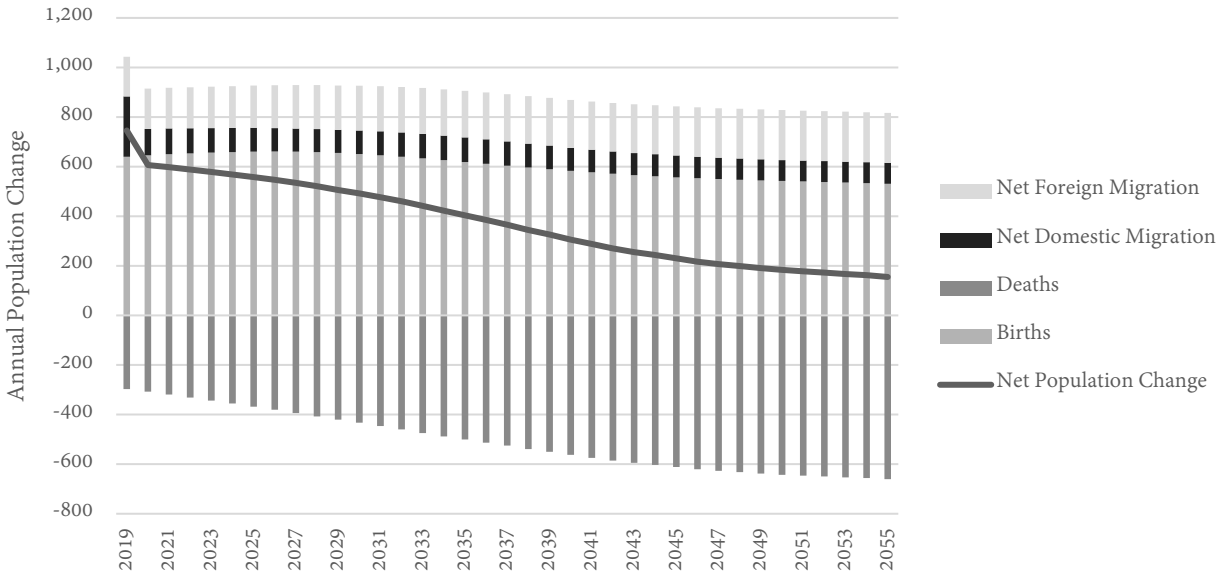
Figure 38. Projected Population for Santa Cruz County Cities, Towns, and Census Designated Places (CDPs), 2010-2055



Source: Arizona Office of Economic Opportunity (2018); ** indicates actual data, not projections

The projected population derives from a number of anticipated demographic trends. This includes increasing net foreign migration, positive-but-decreasing net domestic migration, decreasing births, and increasing deaths (Figure 39).

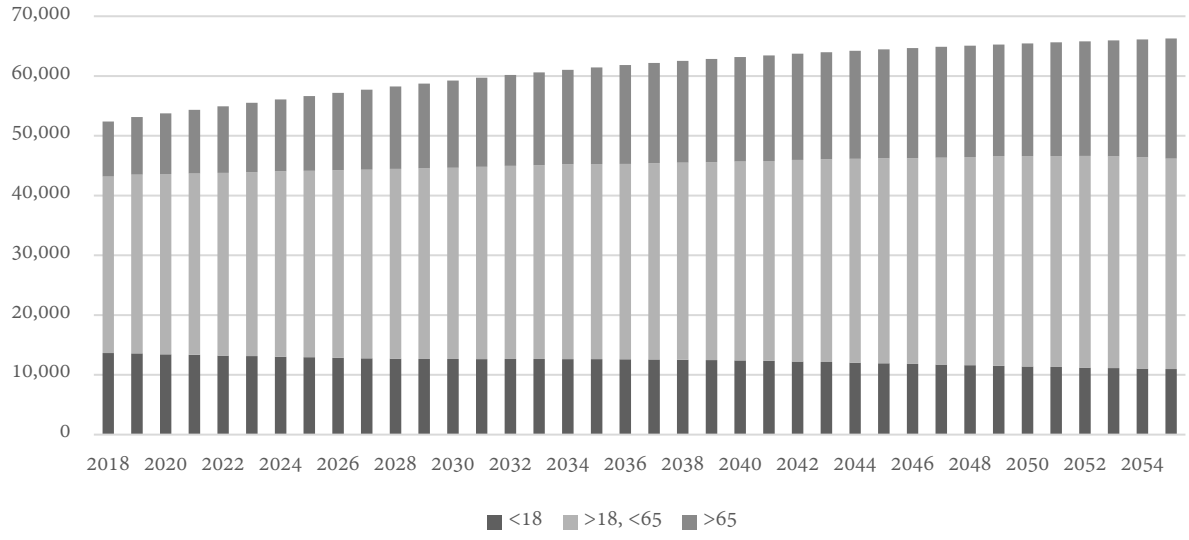
Figure 39. Components of Projected Population Change for Santa Cruz County, 2019-2055, Medium Scenario



Source: Arizona Office of Economic Opportunity (2018)

Combined, these trends lead to a slowly declining population under age 18, a relatively steady population between the ages of 18 and 65, and an increasing population over the age of 65 (Figure 40).

Figure 40. Forecasted Santa Cruz County Population by Age Group, 2018-2055, Medium Scenario



Source: Arizona Office of Economic Opportunity (2018)

Over the period modeled, a 19.3% increase in working-age population is projected, while the overall population of the county is projected to increase by 26.5%, and most of that growth is projected to occur in retirement aged individuals (over age 65). This has important implications for the demand for services in the county, particularly medical and social services.

Overall Economic Growth

Table 34 reports 10-year projections for US real (i.e., inflation-adjusted) GDP growth from different available sources. These include the Mid-Session Review of the White House Office of Management and Budget (OMB), the Congressional Budget Office (CBO), the consensus forecast of a regular survey of business economists (Blue Chip), and the Federal Reserve Open Market Committee (FOMC) median forecast.

Table 34. Projected 10-Year Forecasts for Real GDP (Fourth-Quarter-over-Fourth-Quarter) Growth Rates, United States, 2021-2031

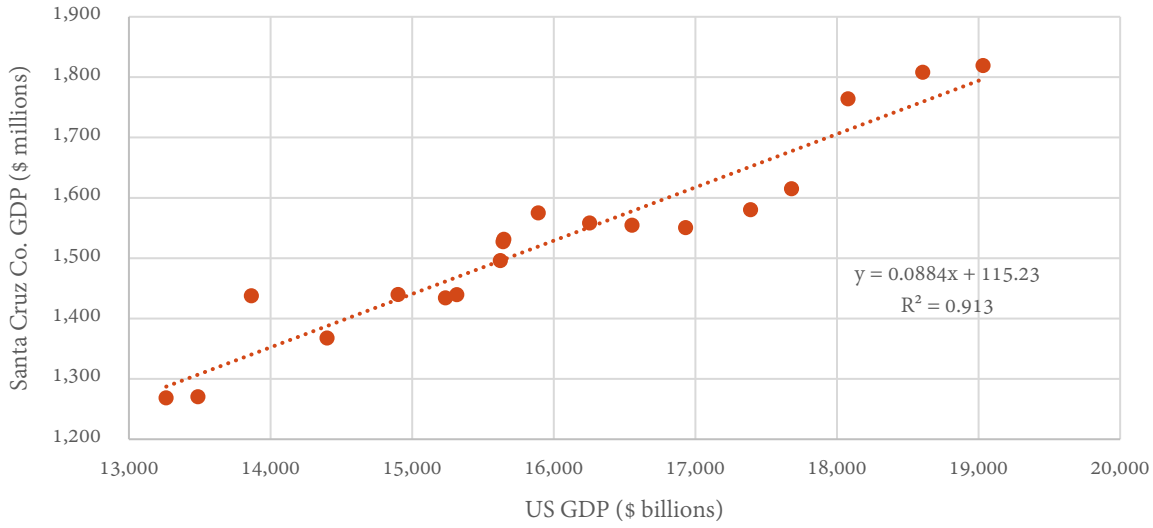
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
OMB	7.1	3.3	2.2	1.8	1.8	1.9	1.9	2.1	2.2	2.3	2.3
CBO	7.4	3.1	1.1	1.1	1.3	1.6	1.6	1.6	1.5	1.6	1.7
Blue Chip	6.4	3.1	2.4	2.2	2.1	1.9	1.9	1.9	1.9	1.9	1.9
FOMC	7	3.3	2.4	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8

OMB: Office of Management & Budget; CBO: Congressional Budget Office; Blue Chip: Consensus Forecast of Blue Chip economic forecasters (Blue Chip); Federal Reserve Open Market Committee (FOMC) median forecast. Source: (OMB, 2021).

Nationally, forecasts for real GDP growth project strong growth continuing in 2021 as the economy begins to rebound from the effects of the COVID-19 pandemic. All projections show economic growth slowing in 2022 from a post-pandemic surge, then moderating in subsequent years. The forecasts differ somewhat in exact percentages, with CBO providing the slowest growth projections and OMB showing the fastest. These projections, however, show the same overall pattern of faster growth over the next two years, followed by moderation. These growth rates are adjusted downwards to account for the effects of inflation. Growth in all these projections in nominal terms (current dollars) are all about 2.3 percentage points higher (OMB, 2021).

Santa Cruz County's GDP has tracked the overall GDP of the country closely over the last two decades of available data (Figure 41). County GDP can deviate from the national economy somewhat. Yet, US GDP predicts more than 91% of the variation in county GDP (Figure 41).

Figure 41. Real GDP of Santa Cruz County Plotted Against US Real GDP, 2001-2019.



The University of Arizona's Economic and Business Research Center's (EBRC) long run outlook for Arizona forecasts that the state will "generate job, income, and population gains at a much faster pace than the nation" (EBRC, 2021). This faster state growth, though, is largely driven by faster growth in the Phoenix metropolitan area. Projected growth for Tucson, for example, is expected to mirror national trends more closely.

Employment

Employment in Santa Cruz County is projected to increase by 8.2% by 2029, an increase of 1,232 jobs (Arizona Office of Economic Opportunity, 2018). This increase is distributed across industries, with some projected to gain in employment, and others projected to contract. *Health care and social assistance* is expected to see the largest percent gain. The largest gain in terms of numbers is anticipated in the *transportation and warehousing* industry which is connected with the region's fresh produce industry. Meanwhile, decreases are expected in retail and government (Table 35).

Table 35. Projected 10-Year Change in Employment by Industry, 2019-2029

Industry	10-Yr Change in Jobs	10-Yr Percent Change in Jobs
Health Care and Social Assistance	432	61.7%
Management of Companies and Enterprises	3	50.0%
Professional, Scientific, and Technical Services	68	33.8%
Transportation and Warehousing	526	30.8%
Mining	20	25.3%
Agriculture, Forestry, Fishing and Hunting	138	19.0%
Manufacturing	79	18.2%
Other Services (Except Government)	55	17.6%
Wholesale Trade	285	15.4%
Professional and Business Services	61	13.6%
Educational Services	125	10.4%
Self Employed	77	8.5%
Information	4	3.5%
Accommodation and Food Services	35	2.6%
Finance and Insurance	-4	-1.9%
Arts, Entertainment, and Recreation	-2	-2.5%
Government	-71	-2.8%
Financial Activities	-10	-3.0%
Administrative & Support & Waste Management & Remediation Services	-10	-4.1%
Real Estate and Rental and Leasing	-6	-5.0%
Utilities	-3	-5.0%
Construction	-25	-12.5%
Retail Trade	-494	-25.6%

Source: Arizona Office of Economic Opportunity (2018)

Water & Climate

In Active Management Areas (AMAs) where groundwater pumping is regulated such that the area maintains a sustainable yield (withdrawals are equal to recharge), irrigated agriculture is not able to expand in acreage, and overall water use should not grow. To the extent that urban and suburban growth occurs within the western portion of the county as population increases, that growth must be offset by a decrease in water use elsewhere. Typically, agriculture-to-urban transfers are most common as water for municipal and industrial use commands a higher price than water for agricultural use. Assuming population growth along the I-19 corridor, it can be assumed that there will be some corresponding decreases in irrigated agriculture within the Santa Cruz AMA.

Climate change will put additional stress on an already water-constrained environment. Based on projections for the U.S.-Mexico border region, the area can expect to see decreasing annual precipitation (medium-high confidence), decreasing winter precipitation (medium-low confidence), decreasing spring precipitation (medium-high confidence), decreasing summer precipitation (medium-low confidence), and increasing drought (high confidence) (Garfin, et al, 2013).

Under these projections, growth in the region's economy will either be enabled through transfer of water out of irrigated agriculture to municipal and industrial (M&I) users, through improvements in technology and water use efficiency both in agriculture and in M&I uses, or both. This has implications for preservation of the county's working landscapes. Climate change may also drive decreases in precipitation, which can impact the productivity of rangelands, with implications for stocking rates on ranches in the county (Wyndham, et al, 2018).

Beyond projected changes in precipitation, expected changes in temperature have implications for many sectors of the economy, particularly agriculture and tourism. Based on downscaled climate model predictions for the Upper Santa Cruz Watershed, the area is expected to see an increase of between 6 degrees and 11 degrees Fahrenheit by 2100 compared with the 1961-1990 average (Meadow, Weiss, & LeRoy, 2021). This will likely lead to increased evapotranspiration by vegetation (native or agriculture), increased evaporation of water bodies such as rivers and creeks, lower fuels moisture, and lower soil moisture. This may impact natural resources, and the availability of water-based outdoor recreation.

Agriculture

Nationally, the agricultural industry has experienced some market consolidation, with the number of farms (and land in farms) generally decreasing, the average size of farms increasing, and a greater share of agricultural products sold coming from fewer farms (USDA, 2019). This is potentially exacerbated by an aging workforce, with the average age of farmers and ranchers continuing to rise (USDA, 2019). The trends in Arizona and Santa Cruz County generally follow these national trends, with some exceptions. Within Santa Cruz County there has been a slight decrease in the number of farms and land in farms, as well as the average farm size. This likely reflects a shift in agricultural production from livestock to crop production, as well as an indication that some of the older producers may be leaving the industry. Between 2012 and 2017, Santa Cruz County experienced a decrease in pastureland acreage and an increase in irrigated cropland (outside of the Santa Cruz AMA) and at the same time the average age of farmers and ranchers in Santa Cruz County decreased from 62.8 years old to 59.5 years old (USDA, 2019b). Growth in irrigated agriculture is likely due to the growth of the region's wine industry, with increases in the number of operations growing wine grapes as well as an increase in wine grape acreage.

USDA projections assume that national farm cash receipts will increase through 2030, with projected increases in both crop and livestock cash receipts (USDA, 2021). This is primarily due to steady demand for U.S. agricultural products, both domestically and abroad. That said, livestock cash receipts are expected to decrease early in the period as producers face lower market prices, which are subsequently expected to result in declines in beef cattle inventory. From an employment perspective, employment in agriculture in the U.S. is projected to have little to no change from 2020 to 2030 (BLS, 2021).

Agricultural projections are not available at the regional- or state-level, but climate change and drought coupled with population growth pose significant risks to agriculture. Drought is a current concern for ranchers and is expected to be a continuing issue in both the near-term and the long-term and, as mentioned previously, is expected to reduce herd size and cattle inventories. Population growth, climate change, and resulting decreased water supplies also pose risks to irrigated agriculture as pressure mounts for water transfers out of agriculture.

