

# AN ECONOMIC IMPACT STUDY OF BICYCLING IN ARIZONA

## Out-of-State Bicycle Tourists & Exports

FINAL REPORT

PREPARED FOR:

ADOT
Multimodal Planning

MPD 64-12 CONTRACT NO: ADOT11-013181

PREPARED BY:

McClure Consulting, LLC

Kimley-Horn and Associates, Inc.

EPR Economic & Policy Resources, Inc.
Econometric, Policy and Financial Analysis

JUNE 2013

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**CONTRACT NO: ADOT11-013181**

**TECHNICAL ADVISORY COMMITTEE (TAC)**
TAC members included representatives from the diverse set of stakeholders below:

- ADOT, Communications
- ADOT, Multimodal Planning Division (MPD), Bicycle and Pedestrian Program
- ADOT, MPD, Transportation Analysis
- ADOT, MPD, Research Center
- ADOT, MPD, Tribal Transportation
- Arizona Office of Tourism
- Arizona State Parks
- Federal Highway Administration – Arizona Division
- MPOs and COGs

**KEY INFORMANTS**
The authors appreciate the input of Key Informants who were contacted for this study and agreed to be interviewed in order to provide additional insight into the study approach and processes. In addition to the persons listed below, other individuals offered informal opinions, and these contributions were also appreciated.

- Tom Armstrong, Cochise Bicycle Advocates
- Bob Beane, Coalition of Arizona Bicyclists
- Wayne Cullop, Greater Arizona Bicycling Association
- Richard DeBernardis, President, Perimeter Bicycling Association of America
- Karen Lamberton, Cochise County Transportation Planner
- Mike Melley, Mountain Bike Association
- Daniel Paduchowski, Verde Valley Cyclists Coalition
- Eric Prosnier, White Mountain Road Club
- Anthony Quintile, Flagstaff Biking Organization
- Bob Richards, Verde Valley Cyclists Coalition
- Todd Sadow, Epic Rides
- Dave Singer, City of Sedona
- Randy Victory, Arizona State Parks
- Matthew Zoll, Bicycle and Pedestrian Program Manager, Pima County Department of Transportation

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# Introduction

This study is specifically focused on the contribution to the Arizona economy from out-of-state visitors engaged in organized bicycling activities in the state, and out-of-state customers, wholesale or retail, of bicycle products made or sold in Arizona. Deriving those estimates involves documenting:

- The manufacture of bicycles and bicycle parts, clothing, and accessories (e.g. helmets, shoes, water bottle cages, cyclometers, locks, gloves, etc.),
- Wholesaling and distribution of these goods,
- Retail sales of bicycles and also bicycle parts, accessories, and clothing, and bicycle servicing and renting,
- Inventorying the various types of bicycling events and of organized tours by bicycle.

The ultimate purpose of the study is to provide information to serve as one basis by which the Arizona Department of Transportation (ADOT) and potentially other state agencies could expand support for bicycling activity, and thereby the bicycle industry, in Arizona.

This document primarily compiles, with selective edits, the contents of the three Working Papers that each summarized various aspects of the study. A final section highlights certain conclusions and recommendations on the part of the consulting team. Working Paper #1 consisted of a review of bicycle-impact-related literature, an annotated tabulation of potentially relevant data sources, a preliminary listing of Arizona bicycling events and tour operators (see Appendix document), and a list of "special contacts," "key informants" (see Acknowledgements). Working Paper #2 began with a presentation of data needs for this study, followed by a discussion of data availability from various secondary sources. The resultant gaps identified within these secondary data sources introduced a discussion of primary data collection sources and survey techniques, with various methods recommended. Specific research products—such as surveys and questionnaires—tied to target data groups were drafted, and guidelines were presented for data analysis. Analytical systems for quantifying the economic impacts were discussed.

Working Paper #3 described: 1) the methodologies for primary data collection and analysis, for compiling and analyzing secondary data (with a focus on the inventories of bicycle-related businesses and events), and for using the primary and secondary data in combination; 2) the findings and conclusions from the data received, compiled, and analyzed, quantified to the extent practical; and 3) designs and recommendations for updating the study in the future.

# 1 Review & Summary of Literature, Methods and Data Sources

## 1.1 Introduction

This Section includes a review of bicycle-impact-related literature, an annotated tabulation of potentially relevant data sources (see Appendix A1.1) and a preliminary list of "special contacts" – industry or organizational people who might be especially helpful in this assignment (see Acknowledgements).