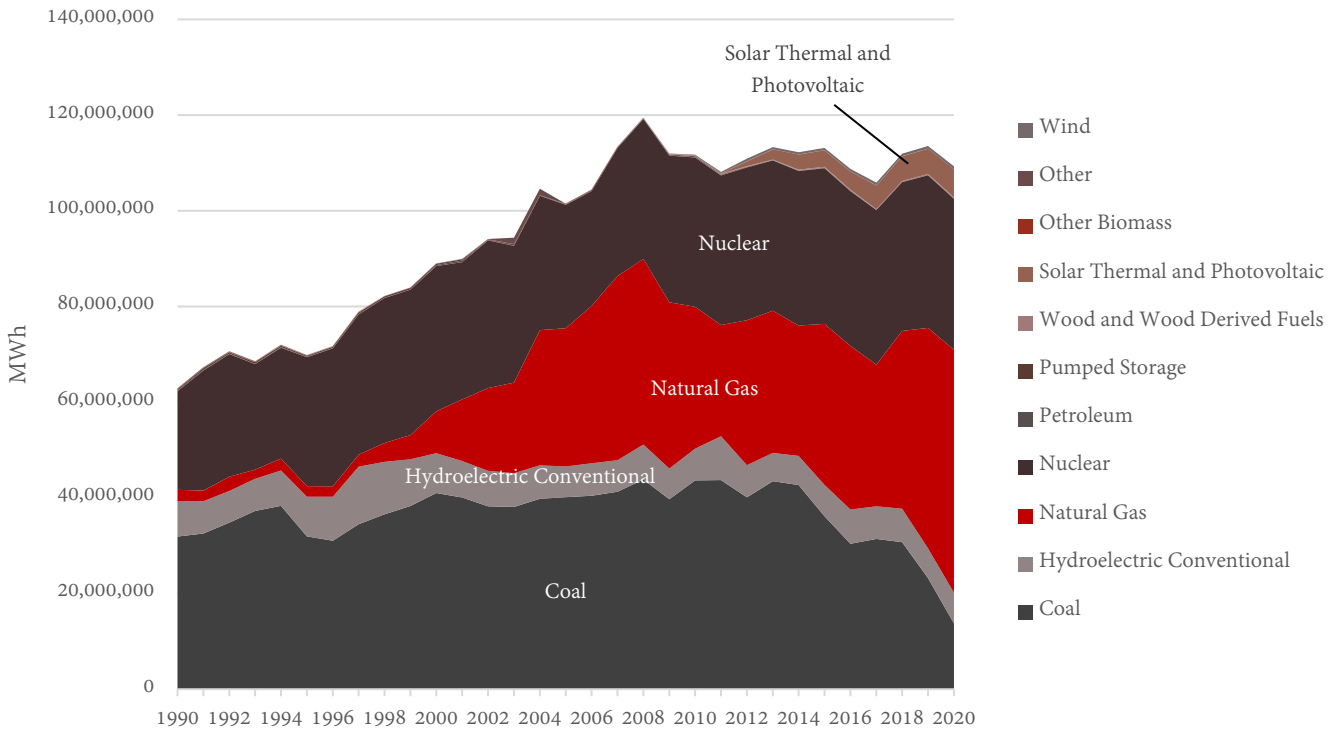
Renewable Energy

The Arizona Corporation Commission enacted a renewable portfolio standard in 2006 requiring regulated utilities in Arizona to generate 15% of energy through renewable technologies by 2025 (ACC, 2021). This includes solar, wind, geothermal, biomass, and other renewable technologies. A provision known as the Distributed Renewable Energy requirement stipulates that half of renewable generation must come from distributed residential installations and the other half from utility-scale installations. As of their 2019 filing, UniSource Energy, the utility serving the western portion of Santa Cruz County, had eligible renewable energy production equivalent to 18.6% of their 2019 retails sales. Their distributed renewable generation was at 68.5% of their 2019 goal (30% of 9% of total energy produced), while their utility scale production stood at 129.3% of the 2019 goal (ACC, 2020). These requirements will drive continued growth in residential solar installations in Santa Cruz County.

The Sulphur Springs Valley Electric Cooperative, which services the eastern portion of Santa Cruz County, reported exceeding the 2025 RPS goal of 15% of energy generated produced through renewable energy technologies as of 2019 (ACC, 2020b). Continued growth of renewable energy in this service area will depend on future requirements on utilities, commercial installations, and distributed residential installations.

In Arizona, electric power generation has seen significant shifts in recent years, with strong movement away from coal and towards natural gas. Though still small compared to other technologies, solar thermal and photovoltaic generation has increased over the past decade (Figure 42).

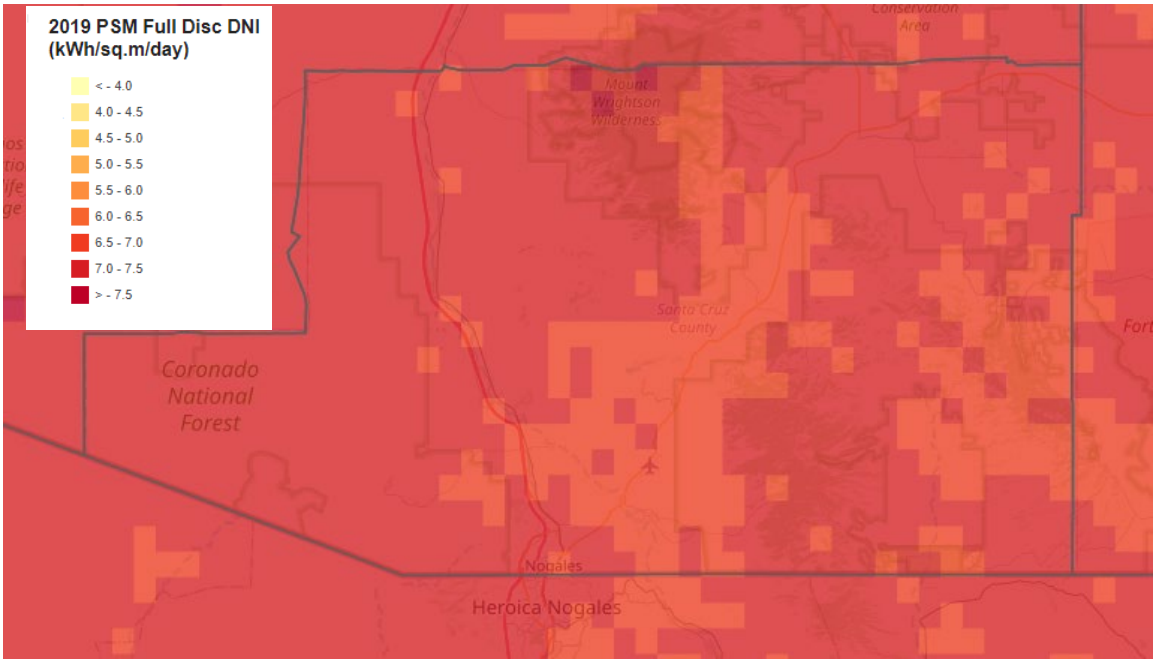
Figure 42. Electricity Production in Arizona by Technology, 1990-2020



Source: EIA (2021)

Assuming the presence of suitable lands with access to transmission lines, Santa Cruz County falls within an area of the country with excellent solar resources (Figure 43).

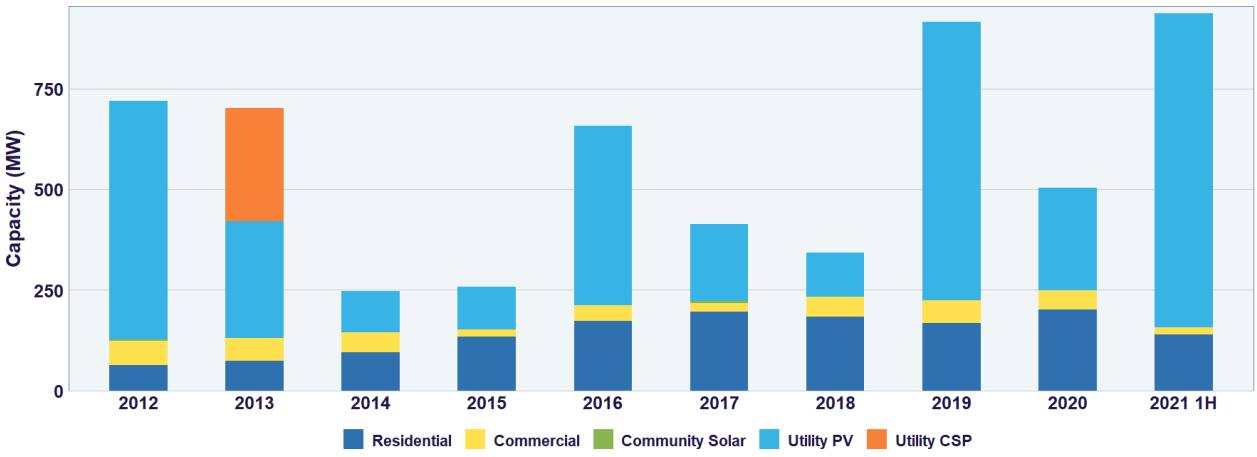
Figure 43. Direct Normal Irradiance for Santa Cruz County, Arizona, 2019



Source: NREL NSRDB Data Viewer

Statewide, Arizona has seen an increasing trend in residential solar installations (SEIA, 2021) (Figure 44). This is anticipated to continue as costs per unit of energy generated decrease. The extent to which economic activity in Santa Cruz County is impacted by this increase in installations depends on whether or not residential solar installation contractors are located in the county. To date, that number appears to be limited. Nonetheless, Santa Cruz County residents are able to contract with providers outside the county for new installations.

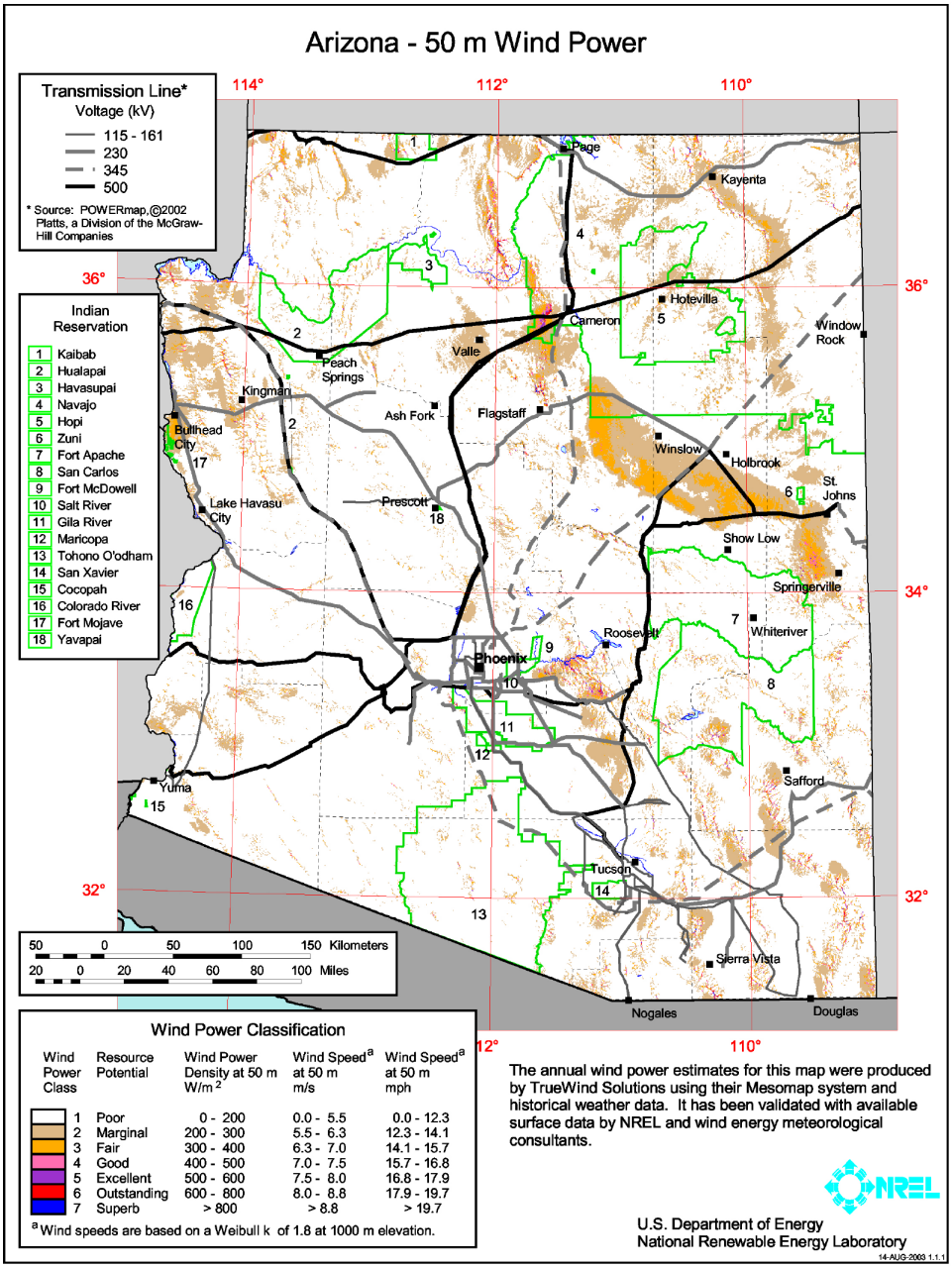
Figure 44. Annual Solar Installations in Arizona by Technology, 2012-2021



Source: SEIA (2021)

Wind energy shows less promise as a source of renewable energy in Santa Cruz County. Wind resource inventories show poor to marginal wind resources across Santa Cruz County. The areas with greatest wind resources are generally located in the northeast quadrant of the state (Figure 45).

Figure 45. Map of Arizona Annual Wind Power Resources



Source: U.S. Department of Energy (2003)

Nationally, in 2019, renewable sources of electricity generation, for the first time, surpassed coal-fired electricity generation. The Energy Information Agency (EIA) of the Department of Energy projects, in their reference scenario that the share of US electricity generated by renewable sources (including solar, wind, hydropower, and

geothermal) will rise from 19% to 38% between 2019 and 2050 (EIA, 2020). While hydroelectric production will remain relatively constant, most of this growth will be in wind and solar power. This growth will increase demand for solar photovoltaic (PV) panel installers and wind turbine technicians. Nationally, wind turbine technician jobs are projected to grow by more than 60% between 2019 and 2029 (Lawhorn, 2021). Over the same period, jobs for PV panel installers are projected to grow by more than 50%. These rates are much higher than the 3.7% projected growth for all occupations. Neither of these two occupations requires a postsecondary degree. Yet, both pay more than median wages for all occupations. Despite rapid growth, though, these occupations do not account for a large number of jobs, with total jobs projected to grow by about 10,000 for the entire US over the coming decade.

Conservation & Restoration

Globally, the science and practice of restoration are rapidly expanding. In fact, in 2019 the United Nations General Assembly declared 2021 to 2030 the Decade on Ecosystem Restoration (Fischer et al., 2021). More locally, river and riparian restoration activities in the U.S. Southwest have increased exponentially since 1990 (Shah et al., 2007). Further, among public land agencies, such as the Bureau of Land Management, management objectives have shifted away from resource extraction toward restoration-focused objectives, with activities focused more on invasive species control, native communities, and ecosystem integrity and function (Copeland et al., 2018).

There are multiple external drivers that can affect the trajectory of C&R activities. These include financial, administrative, and ecological constraints (Li and Gornish, 2020). In regard to financial constraints, a primary source of funding for these efforts comes from government grants and private contributions from individuals, corporations, and foundations. Given this, funding for activities is heavily reliant on supportive federal and state policies as well as broader economic conditions. For example, as disposable income and corporate profits increase and the unemployment rate decreases, charitable giving tends to increase (IBISWorld, 2021). Administrative constraints include the size, scope, and duration of restoration projects and the capacity of organizations to conduct this work. Ecological constraints arise through the absence of post-restoration monitoring and formal studies that link the practical aspects of restoration with the science of restoration, slowing the overall progress of ecological restoration (Li and Gornish, 2020).

Over the next five years, IBISWorld (2021) projects revenue growth for the Conservation and Human Rights Organizations industry to continue to grow, increasing annually by 2.7%. Driving this projection is an increase in per capita disposable income and corporate profits, despite a decrease in federal funding. Further, IBISWorld projects that rising environmental concerns are expected to "lead to a greater number of organizations focused on environmental conservation and wildlife protection" (IBISWorld, 2021, p. 14). Meanwhile, due to these new entrants to the market, competition for private and public dollars is expected to increase.

The Bureau of Labor Statistics estimates that growth in a number of environmentally focused, "green" jobs will exceed average job growth for all occupations (Torpey, 2018). From 2016 to 2026, jobs for environmental engineers and scientists, conservation scientists, and environmental technicians are projected to grow by 6%-12%. Over this same period, jobs for hazardous material removal workers are projected to grow by 17%. Similarly to PV panel installers and wind turbine technicians, these jobs are starting from a low base; so, even rapid percentage growth will lead to an increase of about 30,000 jobs nationally.

Tourism

Following major declines due to the COVID-19 pandemic, tourism is expected to see regular increases over coming years, barring unforeseen circumstances. Domestic trips by U.S. residents are projected to increase at a 9.4% annualized rate from 2021 to 2026 (IBIS World, 2021b). Considering local population increases, as well as projected population increases in the nearby Tucson metropolitan area (an addition of roughly 200,000 people by 2049 (Arizona Department of Economic Security, 2018)), local and regional tourism is likely to see growth.

The EBRC, however, has cautioned that growth may be slower under a more pessimistic forecast scenario regarding COVID where "the outbreak fades more slowly than under baseline assumptions, which delays the recovery in travel and tourism and thus the overall economy" (EBRC, 2021). In response to the pandemic, the Bureau of Labor Statistics (BLS) has adjusted its 10-year projections of job growth for a number of tourism-related occupations (Torpey, 2021). BLS has adjusted downwards its 2019-2029 job growth projections for transit and ground transportation from 5% to 3%, for air transportation from 6% to 3%, for travel accommodation from 0% to -4%, and for food service and drinking places from 7% to 1%.

Both ecotourism and outdoor recreation are industries that have seen strong growth trends in recent years. Globally the ecotourism industry is projected to grow at a rate of 14.3% per year over the decade (Allied Market Research, 2021). Within the United States, outdoor recreation participation has grown steadily since 2014, from over 145 million individuals to over 160 million individuals in 2020 (Outdoor Industry Association, 2021). Recent growth has been driven in part by COVID, however, that occurs amidst a strong, more prolonged growth trend. Visitation to Arizona State Parks has seen consistent growth in recent years, and excluding indoor facilities in the State Parks system, visitation increased between calendar year 2019 and 2020 (Duval, et al, 2021).

Demographic shifts and changing economic conditions may lead to changes in outdoor recreation participation. Research has shown that ethnicity, age, income, and education are key drivers in outdoor recreation participation. For example, non-Hispanic White males with higher income and higher education levels, generally participate in outdoor recreation at higher rates (Cordell, 2012). That said, "generalist activities like hiking, nature viewing, and visiting developed recreation and historic sites remain popular with all population subgroups" (White et al., 2016). Other factors that affect participation in nature-based tourism include the amenities available within a region, with tourists generally wanting to visit places with a high degree and mix of amenities (White et al., 2016).

10-Year & 30-Year Projections

The following section combines the quantitative and qualitative information collected throughout Part III and presents projections for key components related to the Santa Cruz County NBRE within a growth indicator framework. Given uncertainties about future, these projections are categorical in nature (high growth, moderate growth, low growth, etc.), and do not include specific estimated rates of growth or decline.

The following projections are presented at short- and long-term timeframes, 10- and 30-years. The projections presented refer to the growth trend occurring at that time and are not relative to the present baseline conditions. Projections incorporate national and regional trends, as well as local knowledge captured through the SWOT analysis.

- Nature-Based Industries
    - **Agriculture** ***(10 years: low growth / 30 years: low to moderate decline)***

      Ranching is the predominant agricultural activity in Santa Cruz County. Factors influencing ranching in the county include climate change, land use change, and general industry trends. Climate change is expected to result in decreased precipitation in the region, which will put stress on rangeland health and forage availability. An aging cohort of ranchers in the county are faced with decisions regarding successional planning and, due to high land prices in the county, as well as limited interest in ranching among younger generations, often choose to sell land to developers. An industry trend towards consolidation of small ranches is leading to a smaller number of larger ranches. Most trends affecting ranching are external in nature. Ranching is anticipated to experience a steady level of economic activity in the short-term, and low to moderate decline in the long-term.

      Irrigated agriculture in Santa Cruz County includes three main components: cultivation of feed crops for livestock, greenhouse cultivation of specialty crops, and viticulture (wine grape growing). Anticipated declines in precipitation and constraints on expansion of irrigated agriculture within the Santa Cruz AMA, coupled with projected population and housing growth, will constrain irrigated agriculture in the western portion of the county, impacting forage crop cultivation. Meanwhile, based on past trends, employment in greenhouses has demonstrated growth and we expect this to continue. Vineyards and wineries in the eastern portion of the county are expected to continue increasing, as they have in recent years, adding additional operations as well as wine grape acreage. Growth of the wine industry beyond grape acreage is potentially constrained by the state and local regulatory environment.

    - **Renewable Energy** ***(10 years: moderate growth / 30 years: high growth)***

      Nationally and globally, a transition away from fossil fuels toward renewable energy is driving demand for improved energy storage and mining industry products putting additional mining pressure on public lands in the county. Concurrently, installed renewable energy generating capacity is increasing, and interest in market-based solutions is increasing, such as carbon markets. Regulated utilities in the State of Arizona are required to produce 15% of their energy sold through renewable technologies, solar being one of the most viable. Given the strong solar resources available in Santa Cruz County, we expect to see moderate growth in the short-term and high growth in the long-term. This is only in regard to installed generating capacity and not in reference to manufacturing.

- Nature-Based Tourism ***(10 years: low to moderate growth / 30 years: moderate to high growth)***

  Regionally and nationally, visitation to nature-based recreation attractions, such as state and national parks, has seen strong increases in recent years. This is being driven by increased popularity of outdoor recreation activities, as well as the COVID-19 pandemic. In Santa Cruz

County, projected population increases, coupled with anticipated population increases in neighboring Pima County, are expected to drive nature-based tourism activity. Shifts in the local and surrounding community demographic may impact some components of outdoor recreation participation as ethnicity, age, income, and education have been shown to be key drivers in outdoor recreation participation. The anticipated effects of climate change in the region include increases in temperature, as well as decreased precipitation, which will increase pressure on water resources and ecosystems, and lead to decreasing in-stream flows. This may affect the attractiveness of key outdoor recreation locations in the county, in particular, riparian areas and other water-based sites. Changes in temperature may affect the seasonality of demand for outdoor recreation, affecting the length and timing of shoulder seasons. Promotion of nature-based tourism may be constrained by lack of local government resources. Retail, a key source of government funding, is projected to decline in the short and long terms. Finally, growth in nature-based tourism and attraction of more overnight visitors is constrained by lack of lodging and other tourist amenities. This constraint is internal in nature, therefore, the extent of growth and the ability of the county to capture economic activity generating from larger trends towards outdoor recreation depend on the region's successful implementation of nature-based tourism strategies.

- Conservation, Restoration, & Preservation (C&R)
    - **Conservation & Preservation** ***(10 years: moderate growth / 30 years: moderate growth)***

      Conservation and preservation in Santa Cruz County involve use of conservation practices to maintain the health and productivity of public and working lands, and protection of public and privately-owned lands, historic structures, and their surrounding environs. The county's land base is currently heavily dominated by public lands, with limited opportunities for significant increases in protected land. There are opportunities for additional conservation easements on private land, with potential projects currently in the works. Availability of public and private funding will be important determinants of growth in this area. The influence of climate change on working lands in the county may lead some landowners to engage in more conservation measures to bolster the health of their land and keep it in production. Two counteracting trends are forecasted: an increase in use of conservation practices is expected, while a stagnation in the preservation of lands may result from the county's limited private land base. Therefore, both short-term and long-term growth are expected to be moderate overall.

    - **Restoration** ***(10 years: moderate growth / 30 years: moderate to high growth)***

      Globally and nationally, the practice of ecological restoration has been growing rapidly. Within the context of Santa Cruz County, restoration activities in particular have seen growing interest and there is a high level of collaboration within the community. Organizations involved in restoration have seen growth in the level of restoration activities taking place in the county. Restoration activities are expected to continue growing as public awareness of the importance of

ecological restoration increases. A number of regional projects promise to provide opportunities for growth in this area, including flood control projects. Restoration techniques are known to be beneficial for the quality and quantity of water supplies, therefore restoration activities may see increased interest among ranchers and land management agencies as they confront climate change. Availability of public and private funding will help bolster growth in this area. As seen in previous sections, however, the vast majority of economic activity within restoration and conservation in the county is through the Forest Service. As wildland fire suppression continues to consume a growing share of the Forest Service's budget, funding for other activities has been constrained. Under projected impacts of climate change, wildland fire is expected to continue to increase in severity. For this reason, some segments of the restoration space may not experience as strong of growth due to budget constraints. Meanwhile, there is a growth trend in the work of non-profits in this space and growing interest among land management agencies and private landowners in restoring degraded lands in ways that enhance native ecosystems.

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Part IV. Total Economic Contribution of the NBRE

Introduction

Part IV of this report presents an estimate of the total economic contribution of the nature-based restorative economy (NBRE) in Santa Cruz County, Arizona in 2019. This includes economic activity directly supported through ***nature-based tourism***, ***nature-based industries***, and ***conservation, restoration, and preservation (C&R) activities*** as well as economic activity supported in other Santa Cruz County industries through economic multiplier effects.

Economic multiplier effects can be categorized into three separate effects: (1) *direct effects, (2) indirect effects*, or (3) *induced effects*. *Direct effects* are the jobs, incomes, and economic activity directly supported by the industry of interest, in this case the NBRE. *Indirect effects* are the economic activity generated through business-to-business transactions, or when businesses within the NBRE purchase goods and services from other local businesses as inputs or supplies. *Induced effects* are the economic activity generated when households spend income earned from employment in the industry and purchase goods and services from local businesses. Additional rounds of indirect and induced effects are generated as those businesses and employees purchase goods from other local businesses and so on and so forth.

These economic multiplier effects are limited by leakage. Leakage occurs when businesses source their inputs or households purchase goods from outside of the local economy. In this case, leakage occurs when businesses and households purchase goods and services from outside of Santa Cruz County. As noted in Part II, the smaller the study area, the greater the probability of leakage and the lower the multiplier effects. This could be due to a lack of availability of goods and services within the region or for a variety of other reasons. Unless all inputs, goods, and services are purchased locally (a nearly impossible scenario even for the most developed economy), each additional round of transactions results in some amount of leakage out of the local economy until the initial amount spent has leaked out of the study region entirely.

The estimates presented in this report represent the size and scope of the NBRE in Santa Cruz County in 2019 and the economic activity supported in other industries through multiplier effects. This study utilizes the sales and operating costs estimates for different segments of the NBRE, as presented in Part III of the project, to estimate the economic multiplier effects attributable to the NBRE. Multiplier effects are estimated using IMPLAN 3.1 software and data and total economic contributions are presented using a variety of metrics, including output (sales), value added (synonymous with Gross Domestic Product), income, and jobs.

Output, more colloquially known as sales, measures the total dollar value of transactions occurring within the county economy. Measuring economic activity through sales may double count some of the economic activity occurring within a region because sales occur all along the value chain, both when a good or service is being purchased as an input as well as when the good or service is being sold to the final consumer. The sale price of an item includes the costs of all inputs to production as well as the mark-up charged by the business selling the product or service. A good example of the potential double counting of sales is to consider a restaurant that is selling food made from local produce. In this case, the cost of the produce from the local farm would get counted twice: once as the sale of produce, and once as part of the meal sold to the restaurant customer. One unique

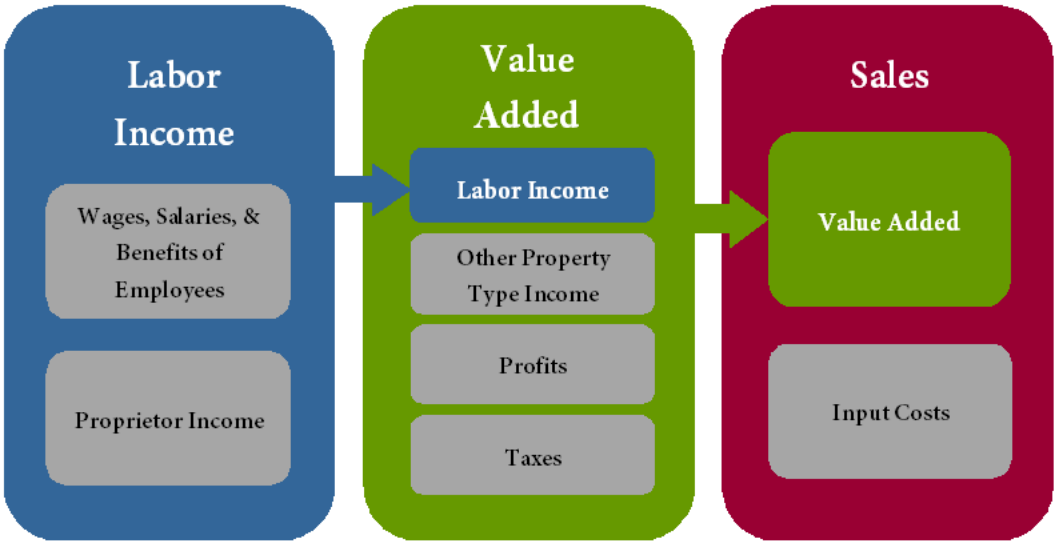
feature about manufacturing industries (of which wineries is one) is that their economic output does not just account for sales within a given year, but also inventory change. In this case, economic output is equal to the value of sales plus the value of any changes in inventory.

For these reasons, economists prefer to use value added to describe the size of a region's economy. Value added is synonymous with Gross Domestic Product (GDP) at the national-level, Gross State Product (GSP) at the state-level, and Gross Regional Production (GRP) at a regional-level. In contrast to the sales metric, value added avoids double-counting inputs to production. More specifically, value added measures the net value of a good and service above and beyond the value of inputs and includes labor income, profits and other rents, and taxes. Labor income, a component of value added, measures the wages, salaries, and benefits to employees, as well as business-owner income.

These measures are components of one another and cannot be combined. Figure 46 presents the relationship between labor income, value added, and output or sales. Because these measures are components of one another, they are not additive, and convention is to report them separately.

Finally, beyond these measures, economic contributions can also be measured in terms of the number of jobs supported through direct, indirect, and induced multiplier effects. Most commonly this metric is reported as the number of full- and part-time jobs supported. Importantly, this metric does not report the number of individual workers filling those jobs, so one "job" does not always equal one person. This is especially important in the case of industries that employ seasonal workers.

Figure 46. Relationship between Labor Income, Value Added, and Sales



Methods

Unlike some industries which are captured in government statistics in their entirety, the NBRE cuts across different industries, including some activities of an industry while excluding others. Additionally, there are multiple organizations that are involved in Santa Cruz County's NBRE that are located outside the county but are nevertheless

involved in projects or investments that stimulate economic activity in the county. For these reasons, Part III of this project estimated the size of the NBRE and the economic activity arising from the NBRE using a variety of primary and secondary data sources.