## 1.2 Review and Interpretation of Previous Literature, with Sources

### 1.2.1 Introduction to Literature Review

Arizona has long been known as a great place to live, work, visit, and recreate. Arizonans enjoy a wide range of climates, topography, and natural beauty. The Arizona Department of Transportation (ADOT) recognizes its role, in partner with other state, regional and local government agencies, as a significant driver of the state's economy. In addition to building highways that facilitate the transport of goods and services as well as the movement of people, ADOT recognizes the critical role played by transportation infrastructure in tourism and recreation and economic development.[1]

The ADOT Bicycle and Pedestrian Program has taken significant strides to support tourism and economic development. A number of related activities called out in the 2003 ADOT Bicycle and Pedestrian Plan have been implemented. The economic importance of bicycling and its attendant benefits for Arizonans is not well known. As noted in the prior studies discussed herein, the activity of bicycling provides environmental, transportation, and health benefits as well as economic benefits. Though such benefits are obviously enjoyed at the individual level, in aggregate these benefit streams from bicycling activity are thought to flow to society in the following forms:

- Reduced health costs (e.g., reduced risks of chronic diseases and ill-health; reduction of sick days in the workplace and increased worker productivity);

[1] As documented, for example, in the ADOT study, Tourism's Impact on Future Transportation Needs, which notes "Baby Boomers now enjoy Adventure Vacations as an option to the typical vacation. . . . the tremendous upswing in adventure travel has caught the public, and the travel industry, by surprise. They want to hike, go white-water rafting, fish, view wildlife, scuba dive, bicycle . . . " (p. 7).

- Reduced costs related to air pollution and greenhouse gas emissions;
- Reduced traffic congestion and increased vehicle operating costs savings (e.g., reduced maintenance costs, reduced oil/gas expenditures); and
- Increased demand for recreational/leisure goods and services.

In addition, bicycling represents an opportunity to grow the regional economy. As the number of active transportation participants and individual trips in the region increases, so does the impact of bicycling on state and local economies. For example, prior research has linked investments in bicycling infrastructure and facilities with economic returns in the form of increased visitation of travelers and tourism and related expenditures.

The purpose of this study is to estimate the economic benefits of bicycling in the State of Arizona. The study emphasis is on developing an objective and defensible model for determining the total economic benefits associated with (1) the bicycle industry of Arizona; and (2) bicycle tourism and visitor spending associated with organized tours, rides, and races in Arizona.

This Part 1 provides a review of literature useful for conducting this economic impact analysis of bicycling in Arizona. Specifically, Part 1 (a) reviews and interprets literature evaluating the benefits and economic impacts of bicycling; (b) evaluates the methods and approaches utilized in prior studies and offers preliminary suggestions for this current study; and (c) reviews recent and on-going activities of state department of transportation bicycle and pedestrian programs, with a particular focus on agency-directed/supported bicycling impact studies. Part 1 also includes a list of sources cited/reviewed, an annotated bibliography of prior relevant economic impact studies, and a glossary of bicycle facilities terminology.

Bicycling is growing in popularity both as a form of transportation and for recreation. Bicycling trips in the United States more than doubled between 1990 and 2010 (Alliance for Biking and Walking, 2012). As levels of bicycling continue to increase, communities are realizing that the convergence of cycling facilities, participants, and bicycle-related industry can be a contributor to local economies. In the past few years, a growing number of public agencies, advocacy organizations, industry groups, and academics have mobilized to document the growing economic benefits of bicycling, both to justify the public spending on facilities and program efforts and to demonstrate the economic value of this form of transportation and recreation.

## 1.3 Review and Interpretation of Previous Literature

This section is intended to review what has been learned about the economic impact of bicycling from prior studies. Overall, this literature review is presented as a three-pronged

analysis of (1) user orientation: studies focused on recreational, health and environmental benefits for active transportation users; (2) infrastructure orientation: studies focused on the economic returns of cycling and pedestrian infrastructure investments; and (3) industry orientation: studies focused on the economic impacts associated with bicycling-related businesses and tourism. An annotated bibliography of the selected studies can be found in Appendix A1.1.

To set the stage for any effort estimating the economic benefits of bicycling, it is necessary to summarize the main issues involved, the matters that confound such endeavors, and a rationale for more structured research for this study in Arizona.