Building from the sales and operating cost estimates presented in Part IV, we adjust the estimates to account for leakage and changes in inventory, and then use a number of IMPLAN modeling techniques to capture economic activity occurring within other industries in Santa Cruz County attributable to the NBRE (the indirect and induced multiplier effects). These modeling techniques include industry changes, industry and institutional spending patterns, labor income changes, as well as developing customized spending patterns through a process called "analysis-by-parts" (ABP). The following section presents a general description of how each component of the NBRE was modeled in IMPLAN. Additional modeling details and data sources for each component of the NBRE are provided in Appendix D.

An industry change is used when a particular industry is impacted, and we know the value of sales that are demanded from that industry. This is the case for nature-based tourism. Based on the results from Part III of the project, we know, for example, that nature-based tourist visitor spending results in approximately $6.3 million in demand for Santa Cruz County restaurants (Table 30). By definition, this spending occurs 100% within the county and the full spending generates a direct contribution within the restaurant industry. This is in contrast to tourist spending at retail establishments, where only a portion of the spending is actually retained by retailers. In this case, the direct contribution of tourist spending to the retail industry is lower than the total reported tourist spending. More information on adjusting the direct contribution for leakage due to retail margins is provided in the following section of the report. Nevertheless, visitor spending within each of these industries generates multiplier effects. To capture these multiplier effects, the visitor spending pattern of nature-based tourists to Santa Cruz County (Table 30) is mapped to IMPLAN industries and modeled through industry changes.

Industry spending patterns are used when a particular industry is impacted, but we don't know the value of sales that are demanded from that industry. In this case, we only know the total value of expenditures (operational expenditures and payroll expenditures), but we don't have much detail on what kinds of inputs are purchased. In this case, because a particular industry is impacted, we can use IMPLAN-derived industry spending patterns. IMPLAN industry spending patterns reflect the national average spending pattern for a given industry. For industries that have a similar mix of inputs regardless of where production occurs (like manufacturing industries), an IMPLAN-derived spending pattern is acceptable. For industries that would have very different spending patterns depending on where goods are produced (like agriculture), an IMPLAN-derived spending pattern would need to be modified. Industry spending patterns only provide information about goods and services purchased as inputs; they do not include any information about expenditures related to labor. In order to capture the induced effects associated with income earned by employees, a labor income change must also be used. An industry spending pattern and labor income change are the modeling techniques used to capture economic activity associated with wineries.

Institutional spending patterns are similar to industry spending patterns, but reflect spending patterns associated with government institutions, such as local government spending on education. The other primary difference between industry spending patterns and institutional spending patterns is that spending on labor is already

included within institutional spending patterns. This type of modeling technique is used to capture economic activity associated with Payment in Lieu of Taxes (PILT) payments to Santa Cruz County governments received from the federal government to compensate for losses in property taxes due to the presence of federal lands.

Finally, we use an analytical process known as analysis-by-parts (ABP) to develop custom spending patterns for activities associated with conservation, restoration, and preservation. Analysis by parts is a modeling technique that allows for building custom spending patterns based on the individual impact components: budgetary expenditures (for inputs purchased) and income (for individuals employed). ABP is useful when an IMPLAN-derived spending pattern would not reflect the purchases of a given industry. ABP is the suggested technique for analyzing non-profit spending and economic activity that does not fit within a current IMPLAN industry (IMPLAN Group, LLC, 2021).

An important consideration of economic contribution analyses is accounting for leakage. As mentioned previously, leakage occurs when businesses and households purchase goods and services from outside of Santa Cruz County. This leakage can occur at all points of transaction, including within the direct contribution of retail purchases. To account for leakages from the county economy due to non-local purchases, local purchase percentages were set to SAM (Social Accounting Matrix) values in the IMPLAN model. The SAM values reflect the availability of locally-produced goods within the county, based on the IMPLAN trade model.

Direct Contribution of NBRE Components to Santa Cruz County in 2019

The following section reports estimates of the direct economic contributions of the NBRE to the Santa Cruz County economy in 2019. Results are presented for the NBRE collectively as well as for each individual component of the NBRE. Table 37 presents the direct contributions of the NBRE using the following economic metrics: jobs, labor income (wages, salaries, and benefits of employees plus business-owner income), value added (synonymous with GDP), and output (or sales). Direct output estimates have been revised from direct sales estimates presented in Part III of the report to account for leakage and changes in inventory. Additional detail on this process can be found in Appendix D. Further, as jobs within several components of the NBRE are challenging to estimate due to lack of data, Appendix D presents the data and procedures used to develop these estimates.

Nature-Based Industries

In Part III, the direct economic activity (sales) associated with nature-based industries in Santa Cruz County in 2019 was estimated at $36.1 million (Table 20). This estimate of direct economic activity includes the estimated sales in 2019 related to agricultural products, wine, and manufactured products produced from locally-sourced renewable resources. However, the direct contribution of wineries must be adjusted for inventory change.

Because wineries engage in a multi-year production process and the year that wine is made is usually not the same year the wine is sold, estimating the direct contribution of wineries in a given year is complicated. The value of wine sales ($3.3 million in 2019) only captures a portion of the economic activity occurring within the wine industry. There is additional economic activity occurring in the industry as wineries transform grapes into wine by crushing, pressing, fermenting, aging, and bottling the wine, all of which also requires inputs and labor and generates economic activity. While the spending associated with 2019 wine production can be used to stimulate the IMPLAN model and estimate the indirect and induced multiplier effects, care must be taken to correctly

estimate the direct output for the wine industry. This is due to the fact that wineries are a manufacturing industry that holds inventory. Therefore, the total direct economic activity (total direct value of output) generated by wineries can be estimated by accounting for both sales taking place in a given year ($3.3 million in 2019 as reported in Table 20) plus the value of change in winery inventory (detailed estimate presented in Appendix D).

After making this adjustment, the total estimated value of output (sales) associated with nature-based industries in Santa Cruz County in 2019 is $40.0 million, supporting 345 jobs and $12.5 million in income, and contributing approximately $12.6 million to Santa Cruz County's GDP (value added) (Table 36). Direct contributions of nature-based industries to county GDP are lower than the value reported for *agriculture, forestry, fishing & hunting* in Part I due to the focus on crops grown and livestock raised within the county and the exclusion of *agricultural support services* (a component of *agriculture, forestry, fishing & hunting*). Economic activity taking place in *agricultural support services* is excluded from the direct contributions because many of these businesses are related to the fresh produce industry and importation of agricultural products from Mexico. Although not included in the direct contribution, the analysis does capture economic activity supported within *agricultural support services* by on-farm agriculture through indirect effects, or when crop and livestock producers purchase goods and services from this sector.

Table 36. Direct Contributions of the NBRE to the Santa Cruz County Economy by Component, 2019

NBRE Component	Full- & Part-Time Jobs	Labor Income	Value Added / GDP	Output / Sales
Nature-Based Industries	345	$12,525,300	$12,619,400	$40,014,700
Nature-Based Tourism	320	$8,861,300	$13,023,300	$22,923,800
Conservation & Restoration	114	$5,411,400	$5,415,400	$13,680,200
Total	***779***	***$26,798,000***	***$31,058,100***	***$76,618,700***

Source: Author calculations; source data obtained through various methods as outlined in Appendix D

Nature-Based Tourism

Direct economic activity (sales) associated with nature-based tourism includes all nature-based tourism visitor spending. As estimated and presented in Part III, nature-based tourist spending was $39.3 million in Santa Cruz County in 2019. While all of this spending occurs within the county and generates indirect and induced multiplier effects, the direct economic contribution of nature-based tourism to output or sales must be adjusted for leakage due to retail margins.

In the case of tourism, leakage occurs when purchases are made at retail outlets. When a tourist spends money at a retail store, only a small portion of this spending is actually retained by the retailer. Instead, a portion goes to transportation costs, a portion goes to wholesale/warehousing costs, and a portion goes back to the industry that actually made the item.

After accounting for this leakage, the total direct contribution to output (sales) associated with nature-based tourism in Santa Cruz County in 2019 is an estimated $22.9 million, supporting 320 jobs and $8.9 million in income, and contributing approximately $13.0 million to Santa Cruz County's GDP (value added) (Table 37).

Conservation, Restoration, and Preservation (C&R)

The direct economic contribution estimates related to C&R activities also need to be adjusted for leakage. In the case of C&R, this leakage occurs when organizations involved in this work purchase supplies at retail outlets and hire contractors from outside of Santa Cruz County. Original estimates of economic activity supported by C&R activities (as presented through operational and project-level expenses) reported in Part III of the report were an estimated $14.2 million (Table 31).

After accounting for leakage related to retail margins and non-local contractors, the total direct contribution to output (sales) associated with C&R activities in Santa Cruz County in 2019 was estimated at $13.7 million. There were an estimated 114 jobs supported in the county through C&R activities with incomes of approximately $5.4 million. Finally, as C&R activities primarily occur within agencies and organizations that do not generate profits, the direct contribution to Santa Cruz County GDP is very close to income supported by this work and is approximately $5.4 million (Table 37). The slight difference between income and value added within this component of the NBRE reflects project-level expenses made within the county by entities outside of the county, for example, for travel-related expenses.

Total NBRE Direct Contribution

Combining all three components of the NBRE, the total direct contribution to output (sales) in Santa Cruz County in 2019 was an estimated $76.6 million, supporting 779 jobs and $26.8 million in income, and contributing nearly $31.1 million to Santa Cruz County's GDP (value added) (Table 37). This direct contribution to output/sales ($76.6 million) has been adjusted from Part III estimates ($89.6 million) to account for leakage related to retail margins and non-local contractors as well as changes in winery inventory.

Total Economic Contributions of NBRE to Santa Cruz County in 2019

When businesses within the NBRE purchase goods and services from other local businesses as inputs or supplies, *indirect multiplier effects* are generated. Similarly, when people employed by businesses within the NBRE spend their income and purchase household goods and services from local businesses, *induced multiplier effects* are generated. These business-to-business transactions and household-to-business transactions support jobs, incomes, and sales in other industries, outside of the NBRE. The following section provides estimates of the direct, indirect & induced, and total economic contributions of the NBRE to the Santa Cruz County economy in 2019.

Table 37 presents results for the NBRE collectively as well as for each individual component within the NBRE. Including indirect and induced multiplier effects, the total estimated contribution of the NBRE to Santa Cruz County's GDP in 2019 was $53.8 million, corresponding to more than $121.7 million in sales. Economic activity attributable to the NBRE, including indirect and induced multiplier effects, supported nearly 1,200 jobs and approximately $41.2 million in income. While most of these jobs are directly supported within the NBRE (779 jobs and $26.8 million in labor income), there were an additional 409 jobs and $14.4 million in income supported in other industries through indirect and induced multiplier effects.

Table 37. Total Economic Contributions of the NBRE to the Santa Cruz County Economy by Component, 2019

NBRE Component	Full- & Part-Time Jobs	Labor Income	Value Added / GDP	Output / Sales
Nature-Based Industries				
Direct	345	$12,525,300	$12,619,400	$40,014,700
Indirect & Induced	263	$9,172,900	$13,761,300	$25,517,200
Total	***608***	***$21,698,200***	***$26,380,700***	***$65,531,900***
Nature-Based Tourism				
Direct	320	$8,861,300	$13,023,300	$22,923,800
Indirect & Induced	89	$2,860,900	$5,143,900	$11,842,600
Total	***409***	***$11,722,200***	***$18,167,200***	***$34,766,400***
Conservation and Restoration				
Direct	114	$5,411,400	$5,415,400	$13,680,200
Indirect & Induced	57	$2,334,600	$3,812,100	$7,696,000
Total	***171***	***$7,746,000***	***$9,227,500***	***$21,376,200***
NBRE Combined Direct	779	$26,798,000	$31,058,100	$76,618,700
NBRE Combined Indirect & Induced	409	$14,368,400	$22,717,300	$45,055,800
NBRE COMBINED TOTAL	***1,188***	***$41,166,400***	***$53,775,400***	***$121,674,500***

Source: Author calculations; IMPLAN

Table 38 presents the top ten industries supported by the NBRE in terms of value added contribution (the equivalent to GDP). These results are in terms of total economic contribution, and therefore include direct, indirect, and induced multiplier effects. Evidence of the influence of each of these effects can be seen in this list. The top influenced industry is *full-service restaurants*, influenced primarily by the direct effects of nature-based tourist spending. The *agricultural support services* industry is supported through indirect multiplier effects when agricultural producers within the county spend on services to support their ranches and farms. *Owner-occupied dwellings,* an industry that accounts for homeowner spending on mortgage, is an example of induced effects, the effects of households spending on their needs.

Table 38. Top 10 IMPLAN Industries Supported by the NBRE by Total Value Added Contribution, 2019

IMPLAN Industry	IMPLAN Industry Description	Employment	Labor Income	Value Added / GDP	Output
509	Full-service restaurants	106	$24,096,500	$36,705,600	$70,642,800
19	Support activities for agriculture & forestry	81	$2,464,700	$3,798,800	$6,789,200
508	Other accommodations	49	$2,814,600	$2,902,600	$3,510,700
449	Owner-occupied dwellings	0	$1,826,600	$2,509,300	$3,551,500
515	Commercial & industrial machinery & equipment repair & maintenance	25	$0	$2,246,400	$2,850,600
408	Retail - Gasoline stores	23	$1,820,500	$2,091,700	$3,329,800
406	Retail - Food & beverage stores	25	$1,199,300	$1,901,600	$3,051,800
507	Hotels & motels, including casino hotels	28	$1,258,500	$1,705,200	$2,420,400
447	Other real estate	35	$778,700	$1,533,000	$2,693,300
411	Retail - General merchandise stores	21	$318,500	$1,314,400	$5,371,600

Source: Author calculations; IMPLAN

Additionally, the NBRE, including multiplier effects, was estimated to have supported $4.7 million in state and local tax revenues in 2019, of which $2.0 million was supported directly.

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Part V. Summary & Discussion

Summary & Context

This report presents estimates of the direct, indirect, induced, and total economic contributions of the NBRE to Santa Cruz County's economy in 2019. Indirect and induced multiplier effects capture economic activity supported in industries outside the NBRE. ***The total economic contribution of the NBRE to the county economy was $53.8 million in county GDP, supporting $121.7 million in sales, 1,188 jobs, and $41.2 million in labor income.***

To compare estimates of economic activity occurring within the NBRE to other industries in the county, the comparison must be made only between direct economic activity. Total output by industry is not commonly reported in government statistics, therefore the best comparison of industry activity is made in terms of value added (gross regional product, or GDP). Industry-level GDP for high-level industries in Santa Cruz County is presented in Part I of this report. If the NBRE were an industry captured in government statistics, direct GDP attributable to the NBRE in Santa Cruz County would be larger than four of the fifteen high-level (2-digit NAICS code) industries in the county. In terms of direct employment, the industry would be larger than nine of the fifteen industries.

An important consideration when comparing the high-level industries presented in Part I of this report with the results of the economic contribution analysis is that the NBRE, as defined in this study, spans across multiple high-level industries. For example, it would not be appropriate to state that nature-based tourism accounts for one-fifth of the *arts, entertainment, recreation, accommodation, & food services* because spending associated with nature-based tourism also includes spending at retail establishments, which is its own high-level industry. Similarly, because nature-based industries only include economic activity associated with crop and livestock production occurring within the county, one cannot compare this with the high-level industry statistics for *agriculture, forestry, fishing & hunting* reported in Part I.

Another consideration for contextualizing the results of this study is the geographic distribution of economic activity attributable to the NBRE. At the county level, most population and economic activity is concentrated in and around the greater Nogales area. Much of the economic activity occurring in the NBRE is occurring outside of Nogales, where it represents a larger share of local (sub-county) economic activity. In other words, the NBRE likely takes on an even larger role within more rural areas of the county. Additionally, economic activity that brings net-new dollars into local economies can be especially important for small, rural communities. This can be the case for nature-based tourist spending when tourists visit from outside the county and represents an infusion of net-new economic activity into rural communities. It would also be the case for federal grants for restoration and conservation activities.

Discussion

This study estimates the economic contributions of nature-based industries, nature-based tourism, and conservation and restoration. This type of analysis is limited to the circulation of money through a local economy, and thus is limited to capturing only monetary transactions. This is just one among many economic values that can be attributed to the natural environment. As such, many economic values are not captured in this report. For example, as noted in a previous section of this report, the immense number of volunteer hours committed to

conservation and restoration organizations within the region is evidence of the value that community members place of these causes, and on the natural environment in general.

The total economic value of natural resources can be divided into a number of components: use values and non-use values. Use values include consumptive uses like extraction of natural resources as well as non-consumptive use values such as recreation. Option values represent the value of retaining the option to use a resource in the future, including preserving the option for future generations (bequest value). Non-consumptive use values can be assigned economic values through methods such as hedonic price analysis, contingent valuation, and travel cost methods. Non-use values include existence value, the value of knowing something exists (Millennium Ecosystem Assessment, 2003). Non-use values can be estimated using contingent valuation methods. Some consider bequest value, the value of being able to preserve a natural resource for future generations, as a non-use value as well.

This report does not capture the intrinsic value of nature-based recreation (a non-consumptive use value), but rather only captures visitor spending related to nature-based tourism. It also does not capture non-use values. A strong and growing body of past research exists regarding the benefits and values that people derive from nature in Santa Cruz County. This includes a study by Petrakis, et al (2020) that mapped the locations where people experience certain ecosystem services (life sustaining, biological diversity, aesthetic, future generations, recreational, economic, therapeutic, historical, intrinsic, spiritual, cultural, and learning) within the Sonoita Creek Watershed. Another study by Weber, et al. (no date) estimated the total economic value (use and nonuse value) of preserving instream flows (from treated effluent) along the Santa Cruz River and the associated riparian vegetation and recreation opportunities, finding that there is strong support for maintaining river habitat primarily for ecological purposes opposed to recreational purposes. Many opportunities for future research exist to quantify and better understand the values people derive from the natural environment in Santa Cruz County.

Finally, a value not captured in this report is the value that homeowners place on proximity to particular natural amenities such as open space, riparian areas, or scenic views. These values can be quantified using a method known as hedonic price analysis which captures the value of specific natural amenities in the price of properties, controlling for the attributes of the home or property itself. For example, Bark et al. (2009) conducted a hedonic analysis of single-family homes in the Tucson area, finding that high quality riparian habitat adds value to nearby homes and that homebuyers do distinguish (and put a premium on habitat quality) as opposed to simply the value of green, open space.

While this study did not undertake a hedonic price analysis, we did perform a simple analysis to estimate the number of properties in the county that may be second homes. An estimated 11% of residential properties county-wide are properties with non-local owners. The rate of non-local ownership varied by area. For example, non-local ownership was lowest in areas around Nogales and Rio Rico (3% to 7% non-local ownership), and highest in the Tubac & Tumacacori area (17%), the Sonoita & Elgin area (20%), and the Patagonia area (29% - 33%). This analysis presents a rough estimate of the percent of residential properties in the county that may be second homes. However, the estimate is based on data that may include some properties used solely as investment properties, or group residential facilities owned by out-of-county entities. A proper assessment of the value of residential real estate in the county attributable to the presence of natural amenities would require a survey of property-owners and a much more detailed analysis of property values.

The county's rich biodiversity, natural beauty, and engaged NBRE community make it a dynamic location for studying the economics of conservation, restoration, and other nature-related economic activity. This study presents a baseline of existing economic activity in the county attributable to the NBRE. It also provides information on the context of this economic activity, and forces at play influencing the future of the county's NBRE. Confronting influences such as climate change or land-use change will present unique challenges in the future, however, this study demonstrates ways in which the regional economy can benefit from efforts to protect and restore the environment.

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Appendices

Appendix A. IMPLAN Industries

Table 39. IMPLAN Industries

IMPLAN Index	IMPLAN 546 Description	Wholly Included	Wholly Excluded	Hybrid / Mixed	Not Sure
1	Oilseed farming				
2	Grain farming				
3	Vegetable and melon farming				
4	Fruit farming				
5	Tree nut farming				
6	Greenhouse, nursery, and floriculture production				
7	Tobacco farming				
8	Cotton farming				
9	Sugarcane and sugar beet farming				
10	All other crop farming				
11	Beef cattle ranching and farming, including feedlots and dual-purpose ranching and farming				
12	Dairy cattle and milk production				
13	Poultry and egg production				
14	Animal production, except cattle and poultry and eggs				
15	Forestry, forest products, and timber tract production				
16	Commercial logging				
17	Commercial fishing				
18	Commercial hunting and trapping				
19	Support activities for agriculture and forestry				
20	Oil and gas extraction				
21	Coal mining				
22	Copper, nickel, lead, and zinc mining				
23	Iron ore mining				
24	Gold ore mining				
25	Silver ore mining				
26	Uranium-radium-vanadium ore mining				
27	Other metal ore mining				
28	Stone mining and quarrying				
29	Sand and gravel mining				
30	Other clay, ceramic, refractory minerals mining				
31	Potash, soda, and borate mineral mining				
32	Phosphate rock mining				
33	Other chemical and fertilizer mineral mining				
34	Other nonmetallic minerals				
35	Drilling oil and gas wells				
36	Support activities for oil and gas operations				
37	Metal mining services				
38	Other nonmetallic minerals services				
39	Electric power generation - Hydroelectric				
40	Electric power generation - Fossil fuel				
41	Electric power generation - Nuclear				
42	Electric power generation - Solar				
43	Electric power generation - Wind				
44	Electric power generation - Geothermal				
45	Electric power generation - Biomass				
46	Electric power generation - All other				
47	Electric power transmission and distribution				
48	Natural gas distribution				

IMPLAN Index	IMPLAN 546 Description	Wholly Included	Wholly Excluded	Hybrid / Mixed	Not Sure
49	Water, sewage and other systems				
50	Construction of new health care structures				
51	Construction of new manufacturing structures				
52	Construction of new power and communication structures				
53	Construction of new educational and vocational structures				
54	Construction of new highways and streets				
55	Construction of new commercial structures, including farm structures				
56	Construction of other new nonresidential structures				
57	Construction of new single-family residential structures				
58	Construction of new multifamily residential structures				
59	Construction of other new residential structures				
60	Maintenance and repair construction of nonresidential structures				
61	Maintenance and repair construction of residential structures				
62	Maintenance and repair construction of highways, streets, bridges, and tunnels				
63	Dog and cat food manufacturing				
64	Other animal food manufacturing				
65	Flour milling				
66	Rice milling				
67	Malt manufacturing				
68	Wet corn milling				
69	Soybean and other oilseed processing				
70	Fats and oils refining and blending				
71	Breakfast cereal manufacturing				
72	Beet sugar manufacturing				
73	Sugar cane mills and refining				
74	Nonchocolate confectionery manufacturing				
75	Chocolate and confectionery manufacturing from cacao beans				
76	Confectionery manufacturing from purchased chocolate				
77	Frozen fruits, juices and vegetables manufacturing				
78	Frozen specialties manufacturing				
79	Canned fruits and vegetables manufacturing				
80	Canned specialties				
81	Dehydrated food products manufacturing				
82	Cheese manufacturing				
83	Dry, condensed, and evaporated dairy product manufacturing				
84	Fluid milk manufacturing				
85	Creamery butter manufacturing				
86	Ice cream and frozen dessert manufacturing				
87	Frozen cakes and other pastries manufacturing				
88	Poultry processing				
89	Animal, except poultry, slaughtering				
90	Meat processed from carcasses				
91	Rendering and meat byproduct processing				
92	Seafood product preparation and packaging				
93	Bread and bakery product, except frozen, manufacturing				
94	Cookie and cracker manufacturing				
95	Dry pasta, mixes, and dough manufacturing				
96	Tortilla manufacturing				
97	Roasted nuts and peanut butter manufacturing				
98	Other snack food manufacturing				
99	Coffee and tea manufacturing				
100	Flavoring syrup and concentrate manufacturing				
101	Mayonnaise, dressing, and sauce manufacturing				
102	Spice and extract manufacturing				

IMPLAN Index	IMPLAN 546 Description	Wholly Included	Wholly Excluded	Hybrid / Mixed	Not Sure
103	All other food manufacturing				
104	Bottled and canned soft drinks & water				
105	Manufactured ice				
106	Breweries				
107	Wineries				
108	Distilleries				
109	Tobacco product manufacturing				
110	Fiber, yarn, and thread mills				
111	Broadwoven fabric mills				
112	Narrow fabric mills and schiffli machine embroidery				
113	Nonwoven fabric mills				
114	Knit fabric mills				
115	Textile and fabric finishing mills				
116	Fabric coating mills				
117	Carpet and rug mills				
118	Curtain and linen mills				
119	Textile bag and canvas mills				
120	Rope, cordage, twine, tire cord and tire fabric mills				
121	Other textile product mills				
122	Hosiery and sock mills				
123	Other apparel knitting mills				
124	Cut and sew apparel contractors				
125	Men's and boys' cut and sew apparel manufacturing				
126	Women's and girls' cut and sew apparel manufacturing				
127	Other cut and sew apparel manufacturing				
128	Apparel accessories and other apparel manufacturing				
129	Leather and hide tanning and finishing				
130	Footwear manufacturing				
131	Other leather and allied product manufacturing				
132	Sawmills				
133	Wood preservation				
134	Veneer and plywood manufacturing				
135	Engineered wood member and truss manufacturing				
136	Reconstituted wood product manufacturing				
137	Wood windows and door manufacturing				
138	Cut stock, resawing lumber, and planing				
139	Other millwork, including flooring				
140	Wood container and pallet manufacturing				
141	Manufactured home (mobile home) manufacturing				
142	Prefabricated wood building manufacturing				
143	All other miscellaneous wood product manufacturing				
144	Pulp mills				
145	Paper mills				
146	Paperboard mills				
147	Paperboard container manufacturing				
148	Paper bag and coated and treated paper manufacturing				
149	Stationery product manufacturing				
150	Sanitary paper product manufacturing				
151	All other converted paper product manufacturing				
152	Printing				
153	Support activities for printing				
154	Petroleum refineries				
155	Asphalt paving mixture and block manufacturing				
156	Asphalt shingle and coating materials manufacturing				
157	Petroleum lubricating oil and grease manufacturing				

IMPLAN Index	IMPLAN 546 Description	Wholly Included	Wholly Excluded	Hybrid / Mixed	Not Sure
158	All other petroleum and coal products manufacturing				
159	Petrochemical manufacturing				
160	Industrial gas manufacturing				
161	Synthetic dye and pigment manufacturing				
162	Other basic inorganic chemical manufacturing				
163	Other basic organic chemical manufacturing				
164	Plastics material and resin manufacturing				
165	Synthetic rubber manufacturing				
166	Artificial and synthetic fibers and filaments manufacturing				
167	Nitrogenous fertilizer manufacturing				
168	Phosphatic fertilizer manufacturing				
169	Fertilizer mixing				
170	Pesticide and other agricultural chemical manufacturing				
171	Medicinal and botanical manufacturing				
172	Pharmaceutical preparation manufacturing				
173	In-vitro diagnostic substance manufacturing				
174	Biological product (except diagnostic) manufacturing				
175	Paint and coating manufacturing				
176	Adhesive manufacturing				
177	Soap and other detergent manufacturing				
178	Polish and other sanitation good manufacturing				
179	Surface active agent manufacturing				
180	Toilet preparation manufacturing				
181	Printing ink manufacturing				
182	Explosives manufacturing				
183	Custom compounding of purchased resins				
184	Photographic film and chemical manufacturing				
185	Other miscellaneous chemical product manufacturing				
186	Plastics packaging materials and unlaminated film and sheet manufacturing				
187	Unlaminated plastics profile shape manufacturing				
188	Plastics pipe and pipe fitting manufacturing				
189	Laminated plastics plate, sheet (except packaging), and shape manufacturing				
190	Polystyrene foam product manufacturing				
191	Urethane and other foam product (except polystyrene) manufacturing				
192	Plastics bottle manufacturing				
193	Other plastics product manufacturing				
194	Tire manufacturing				
195	Rubber and plastics hoses and belting manufacturing				
196	Other rubber product manufacturing				
197	Pottery, ceramics, and plumbing fixture manufacturing				
198	Brick, tile, and other structural clay product manufacturing				
199	Flat glass manufacturing				
200	Other pressed and blown glass and glassware manufacturing				
201	Glass container manufacturing				
202	Glass product manufacturing made of purchased glass				
203	Cement manufacturing				
204	Ready-mix concrete manufacturing				
205	Concrete block and brick manufacturing				
206	Concrete pipe manufacturing				
207	Other concrete product manufacturing				
208	Lime manufacturing				
209	Gypsum product manufacturing				
210	Abrasive product manufacturing				
211	Cut stone and stone product manufacturing				

IMPLAN Index	IMPLAN 546 Description	Wholly Included	Wholly Excluded	Hybrid / Mixed	Not Sure
212	Ground or treated mineral and earth manufacturing				
213	Mineral wool manufacturing				
214	Miscellaneous nonmetallic mineral products manufacturing				
215	Iron and steel mills and ferroalloy manufacturing				
216	Iron, steel pipe and tube manufacturing from purchased steel				
217	Rolled steel shape manufacturing				
218	Steel wire drawing				
219	Alumina refining and primary aluminum production				
220	Secondary smelting and alloying of aluminum				
221	Aluminum sheet, plate, and foil manufacturing				
222	Other aluminum rolling, drawing and extruding				
223	Nonferrous metal (exc aluminum) smelting and refining				
224	Copper rolling, drawing, extruding and alloying				
225	Nonferrous metal, except copper and aluminum, shaping				
226	Secondary processing of other nonferrous metals				
227	Ferrous metal foundries				
228	Nonferrous metal foundries				
229	Custom roll forming				
230	Crown and closure manufacturing and metal stamping				
231	Iron and steel forging				
232	Nonferrous forging				
233	Cutlery, utensil, pot, and pan manufacturing				
234	Handtool manufacturing				
235	Prefabricated metal buildings and components manufacturing				
236	Fabricated structural metal manufacturing				
237	Plate work manufacturing				
238	Metal window and door manufacturing				
239	Sheet metal work manufacturing				
240	Ornamental and architectural metal work manufacturing				
241	Power boiler and heat exchanger manufacturing				
242	Metal tank (heavy gauge) manufacturing				
243	Metal cans manufacturing				
244	Metal barrels, drums and pails manufacturing				
245	Hardware manufacturing				
246	Spring and wire product manufacturing				
247	Machine shops				
248	Turned product and screw, nut, and bolt manufacturing				
249	Metal heat treating				
250	Metal coating and nonprecious engraving				
251	Electroplating, anodizing, and coloring metal				
252	Valve and fittings, other than plumbing, manufacturing				
253	Plumbing fixture fitting and trim manufacturing				
254	Ball and roller bearing manufacturing				
255	Small arms ammunition manufacturing				
256	Ammunition, except for small arms, manufacturing				
257	Small arms, ordnance, and accessories manufacturing				
258	Fabricated pipe and pipe fitting manufacturing				
259	Other fabricated metal manufacturing				
260	Farm machinery and equipment manufacturing				
261	Lawn and garden equipment manufacturing				
262	Construction machinery manufacturing				
263	Mining machinery and equipment manufacturing				
264	Oil and gas field machinery and equipment manufacturing				
265	Semiconductor machinery manufacturing				
266	Food product machinery manufacturing				