### 1.3.1 User Orientation Focus: Health, Environmental and Transport System Benefits of Bicycling

#### *Background*

Advocacy groups point out that bicycling provides an enjoyable, convenient and affordable means of physical activity and recreation. The most effective fitness routines are moderate in intensity, individualized, and incorporated into our daily lives—both for personal transportation (e.g., commuting to work) and for recreation.[2]

According to National Institutes of Health, approximately $142 billion in medical costs are spent annually on obesity and physical inactivity in the United States (American Public Health Association, 2010). The estimate includes healthcare costs, lost wages due to illness and disability, and future earnings lost by premature death. Evidence suggests that improved bicycling facilities leads to increased cycling use. Increased physical activity—as found in cycling—could help to reduce the risk of coronary heart disease, premature death, high blood pressure, obesity, adult-onset diabetes, depression, and colon cancer. A more active population can help reduce the cost of health care, decrease workplace absenteeism, and maintain the independence of older adults.

Sedentary lifestyles have serious consequences for public health. The most visible is the sharp rise in obesity across the United States in recent years. Over two-thirds of adults in the United States are either overweight or obese. In the United States, the prevalence of obesity has steadily increased over the years from 13 percent in 1960 to 35 percent in 2008. (According to

[2] Advocacy groups such as the Alliance for Biking and Walking, League of American Bicyclists, Australian Bicycle Council, British Cycling, Canadian Cycling Association, and Vélo Québec.

the Arizona Department of Health Services, more than half [56%] of adult Arizonans are overweight or obese.)

Obesity is more than a cosmetic issue; it is associated with serious health conditions, namely increased risks of diabetes and cardiovascular diseases. Physical inactivity contributes substantially to the burden of disease, death and disability. Increased physical activity, as displayed in cycling, can lower the risks of obesity, lower the risks of hospitalization from asthma, and address other health conditions such as heart disease, some cancers, and type 2 diabetes.

Policy changes at the local level have the potential to encourage increased physical activity over the long term by making active transportation an easier choice for residents. Studies have estimated that up to 40 percent of chronic illnesses could be prevented by regular physical activity, suggesting that additional planning could offer opportunities for increased physical activity by creating bicycling alternatives, such as dedicated on-road and off-road bikeways, to motorized transportation. Other health benefits associated with increased physical activity include improved mental health and well being (Bassett, Jr. et al, 2008; Chenoweth & Associates, 2009).

Bicycling has been shown to confer other benefits (so-called "green dividends") in the form of externalities such as avoided costs, congestion reduction, and lessening of environmental degradation." For instance, bicycling is viewed as an energy-efficient, non-polluting mode of travel. Short distance, motor vehicle trips are the least fuel-efficient and generate the most pollution per mile. These trips have the greatest potential of being replaced by cycling (or walking) trips. Shifting to this mode can help mitigate global climate change, local air pollution, smog, acid rain, water pollution, and noise pollution and thus create "green dividends." Increasing the active transportation mode of bicycling (and thereby reducing motorized transportation) can contribute to an environment that is pleasant and safe with less noise and pollution (Victoria Transport Policy Institute, 2009).

### *Methodology review*

Economic appraisal is a commonly applied method in transport planning. However, the health-related effects of bicycling are rarely taken into account. A review of studies on transport-related physical activity reveals that most approaches utilize a cost-benefit analysis framework. Such a framework can, in theory, be integrated into a comprehensive economic analysis of transport-related physical activity, as well as assess the current situation of infrastructure investments made in the past. However, among the more significant challenges in modeling are the following:

- The relationship between observed bicycling and total physical activity, including assumptions about how bicycling might influence total physical activity, and that all observed cyclists could be classified as sufficiently active (and therefore have a reduced risk and/or reduced medical costs);
- Assessing physical activity as a positive effect on morbidity versus all-cause mortality;
- Substitution of activity between bicycling and other active transport modes;
- Direct attribution of bicycling activity over a finite period (for instance, one year) to quantifiable health benefits

In addition, an economic appraisal of cycling will need to be based on some consensus on methods for valuing health and/or life. For instance, the standard "value of statistical life" remains unresolved irrespective of the approach taken: a "cost of illness" approach (applying costs to each specific disease) or "years of life lost" approach (Abelson, 2008). Furthermore, there is a time dimension that is not explicitly taken into account. In other words, there is a delay between increases in physical activity (such as walking and bicycling) and measurable benefits. There is a need for including a level of uptake of bicycling into such an appraisal. Some studies assume a five-year "build-up" period for reaching full effect of benefits.