IMPLAN Index	IMPLAN 546 Description	Wholly Included	Wholly Excluded	Hybrid / Mixed	Not Sure
267	Sawmill, woodworking, and paper machinery				
268	Printing machinery and equipment manufacturing				
269	All other industrial machinery manufacturing				
270	Optical instrument and lens manufacturing				
271	Photographic and photocopying equipment manufacturing				
272	Other commercial service industry machinery manufacturing				
273	Air purification and ventilation equipment manufacturing				
274	Heating equipment (except warm air furnaces) manufacturing				
275	Air conditioning, refrigeration, and warm air heating equipment manufacturing				
276	Industrial mold manufacturing				
277	Special tool, die, jig, and fixture manufacturing				
278	Cutting tool and machine tool accessory manufacturing				
279	Machine tool manufacturing				
280	Rolling mill and other metalworking machinery manufacturing				
281	Turbine and turbine generator set units manufacturing				
282	Speed changer, industrial high-speed drive, and gear manufacturing				
283	Mechanical power transmission equipment manufacturing				
284	Other engine equipment manufacturing				
285	Pump and pumping equipment manufacturing				
286	Air and gas compressor manufacturing				
287	Elevator and moving stairway manufacturing				
288	Conveyor and conveying equipment manufacturing				
289	Overhead cranes, hoists, and monorail systems manufacturing				
290	Industrial truck, trailer, and stacker manufacturing				
291	Power-driven handtool manufacturing				
292	Welding and soldering equipment manufacturing				
293	Packaging machinery manufacturing				
294	Industrial process furnace and oven manufacturing				
295	Fluid power cylinder and actuator manufacturing				
296	Fluid power pump and motor manufacturing				
297	Scales, balances, and miscellaneous general purpose machinery manufacturing				
298	Electronic computer manufacturing				
299	Computer storage device manufacturing				
300	Computer terminals and other computer peripheral equipment manufacturing				
301	Telephone apparatus manufacturing				
302	Broadcast and wireless communications equipment manufacturing				
303	Other communications equipment manufacturing				
304	Audio and video equipment manufacturing				
305	Printed circuit assembly (electronic assembly) manufacturing				
306	Bare printed circuit board manufacturing				
307	Semiconductor and related device manufacturing				
308	Capacitor, resistor, coil, transformer, and other inductor manufacturing				
309	Electronic connector manufacturing				
310	Other electronic component manufacturing				
311	Electromedical and electrotherapeutic apparatus manufacturing				
312	Search, detection, and navigation instruments manufacturing				
313	Automatic environmental control manufacturing				
314	Industrial process variable instruments manufacturing				
315	Totalizing fluid meter and counting device manufacturing				
316	Electricity and signal testing instruments manufacturing				
317	Analytical laboratory instrument manufacturing				
318	Irradiation apparatus manufacturing				

IMPLAN Index	IMPLAN 546 Description	Wholly Included	Wholly Excluded	Hybrid / Mixed	Not Sure
319	Watch, clock, and other measuring and controlling device manufacturing				
320	Blank magnetic and optical recording media manufacturing				
321	Software and other prerecorded and record reproducing				
322	Electric lamp bulb and part manufacturing				
323	Lighting fixture manufacturing				
324	Small electrical appliance manufacturing				
325	Household cooking appliance manufacturing				
326	Household refrigerator and home freezer manufacturing				
327	Household laundry equipment manufacturing				
328	Other major household appliance manufacturing				
329	Power, distribution, and specialty transformer manufacturing				
330	Motor and generator manufacturing				
331	Switchgear and switchboard apparatus manufacturing				
332	Relay and industrial control manufacturing				
333	Storage battery manufacturing				
334	Primary battery manufacturing				
335	Fiber optic cable manufacturing				
336	Other communication and energy wire manufacturing				
337	Wiring device manufacturing				
338	Carbon and graphite product manufacturing				
339	All other miscellaneous electrical equipment and component manufacturing				
340	Automobile manufacturing				
341	Light truck and utility vehicle manufacturing				
342	Heavy duty truck manufacturing				
343	Motor vehicle body manufacturing				
344	Truck trailer manufacturing				
345	Motor home manufacturing				
346	Travel trailer and camper manufacturing				
347	Motor vehicle gasoline engine and engine parts manufacturing				
348	Motor vehicle electrical and electronic equipment manufacturing				
349	Motor vehicle transmission and power train parts manufacturing				
350	Motor vehicle seating and interior trim manufacturing				
351	Motor vehicle metal stamping				
352	Other motor vehicle parts manufacturing				
353	Motor vehicle steering, suspension component (except spring), and brake systems manufacturing				
354	Aircraft manufacturing				
355	Aircraft engine and engine parts manufacturing				
356	Other aircraft parts and auxiliary equipment manufacturing				
357	Guided missile and space vehicle manufacturing				
358	Propulsion units and parts for space vehicles and guided missiles manufacturing				
359	Railroad rolling stock manufacturing				
360	Ship building and repairing				
361	Boat building				
362	Motorcycle, bicycle, and parts manufacturing				
363	Military armored vehicle, tank, and tank component manufacturing				
364	All other transportation equipment manufacturing				
365	Wood kitchen cabinet and countertop manufacturing				
366	Upholstered household furniture manufacturing				
367	Nonupholstered wood household furniture manufacturing				
368	Other household nonupholstered furniture manufacturing				
369	Institutional furniture manufacturing				
370	Wood office furniture manufacturing				

IMPLAN Index	IMPLAN 546 Description	Wholly Included	Wholly Excluded	Hybrid / Mixed	Not Sure
371	Custom architectural woodwork and millwork				
372	Office furniture, except wood, manufacturing				
373	Showcase, partition, shelving, and locker manufacturing				
374	Mattress manufacturing				
375	Blind and shade manufacturing				
376	Surgical and medical instrument manufacturing				
377	Surgical appliance and supplies manufacturing				
378	Dental equipment and supplies manufacturing				
379	Ophthalmic goods manufacturing				
380	Dental laboratories				
381	Jewelry and silverware manufacturing				
382	Sporting and athletic goods manufacturing				
383	Doll, toy, and game manufacturing				
384	Office supplies (except paper) manufacturing				
385	Sign manufacturing				
386	Gasket, packing, and sealing device manufacturing				
387	Musical instrument manufacturing				
388	Fasteners, buttons, needles, and pins manufacturing				
389	Broom, brush, and mop manufacturing				
390	Burial casket manufacturing				
391	All other miscellaneous manufacturing				
392	Wholesale - Motor vehicle and motor vehicle parts and supplies				
393	Wholesale - Professional and commercial equipment and supplies				
394	Wholesale - Household appliances and electrical and electronic goods				
395	Wholesale - Machinery, equipment, and supplies				
396	Wholesale - Other durable goods merchant wholesalers				
397	Wholesale - Drugs and druggists' sundries				
398	Wholesale - Grocery and related product wholesalers				
399	Wholesale - Petroleum and petroleum products				
400	Wholesale - Other nondurable goods merchant wholesalers				
401	Wholesale - Wholesale electronic markets and agents and brokers				
402	Retail - Motor vehicle and parts dealers				
403	Retail - Furniture and home furnishings stores				
404	Retail - Electronics and appliance stores				
405	Retail - Building material and garden equipment and supplies stores				
406	Retail - Food and beverage stores				
407	Retail - Health and personal care stores				
408	Retail - Gasoline stores				
409	Retail - Clothing and clothing accessories stores				
410	Retail - Sporting goods, hobby, musical instrument and book stores				
411	Retail - General merchandise stores				
412	Retail - Miscellaneous store retailers				
413	Retail - Nonstore retailers				
414	Air transportation				
415	Rail transportation				
416	Water transportation				
417	Truck transportation				
418	Transit and ground passenger transportation				
419	Pipeline transportation				
420	Scenic and sightseeing transportation and support activities for transportation				
421	Couriers and messengers				
422	Warehousing and storage				
423	Newspaper publishers				
424	Periodical publishers				

IMPLAN Index	IMPLAN 546 Description	Wholly Included	Wholly Excluded	Hybrid / Mixed	Not Sure
425	Book publishers				
426	Directory, mailing list, and other publishers				
427	Greeting card publishing				
428	Software publishers				
429	Motion picture and video industries				
430	Sound recording industries				
431	Radio and television broadcasting				
432	Cable and other subscription programming				
433	Wired telecommunications carriers				
434	Wireless telecommunications carriers (except satellite)				
435	Satellite, telecommunications resellers, and all other telecommunications				
436	Data processing, hosting, and related services				
437	News syndicates, libraries, archives and all other information services				
438	Internet publishing and broadcasting and web search portals				
439	Nondepository credit intermediation and related activities				
440	Securities and commodity contracts intermediation and brokerage				
441	Monetary authorities and depository credit intermediation				
442	Other financial investment activities				
443	Direct life insurance carriers				
444	Insurance carriers, except direct life				
445	Insurance agencies, brokerages, and related activities				
446	Funds, trusts, and other financial vehicles				
447	Other real estate				
448	Tenant-occupied housing				
449	Owner-occupied dwellings				
450	Automotive equipment rental and leasing				
451	General and consumer goods rental except video tapes and discs				
452	Video tape and disc rental				
453	Commercial and industrial machinery and equipment rental and leasing				
454	Lessors of nonfinancial intangible assets				
455	Legal services				
456	Accounting, tax preparation, bookkeeping, and payroll services				
457	Architectural, engineering, and related services				
458	Specialized design services				
459	Custom computer programming services				
460	Computer systems design services				
461	Other computer related services, including facilities management				
462	Management consulting services				
463	Environmental and other technical consulting services				
464	Scientific research and development services				
465	Advertising, public relations, and related services				
466	Photographic services				
467	Veterinary services				
468	Marketing research and all other miscellaneous professional, scientific, and technical services				
469	Management of companies and enterprises				
470	Office administrative services				
471	Facilities support services				
472	Employment services				
473	Business support services				
474	Travel arrangement and reservation services				
475	Investigation and security services				
476	Services to buildings				
477	Landscape and horticultural services				
478	Other support services				

IMPLAN Index	IMPLAN 546 Description	Wholly Included	Wholly Excluded	Hybrid / Mixed	Not Sure
479	Waste management and remediation services				
480	Elementary and secondary schools				
481	Junior colleges, colleges, universities, and professional schools				
482	Other educational services				
483	Offices of physicians				
484	Offices of dentists				
485	Offices of other health practitioners				
486	Outpatient care centers				
487	Medical and diagnostic laboratories				
488	Home health care services				
489	Other ambulatory health care services				
490	Hospitals				
491	Nursing and community care facilities				
492	Residential mental retardation, mental health, substance abuse and other facilities				
493	Individual and family services				
494	Child day care services				
495	Community food, housing, and other relief services, including rehabilitation services				
496	Performing arts companies				
497	Commercial Sports Except Racing				
498	Racing and Track Operation				
499	Independent artists, writers, and performers				
500	Promoters of performing arts and sports and agents for public figures				
501	Museums, historical sites, zoos, and parks				
502	Amusement parks and arcades				
503	Gambling industries (except casino hotels)				
504	Other amusement and recreation industries				
505	Fitness and recreational sports centers				
506	Bowling centers				
507	Hotels and motels, including casino hotels				
508	Other accommodations				
509	Full-service restaurants				
510	Limited-service restaurants				
511	All other food and drinking places				
512	Automotive repair and maintenance, except car washes				
513	Car washes				
514	Electronic and precision equipment repair and maintenance				
515	Commercial and industrial machinery and equipment repair and maintenance				
516	Personal and household goods repair and maintenance				
517	Personal care services				
518	Death care services				
519	Dry-cleaning and laundry services				
520	Other personal services				
521	Religious organizations				
522	Grantmaking, giving, and social advocacy organizations				
523	Business and professional associations				
524	Labor and civic organizations				
525	Private households				
526	Postal service				
527	Federal electric utilities				
528	Other federal government enterprises				
529	State government passenger transit				
530	State government electric utilities				

IMPLAN Index	IMPLAN 546 Description	Wholly Included	Wholly Excluded	Hybrid / Mixed	Not Sure
531	Other state government enterprises				
532	Local government passenger transit				
533	Local government electric utilities				
534	Other local government enterprises				
535	* Not an industry (Used and secondhand goods)				
536	* Not an industry (Scrap)				
537	* Not an industry (Rest of world adjustment)				
538	* Not an industry (Noncomparable foreign imports)				
539	* Employment and payroll of state govt, education				
540	* Employment and payroll of state govt, hospitals and health services				
541	* Employment and payroll of state govt, other services				
542	* Employment and payroll of local govt, education				
543	* Employment and payroll of local govt, hospitals and health services				
544	* Employment and payroll of local govt, other services				
545	* Employment and payroll of federal govt, military				
546	* Employment and payroll of federal govt, non-military				

Appendix B. IMPLAN Exercise Summary

OVERVIEW

Based on the RFP&Q, we use the Ecosystem Services (ES) framework for defining the nature-based restorative economy (NBRE). This focuses on the services that the environment provides that support human-well-being. This includes:

- Provisioning services - food, fresh water, wood & fiber, fuel, etc.
- Regulating services - climate, flood, disease regulation, etc.
- Cultural services - recreational, educational, spiritual, etc.
- Supporting services - nutrient cycling, soil formation, etc.

Using the 3-legged stool approach discussed during the kick-off meeting, the targeted industries include:

1. Nature-based industries - industries that rely on products derived from nature. (Provisioning services within ES framework)
2. Nature-based tourism - economic activities that rely on products of or experiences with nature. (Cultural services within ES framework)
3. Ecological restoration & conservation - economic activities related to conservation, restoration, education related to environmental issues, etc. (Activities that support all components within ES framework)

Prior to the kickoff meeting, we asked for members of the project steering committee and others to participate in the IMPLAN exercise. The instructions presented a list of 546 IMPLAN industries and asked each member to identify whether they think the industry should be: (1) wholly included in the NBRE, (2) wholly excluded from the NBRE, or (3) a hybrid/mixed sector with some activities within and some outside of the NBRE. The goal of the IMPLAN exercise was to identify nature-based industries.

Below is a summary of consensus areas from the IMPLAN exercise as well as supporting information from the IMPLAN model.

Consensus Areas from IMPLAN Exercise

1. Include all agricultural industries (IMPLAN 1-19)
2. Include renewable electricity generation (44-47)
    a. No industries present in Santa Cruz County according to baseline IMPLAN data or from the Department of Labor's Quarterly Census of Employment and Wages (QCEW) data
    b. One could discuss the potential for renewable electricity in the County in the longer-term projections part of the report and the SWOT analysis

3. Generally, want to include some portion of food manufacturing (with some exceptions); only industries present in Santa Cruz County (according to baseline IMPLAN data) are:
    a. 74- Sugar cane mill = $12.3 million
    b. 81- Canned fruit & veggies = $4.9 million
    c. 94- Bread & bakery manuf. = $3.4 million
    d. 95- Frozen cakes = $300K
    e. 105- All other food manuf. = $3.4 million
4. Include breweries, wineries, and distilleries
    a. According to baseline IMPLAN data, only the wineries industry is present in Santa Cruz County
5. Generally, want to include some portion of fiber and wood manufacturing; only industries present in Santa Cruz County (according to baseline IMPLAN data) are:
    a. 117- Textile finishing mill = $4.6 million
    b. 123- Other mill = $200K
    c. 126- Apparel contractors = $2.1 million
    d. 127- Men & boys' apparel = $5.4 million
    e. 132- Footwear= $3.7 million
    f. 142- Wood containers = $1.4 million
    g. 145- All other wood = $600k
    h. 149- Paper board container = $500k
6. Generally, want to include some portion of furniture manufacturing; only industry present in Santa Cruz County (according to baseline IMPLAN data) is:
    a. 368- Wood kitchen cabinet = $400k
7. Generally, want to include some portion of:
    a. Services (414-471)
    b. Education & Medical (472-487)
    c. Arts & Recreation (488-498)
    d. Hotels & Restaurants (499-503)
8. Some other disparate industries selected were:
    a. 242- Ornamental & arch metal work = $2.2 million
    b. 154- Printing = $1.8 million
    c. 249- Machine shops = $714K
    d. 390- Musical instrument manuf. = $1.4 million

Takeaways:

- We think that partial inclusion of services, education & medical, arts & recreation, and hotels & restaurants (item #7 above) in the IMPLAN exercise was intended to capture economic activity related to the other two components of the NBRE: **nature-based tourism** and **ecological restoration &**

conservation. We have other ways of estimating these economic activities and suggest not including items listed in 7 and 8 in nature-based industries.

- Nature-based tourism will be estimated through visitor data and visitor spending patterns.
- Ecological restoration & conservation will be estimated through organizations' spending.
  - We are proposing a bottom-up approach (catalogue organizations involved in restoration & collect info on their activity in the county)
    - Benefits – captures investment by local & non-local organizations in restoration & conservation activities in the county; feasible in Santa Cruz County
    - Drawbacks – more work

Decision-points for nature-based industry component:

- Include all agricultural activity? (Yes/No)
  - A "yes" vote will include all crop, livestock, and agricultural support activities.
  - A "no" vote will exclude all crop, livestock, and agricultural support activities.

YES	NO

- Include renewable electricity generation? (Yes/No)
  - There is no IMPLAN data associated with renewable energy. Does the committee know of initiatives in this arena? Can only be included with supporting data.
  - We plan to address this in the SWOT analysis.

YES	NO

- Include food, fiber, and wood manufacturing (items in #3, #4, #5 above)*? (Yes/No)
  - A "yes" vote will include all food, fiber, and wood manufacturing.
    i. Other studies have included manufacturing industries that rely on natural products.
    ii. There are a relatively small number of industries (~15); may not abstract from a more nature-focused study (accounts for about 2% of gross sales within the county).
  - A "no" vote will exclude all food, fiber, and wood manufacturing.:
    i. Largest industry in the county is related to sugar cane manufacturing; businesses may be related economic activity in Ambos Nogales.
    ii. These manufactured products are not likely to be tied to local production of agricultural products.
    iii. The relative size of all food, fiber, and wood manufacturing is about the same size as all agricultural activity in the county (about 2% of gross sales).

iv. Some value-added activities related to agricultural production are already captured within the agricultural data. For example, if an ag business is selling some food products from fruit, that would likely be captured already within the agriculture industry.

YES	NO

*We intend to include wineries (#4) in the analysis because our previous research has shown that the wine industry is highly-vertically integrated, with a large majority of a winery's grapes sourced directly from its own vineyard.

Questions for nature-based tourism component:

- Does the group have any information on popular tourist attractions, specifically visitor data?
- Does the group know of any specific nature-based businesses located in Santa Cruz County? These could be tour operators, specialized outdoor recreation retail stores, etc.

Questions for ecological restoration & conservation component:

- Would the group like to include all types of restoration? For example, should mining remediation be included? (Yes/No)
    - One way to look at it is the extent to which these types of activities would dominate and create a skewed picture of the activity in the area. If there are large outliers, we may want to consider not including. If there are no significant outliers, we can include the spending related with these projects but with some explanation.
    - This is a larger discussion about making a distinction between activities that must be undertaken because of legal liability (point-source damage) vs. landscape scale activities (non-point damage). We present a graphical representation of the restoration continuum below.
    - One option is that we could address the issues of perverse incentives within the text of the report, but not exclude any specific restoration activity.
    - As described to us, restoration *inherently* addresses past mismanagement, current mismanagement, and future mismanagement (due to climate change).

YES	NO	If no, what should not be included?

Appendix C. Conservation, Restoration, & Preservation Entities Identified Active in Santa Cruz County

Table 40 presents a list of agencies and organizations that have been identified as being involved in recent conservation, restoration, and preservation initiatives and projects in Santa Cruz County. These include federal and state agencies, local non-profit organizations, non-profit organizations outside of the county, and others. This does not represent a complete accounting of entities that have ever been involved in regional conservation, restoration, or preservation efforts in the region, but does reflect the organizations that were identified through snowball sampling methods and those that were contacted and requested to participate in the study. To ensure that the study adheres to the definition of C&R activities, Table 40 also presents the mission of the organization. Finally, the table identifies the entity's participation status in the study through the following categories:

- "Used in analysis" indicates respondent-provided data.
- "Secondary" indicates that data was obtained through secondary sources. Additional details about each data source are provided in Appendix D.
- "Partial" indicates that data obtained through primary or secondary sources is likely to reflect only a portion of the spending in the county in 2019.
- "Volunteer" indicates that the organization is primarily volunteer led.
- "Not applicable" indicates that the organization reported that they did not have expenses related to activities, projects, or initiatives occurring in Santa Cruz County in 2019. This could indicate that the organization worked in the broader region (but not in Santa Cruz County), has worked in the region in past but did not have activities in 2019, or that the organization is primarily volunteer-led and did not have expenses to report.
- "Not reported" indicates that no contact was made with the organization.

Table 40. Entities Involved in Conservation, Restoration, and Preservation Activities in Santa Cruz County and Surrounding Area

Entity	Type	Mission	Reported 2019 Expenses
U.S Forest Service (USFS), Coronado National Forest	Federal	To sustain the health, diversity, and productivity of the nation's forests and grasslands to meet the needs of present and future generations.	Secondary
Bureau of Land Management (BLM)	Federal	To sustain the health, diversity, and productivity of public lands for the use and enjoyment of present and future generations.	Not reported
National Park Service (NPS)	Federal	To preserve unimpaired the natural and cultural resources and values of the national park system for the enjoyment, education, and inspiration of this and future generations.	Used in analysis
U.S. Fish and Wildlife Service (USFWS)	Federal	To conserve, protect and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people.	Secondary; Partial
U.S. Geological Survey (USGS)	Federal	To monitor, analyze, and predict current and evolving dynamics of complex human and natural Earth-system interactions and to deliver actionable intelligence at scales and timeframes relevant to decision makers	Not applicable
International Boundary Water Commission (USIBWC), Nogales International Wastewater Treatment Plant (NIWTP)	Federal	To provide secondary treatment for wastewater generated in both Nogales, Arizona and Nogales, Sonora.	Secondary
Natural Resource Conservation Service (NRCS)	Federal	To provide resources to farmers and landowners to aid them with conservation. Ensuring productive lands in harmony with a healthy environment is our priority.	Used in analysis
Arizona State Parks and Trails (ASPT)	State	Managing and conserving Arizona's natural, cultural and recreational resources for the benefit of the people, both in our Parks and through our Partners.	Used in analysis
Arizona Department of Environmental Quality (ADEQ)	State	To protect and enhance public health and the environment in Arizona.	Not reported
Arizona Game and Fish Department (AZGFD)	State	To conserve Arizona's diverse wildlife resources and manage for safe, compatible outdoor recreation opportunities for current and future generations.	Secondary; Partial

Entity	Type	Mission	Reported 2019 Expenses
Arizona Department of Water Resources (ADWR)	State	To safeguard the health, safety and economic welfare of the public by protecting, conserving and enhancing Arizona's water supplies in a bold, thoughtful and innovative manner.	Secondary; Partial
Santa Cruz County Natural Resource Conservation District (NRCD)	County	To support policies and practices that are economically feasible, socially acceptable, and environmentally responsible; and, help provide financial and technical assistance to cooperators through collaboration with others.	Secondary
Borderlands Restoration Network (BRN)	Local Non-Profit	To grow a restorative economy by rebuilding healthy ecosystems, restoring habitat for plants and wildlife, and reconnecting our border communities to the land through shared learning.	Used in analysis
Hummingbird Monitoring Network (HMN)	Local Non-Profit	To help hummingbirds survive, reproduce, and thrive while engaging human communities to demonstrate how they can benefit economically, socially, and ecologically through their hummingbird conservation activities.	Secondary
Patagonia Area Resource Alliance (PARA)	Local Non-Profit	To stop destruction by mining in the Patagonia Mountains, Canelo Hills and San Rafael Valley. To protect and preserve the Patagonia area waterways from pollution and depletion by mining activities.	Used in analysis
San Rafael Valley A Land in Balance	Local Non-Profit	To protect and defend the diverse community culture, the long-term economic viability, and the healthy ecosystem of the San Rafael Valley watershed located in southern Arizona.	Not applicable; Volunteer
Deep Dirt Institute	Local Non-Profit	To inspire and educate individuals and their communities in living in resilient and regenerative ways.	Used in analysis
Cuenca de Los Ojos (CLO)	Local Non-Profit	To preserve and restore the monumental habitat of the Madrean Archipelago and protecting the vast number of species it supports.	Not applicable
Friends of Sonoita Creek	Local Non-Profit	To protect and restore the water and natural habitat of Sonoita Creek and its watershed.	Volunteer
Santa Fe Ranch Foundation	Local Non-Profit	Dedicated to: the conservation and preservation of the land and its non-renewable resources; to agriculture and its role in our daily lives; and to science, social studies, physical and health education.	Secondary

Entity	Type	Mission	Reported 2019 Expenses
Arizona Quail Alliance	Local Non-Profit	Wildlife preservation, protection (NTEE classification)	Not reported
Madrean Archipelago Wildlife Center	Local Non-Profit	To build pathways of compassionate coexistence between people and wildlife in the Madrean Archipelago ecoregion through actions of wildlife education, conservation, advocacy and rehabilitation.	Used in analysis; Volunteer
Empire Ranch Foundation	Local Non-Profit	To protect, restore and sustain the Empire Ranch historical buildings and landscape as an outstanding western heritage education center.	Not applicable
Tubac Nature Center	Local Non-Profit	To provide education, and to enhance appreciation for the Santa Cruz River and its environment in the Tubac and the Santa Cruz County area.	Used in analysis; Volunteer
Arizona Native Plant Society	Local Non-Profit	To promote knowledge, appreciation, conservation, and restoration of Arizona native plants and their habitats.	Not reported
Friends of the Santa Cruz River	Local Non-Profit	To ensure a continued flow of the river's surface waters, promote the highest river water quality achievable, and to protect and restore the riparian ecosystem and diversity of life supported by the river's waters	Used in analysis; Volunteer
Friends of Tubac Presidio & Museum	Local Non-Profit	To preserving the history of the settlement of the territory that would eventually become Arizona. Anza Trail passes through the park.	Used in analysis; Volunteer
Wildlife Corridors, LLC	Local Other	To facilitate novel public-private partnerships to protect open land, improve habitat, and facilitate wildlife movement.	Used in analysis
Borderlands Restoration L3C	Local Other	To reconnect wildlife, land, and people in the Arizona/Sonora Borderland region by involving people in restoring the ecosystem on which we depend.	Used in analysis
Santa Cruz Valley Heritage Alliance	Non-Local Non-Profit	To connect people to the cultural, historic, and natural treasures of the Santa Cruz Valley through education, preservation and promotion of its unique resources and living traditions.	Not applicable
Biophilia Foundation	Non-Local Non-Profit	To support efforts that protect, restore, enhance, and preserve wildlife habitat for all species of native plants and animals.	Not applicable
The Nature Conservancy (TNC)	Non-Local Non-Profit	To conserve the lands and waters on which all life depends.	Used in analysis; Partial

Entity	Type	Mission	Reported 2019 Expenses
Native Seeds SEARCH	Non-Local Non-Profit	To conserve and promote the arid-adapted crop diversity of the Southwest in support of sustainable farming and food security.	Not applicable
Sky Island Alliance (SIA)	Non-Local Non-Profit	To protect and restore the diversity of life and lands in the Sky Island region by connecting wildlife pathways, protecting critical water sources, and promoting public appreciation of the Madrean Sky Islands.	Not reported
Altar Valley Conservation Alliance	Non-Local Non-Profit	To conserve healthy and productive working landscapes, promote a thriving agricultural economy, and sustain a resilient rural community.	Not applicable
Arizona Land and Water Trust	Non-Local Non-Profit	To protect Southern Arizona's vanishing western landscapes, its farms and ranches, wildlife habitat, and the waters that sustain them.	Used in analysis
Society For Ecological Restoration - Southwest Chapter	Non-Local Non-Profit	To foster a network of resource specialists with interest and expertise in restoring desert and other arid ecosystems and to promote the exchange of knowledge, awareness, and collaborative opportunities as a means of sustaining the diversity of life on Earth and reestablishing an ecologically healthy relationship between nature and culture.	Not applicable
Watershed Management Group Inc	Non-Local Non-Profit	To develop community-based solutions to ensure the long-term prosperity of people and health of the environment.	Not applicable
Sonoran Institute	Non-Local Non-Profit	To connect people and communities with the natural resources that nourish and sustain them.	Not applicable
Tucson Audubon Society	Non-Local Non-Profit	To inspire people to enjoy and protect birds through recreation, education, conservation, and restoration of the environment upon which we all depend.	Used in analysis
Cienega Watershed Partnership	Non-Local Non-Profit	To conserve the nationally significant resources of the Las Cienegas National Conservation Area	Used in analysis
Arizona Antelope Foundation	Non-Local Non-Profit	To increase pronghorn populations in Arizona through habitat improvements, habitat acquisition, the translocation of animals to historic range, and public comment on activities affecting pronghorn and their habitat.	Not reported
Pheasants Forever	Non-Local Non-Profit	To conserve pheasants, quail, and other wildlife through habitat improvements, public access, education, and conservation advocacy.	Not reported

Entity	Type	Mission	Reported 2019 Expenses
Trust for Public Land	Non-Local Non-Profit	To create parks and protect land for people, ensuring healthy, livable communities for generations to come.	Not applicable
Southern Arizona Quail Forever	Non-Local Non-Profit	To conserve quail, pheasants, and other wildlife through habitat improvements, public access, education, and conservation advocacy.	Not applicable

Appendix D. Data Sources and Detailed Methods

This project characterizes the Nature-Based Restorative Economy (NBRE) in Santa Cruz County, Arizona and measures its direct and total economic contribution within the county in 2019. Santa Cruz County's NBRE is defined as having three main components: economic activity related to (1) nature-based industries, (2) nature-based tourism, and (3) conservation, restoration, and preservation (referred to as C&R for brevity) (Part II describes the process of defining the NBRE). Unlike some industries which are captured in government statistics in their entirety, the NBRE cuts across different industries, including some activities while excluding others. Furthermore, organizations involved in the NBRE in Santa Cruz County may be based in other locations outside the county, but nonetheless are involved in projects or investments that stimulate economic activity within the county. For these reasons, this study estimates the size of the NBRE and the economic activity arising from the NBRE using a variety of primary and secondary data sources, presenting estimates of sales and operating costs for each component of the NBRE (presented in Part III). Building from these estimates, adjustments are made to account for leakage and changes in inventory and total economic contributions (including indirect and induced multiplier effects) are estimated using the IMPLAN model (presented in Part IV).

The following section describes the data sources used for each component in more detail, how direct output estimates have been revised from direct sales estimates presented in the Part III, how direct jobs have been calculated, and what IMPLAN modeling techniques were used to capture indirect and induced multiplier effects.

The IMPLAN data and model used for this analysis was IMPLAN Version 3.1 Model Year 2018 for Santa Cruz County (IMPLAN Group, LLC, 2019). Because this analysis does not rely on IMPLAN data for the estimates of direct economic activity affiliated with the NBRE, a model year previous to the study year is acceptable. To account for leakage from the county economy due to non-local purchases in each round of multiplier effects, the analysis relies on IMPLAN-derived SAM (Social Accounting Matrix) values. SAM values reflect the local availability of locally produced goods within the county based on the IMPLAN trade model.

Nature Based Industries

Agriculture

All agricultural data (agricultural output and operating expenditures) were obtained from Bureau of Economic Analysis (BEA) Farm Income and Expenses data for 2019. Table 41 presents the data used in this analysis. Direct agricultural output or total farm income was calculated as the sum of cash receipts from marketings plus other income (such as government payments and other miscellaneous income). Agricultural proprietor income was calculated as the difference between total income and total production expenses. Hired farm labor expenses are provided by the BEA. For purposes of the analysis, hired labor is modeled separately from other input expenses, therefore we calculate spending on inputs to production as the difference between production expenses and hired farm labor expenses.

Table 41. Santa Cruz County Farm Income and Expense Data, 2019

Category	Value
Cash receipts from marketings	$27,754,000
Other income	$2,341,000
Total Income	$30,095,000
Production expenses	$27,092,000
Ag Proprietor Income	$3,003,000
Hired farm labor expenses	$4,754,000
Total production expenses less hired labor	$22,338,000

Source: Bureau of Economic Analysis, 2020

The breakdown of farm expenses provided by the BEA is high-level, therefore, to model farm expenses, we apply the ratio of farm expenses for the county from the 2017 USDA Census of Agriculture to the calculated production expenses less hired labor figure from the BEA for 2019, producing the following spending pattern (Table 42). This spending was modeled in IMPLAN as an industry spending pattern, with the spending pattern customized to reflect the expenditures in Table 42 and local purchase percentages set to IMPLAN SAM model values. As industry spending patterns only incorporate non-labor expenses, farm proprietor income was modeled as a proprietor income change and hired farm labor expenses were modeled as an employee compensation income change.

Table 42. Estimated Santa Cruz County Agriculture Spending Pattern

IMPLAN Industry	Value
167 Nitrogenous fertilizer manufacturing	$1,004,684
170 Pesticide and other agricultural chemical manufacturing	$478,671
10 All other crop farming	$3,503,244
11 Beef cattle ranching & farming, incl. feedlots & dual-purpose ranching & farming	$722,391
408 Retail - Gasoline stores	$1,834,030
49 Water, sewage and other systems	$1,244,896
515 Commercial and industrial machinery and equipment repair and maintenance	$3,671,568
19 Support activities for agriculture and forestry	$4,025,749
447 Other real estate	$1,430,754
441 Monetary authorities and depository credit intermediation	$1,499,136
453 Commercial and industrial machinery and equipment rental and leasing	$838,990
467 Veterinary services	$838,990
47 Electric power transmission and distribution	$1,244,896
TOTAL	$22,338,000

Source: Authors' calculations; USDA, 2019; Bureau of Economic Analysis, 2020

Jobs in agriculture in Santa Cruz County can be challenging to estimate. Data published by the Bureau of Labor Statistics (BLS) has many undisclosed values within agriculture, and most agricultural industries lack employment estimates for 2019. We use BEA hired farm labor plus estimated proprietor income divided by average annual wage for 45-2092: Farmworkers and Laborers, Crop, Nursery, and Greenhouse for non-metropolitan counties in

Arizona from the Bureau of Labor Statistics for May, 2020 to estimate agricultural jobs in Santa Cruz County (Bureau of Labor Statistics, 2020).

Wineries

Because wineries engage in a multi-year production process and the year that wine is made is usually not the same year the wine is sold, estimating the direct contribution of wineries in a given year is complicated. The direct economic activity generated by wineries can be estimated by accounting for both sales taking place in a given year plus the value of change in the winery's inventory. This was estimated using estimated 2019 sales for Santa Cruz County wineries based on statewide estimates and the number of wineries in the county, as well as the estimated number of gallons produced and sold in the year, for an estimate in the change in inventory within the county (Bickel et al., 2021). Cost per gallon produced and estimated costs for retail sales were applied to arrive at an estimated value of direct industry output for 2019 as presented below in Table 43.

The indirect and induced economic contribution of wineries are modeled using estimated expenditures on inputs and labor for 2019. Expenditures exceed revenues in 2019 due to industry growth and delays between when wine is produced and when it is sold. The value of expenditures is broken into employee compensation, proprietor income, and intermediate expenditures. Intermediate expenditures were modeled using IMPLAN's built-in industry spending pattern for wineries. Local purchase percentages were set to IMPLAN SAM model values. Employee compensation is modeled as a labor income change. Proprietor income realized when sales are made are modeled as a proprietor income change. Value added was estimated as the sum of employee compensation and proprietor's income.

To estimates winery jobs in the county, we divided estimated employee compensation in 2019 by the average annual pay for wineries in 2019 in SCC from the BLS QCEW, for an estimate of 102 jobs (BLS, 2021). We then added 18 proprietor jobs based on the number of wineries in the county (Bickel et al., 2021).

Table 43. Data and Modeling Approach for Santa Cruz County Wineries

Impact	Modeling Approach	Value
Direct effect		
Industry output	Sales + value of change in inventory	$7,274,699
Indirect & induced effects		
Employee compensation for production & retail operations	Labor income change (employee compensation)	$2,434,293
Winery business income realized when product sold	Labor income change (proprietor income)	$1,472,658
Winery spending on inputs to production	Industry spending pattern	$4,320,000

Source: Author calculations; Bickel, et al, 2021.

Manufacturing

Two types of manufacturing were modeled in the analysis – a wood products manufacturer and value added food products manufacturing by farms. The wood products manufacturer was captured through an industry change under '143 – All other miscellaneous wood product manufacturing' and food manufacturing was modelled under '103 – All other food manufacturing'. As economic activity related to these industries was modeled through an industry change and because the industries are located in the county, local purchase percentages were set to 100%. Jobs directly supported through NBRE manufacturing industries are estimated using the IMPLAN model.

Solar Power Generation

Solar power generation was modeled using an industry spending pattern for '42 – Electric power generation – Solar'. Local purchase percentages were set to SAM model values. This industry was modeled only as operating costs because pinpointing the location and value of electricity sales by the utility is difficult. For that reason, direct effects are excluded from the total. Direct jobs supported in solar power generation are not estimated for this analysis because it is not known where operation jobs are located for the solar power installation.

Nature Based Tourism

Nature based tourist spending was modeled as a series of industry changes. An industry spending pattern is used because we know the value of sales that are demanded from each of the various tourist industries through the visitor spending pattern developed in Part III. The spending pattern is mapped to IMPLAN and modeled as a series of industry changes (Table 44). All local purchase percentages were set to 100% because by definition the tourist spending is occurring in Santa Cruz County. That said, all purchases made through retail industries were adjusted to account for retail margins. Retail margins account for the fact that only a portion of visitor spending is actually retained by the retailer. So, in this case, the direct contribution of tourist spending to the retail industry is lower than the total reported tourist spending. Retail margin adjustments were made to all retail industries (406 – Retail - Food and beverage stores, 408 Retail - Gasoline stores, 411 Retail - General merchandise stores, and 412 Retail - Miscellaneous store retailers), resulting in a direct output sales contribution of $22.9 million rather than the total visitor spending $39.3 million. Jobs directly supported through nature-based tourism are estimated using the IMPLAN model.

Table 44. Nature-Based Tourism Spending by Category in Santa Cruz County Mapped to IMPLAN Industry

Category	IMPLAN Industry	Value
Lodging	507 Hotels and motels, including casino hotels	$2,686,779
Camping	508 Other accommodations	$3,551,450
Restaurant	509 Full-service restaurants	$6,328,889
Grocery	406 Retail - Food and beverage stores	$6,035,308
Gas & transportation	408 Retail - Gasoline stores	$11,310,122
Retail	411 Retail - General merchandise stores	$3,829,635
Entrance Fees	501 Museums, historical sites, zoos, and parks	$3,373,084
Other	412 Retail - Miscellaneous store retailers	$2,193,476
	TOTAL	$39,308,742

Source: Author calculations

Conservation & Restoration

Economic activity related to conservation, restoration, and preservation (C&R) was modeled using analysis-by-parts (ABP) and a customized spending pattern as well as a series of industry changes. Detailed financial expenditure data was collected from organizations or groups actively engaged in C&R activities in Santa Cruz County in 2019 through semi-structured interviews and/or secondary data sources. Direct economic activity related to C&R activities in Santa Cruz County in 2019 was estimated at $14.2 million (Table 31). However, adjustments were made to account for leakage. In the case of C&R, leakage occurs when organizations involved in this work purchase supplies at retail outlets and hire contractors from outside of Santa Cruz County. Retail margins for 2019 were obtained from IMPLAN (IMPLAN Group, LLC, 2021). After accounting for leakage related to retail margins and non-local contractors, the total direct contribution to output (sales) associated with C&R activities in Santa Cruz County in 2019 was estimated at $13.7 million (Table 37).

To the extent possible, organizations and agencies located in Santa Cruz County were asked to provide a detailed operational budget for 2019. In some cases, expenditure data was obtained from secondary data sources, including the Arizona Financial Transparency Portal (2021) for state agencies, USASpending.gov (2021) for federal agencies, the ProPublica Non-Profit Explorer (2021) that provides publicly available tax filings for tax-exempt organizations, and other publicly available sources (such as organizational websites). As data allowed, payroll expenses were separated from non-payroll expenses and non-payroll expenses were mapped to the most appropriate IMPLAN category. When detailed information was not available for non-payroll expenses (and therefore could not be distributed to individual IMPLAN categories), IMPLAN industry and institution spending patterns were used to develop the individual organization's spending pattern. A spending pattern was developed for each organization, ultimately generating a single customized spending pattern for the C&R activities in Santa Cruz County in 2019 conducted by a local organization. Payroll expenses were modeled as an employee compensation (EC) labor income change, contractor expenses were modeled as a proprietor income (PI) labor income change, and non-payroll expenses were modeled through the customized spending pattern for C&R activities in 2019. Activities that were conducted by a non-local organization reflect travel-related expenses and

other purchases made from Santa Cruz County vendors and are modeled through industry changes with local purchase percentages set to 100%.

Payroll expenses and contractor expenditures for local non-profit organizations and state and local agencies are divided by average annual wage for 19-4071: Forest and Conservation Technicians for non-metropolitan counties in Arizona from the Bureau of Labor Statistics for May, 2020 to estimate C&R non-profit and state and local agency jobs in Santa Cruz County (Bureau of Labor Statistics, 2020). Federal jobs supported through C&R activities are estimated using payroll and contractor expense data and an average wage of reporting entities.

Table 46 presents the list of agencies and organizations where primary or secondary data were available to develop estimates of C&R activities in 2019 and the resulting multiplier effects in Santa Cruz County. In total, there were 25 entities with primary or secondary data was available. Table 46 also identifies the data source(s), IMPLAN modeling approach, local purchase percentages, and any additional estimation or modeling notes for each entity with reported C&R activities in Santa Cruz County in 2019.

Table 45. Data Source, Modeling Approach, and Notes in Relation to Modeled Conservation, Restoration, and Preservation Economic Activities

#	Entity	Data Source	Modeling Approach	LPP	Notes
1	U.S Forest Service (USFS), Coronado National Forest	Primary; federalpay.org	EC; Federal Government Non-Defense ISP	SAM	Budget provided for entire Coronado National Forest: estimated non-salary cost per acre & applied to number of acres in county; estimated salary cost for employees within Nogales District using 2019 national average Forest Service salary and reported number of employees
2	National Park Service (NPS)	Primary; USASpending.gov	EC; Customized ISP; ISP-501: Museums, historical sites, zoos, and parks	SAM	Mapped expenditures as able, remainder modeled through ISP-501. USASpending payments to local non-profit organizations were removed to prevent double counting.
3	U.S. Fish and Wildlife Service (USFWS)	USASpending.gov	EC	SAM	Reflects payments to private landowners for Partners for Fish and Wildlife Program.
4	International Boundary Water Commission (USIBWC), Nogales International Wastewater Treatment Plant (NIWTP)	NIWTP website	EC; ISP-49: Water, sewage, and other systems	SAM	Estimated EC assuming IMPLAN ratios.
5	Natural Resource Conservation Service (NRCS)	Primary	EC; Customized ISP	SAM	Reflects payments to landowners and installation of conservation measures.
6	Arizona State Parks and Trails (ASPT)	Primary	EC; ISP-501: Museums, historical sites, zoos, and parks	SAM	Operating budget for Patagonia Lake State Park and Sonoita Creek State Natural Area.
7	Arizona Game and Fish Department (AZGFD)	AZ Financial Portal	Industry Change	100%	Reflects payments made to vendor in county.

#	Entity	Data Source	Modeling Approach	LPP	Notes
8	Arizona Department of Water Resources (ADWR)	Primary; AZ Financial Portal	Industry Change	100%	Reflects travel-related expenses and other payments made to vendor in county.
9	Santa Cruz County Natural Resource Conservation District (NRCD)	NRCD website	PI; Customized ISP	SAM	
10	Borderlands Restoration Network (BRN)	Primary	EC; PI; Customized ISP	SAM	Adjusted for non-local contractor expenses.
11	Hummingbird Monitoring Network (HMN)	ProPublica Non-Profit Explorer	PI; ISP-522: Grantmaking, giving, and social advocacy organizations	SAM	Not enough detail to develop customized ISP, used ISP-522 entirely.
12	Patagonia Area Resource Alliance (PARA)	Primary	PI; Customized ISP	SAM	
13	Deep Dirt Institute	Primary	EC; Customized ISP	SAM	
14	Santa Fe Ranch Foundation	ProPublica Non-Profit Explorer	EC; PI; Customized ISP	SAM	
15	Madrean Archipelago Wildlife Center	Primary	Customized ISP	SAM	Primarily volunteer organization.
16	Tubac Nature Center	Primary	PI; Customized ISP	SAM	Primarily volunteer organization.
17	Friends of the Santa Cruz River	Primary	Customized ISP	SAM	Primarily volunteer organization.
18	Friends of Tubac Presidio & Museum	ProPublica Non-Profit Explorer	EC; Customized ISP; ISP-501: Museums, historical sites, zoos, and parks	SAM	Mapped expenditures as able, remainder modeled through ISP - 501. Primarily volunteer organization.
19	Wildlife Corridors, LLC	Primary	PI; Customized ISP	SAM	
20	Borderlands Restoration L3C	Primary	EC; PI; Customized ISP	SAM	

#	Entity	Data Source	Modeling Approach	LPP	Notes
21	The Nature Conservancy (TNC)	Primary	EC; Customized ISP	SAM	Reflects operation of Patagonia-Sonoita Creek and Canelo Hills Preserve.
22	Arizona Land and Water Trust	Primary	Industry Change	100%	Reflects travel and travel-related monitoring expenses.
23	Tucson Audubon Society	Primary	EC; PI; Customized ISP	SAM	Reflects operation of Paton Center and other projects in county.
24	Cienega Watershed Partnership	Primary	ISP-463: Environmental and other technical consulting services	SAM	Detailed budget not available, modeled through ISP-462.
25	Payment in Lieu of Taxes (PILT)	DOI website	State/Local Government Education ISP; EC; ISP-62: Maintenance and repair construction of highways, streets, bridges, and tunnels	SAM	Assumed 50% spent for local education and 50% for roads. Road costs were split into IMPLAN-derived EC and IE. Modeled through ISP-62.

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