Finally, any comprehensive economic appraisal of the health effects of bicycling will then be discounted to take into account inflation and allow for the calculation of present value. Most of these health-related benefit-cost analyses have been associated with increased bicycling use as a direct result of expanding bicycle facilities/infrastructure (Buis and Wittink, 2000; Cavill et. al, 2008; Davis, 2010; Fishman et. al., 2011; Genter, et. al., 2008; Gotschi and Mills, 2008; Gotschi, 2011; Saelensminde, 2004; Wang, et. al., 2005). All of these studies indicate that benefits exceed costs. Such consensus is a reflection of a variety of factors, including the inexpensive nature of bicycle facilities and optimistic adoption rates of such facilities. However, these studies are often troubled by the relatively unreliable manner in which demand is estimated and benefit values (particularly health-related) are derived.

Many of these health-related effects of bicycling have been incorporated into an analytical assessment tool by European health economic researchers (Cavil et. al, 2008; World Health Organization, 2008). This analytical tool—health economic assessment tool (HEAT) for bicycling can estimate the maximum and mean annual benefits and values in terms of reduced mortality as a result of cycling. Such a tool can be utilized as an input to comprehensive cost-benefit analyses of new transport infrastructures or assessments of existing infrastructures.

### 1.3.2 Infrastructure Orientation Focus: Returns to Investment, Impact Assessment and Valuation of Bicycling Facilities

#### *Background*

As noted above, several analyses of bicycling infrastructure projects have been completed in the context of traffic congestion and increased travel times, environmental degradation, and improved health/reduced mortality from enhanced physical activity transport. Generally, these assessments are completed within the context of a cost-benefit analytical framework with the following components:

- Costs associated with the plan and design, operation and maintenance of cycling/pedestrian infrastructure, such as bikeways; and
- Benefits associated with the use of cycling infrastructure, identifying the full range of direct and indirect benefits to cyclists.

Although costs are both easily identified and quantified, the methods (and related transparency) of determining and quantifying benefits are more difficult to develop and are less likely to achieve consensus. For instance, the data sources and methods utilized for the aforementioned benefits of avoided costs, congestion reduction, improved health, and positive environmental impacts are sometimes carelessly applied without deliberation to context or procedures.

#### *Bikeways*

Another aspect of an infrastructure focus is documenting the economic impacts of a specific bikeway.[3] The underlying premise is that bikeways can provide a substantial boost in the number of visitors attracted to an area, thus increasing the likelihood of money being spent within the local area (Schoutens, 2006; Lawrie, et. al., 2004; Bowker, et. al., 2007). The majority of users of these bikeways engage in bicycling as their primary activity. Thus, it is logical to assume that most of the economic impacts of bikeway use can be attributed to bicycling.

[3] A bikeway is a generic term for any road, street, path or way which in some manner is specifically designated for bicycle travel, regardless of whether such facilities are designated for the exclusive use of bicycles or are to be shared with other transportation modes. See Appendix A1.2: Glossary of Bicycle Facilities Terminology.

Research on bikeway use and economic impacts originated in the early 1990s as some of the first rail-trail conversions[4] were complete, providing some of the first longer bikeway facilities for cycling in the United States. Economic impact studies were often commissioned by the agency responsible for the bikeway to demonstrate the economic benefit or return on investment in the trail conversion. Many of these studies utilized some type of user survey, such as self-administered or intercept (survey takers recruit respondents at specific locations) to obtain information about trail user and expenditure patterns.

Research results indicate that bikeways generate revenue from users, mostly through purchases on food, lodging and incidentals at nearby establishments. Such results vary depending on the length and location of the bikeway as well as the area's attractiveness to potential visitors. One report on the economic impacts of trails claims that trail-related expenditures range from $1 per day to more than $75 per day in the U.S. (Sjoquist, 2008). In general, most of these studies focus on the number of visits or visitors (and their duration) generated by the trail, the average amount that each visitor spent, and hence the total revenue or sales that can be attributed to trail users. Developing bikeway user expenditure profiles obtained from survey results is critical in economic impact estimation (Downward, et. al., 2009; Bowker, et. al., 2007).

### *Valuation and trails*

Finally, bicycle facilities, such as trails, are viewed as amenities that provide economic benefits by increasing the value of nearby real estate. Increased property valuation in turn raises property tax revenues for local governments. Models that calculate the impact of amenities, such as parks, greenways, and trails on nearby real estate values are based on the concept of enhancement valuation—the extent to which the amenity affects the surrounding land market. The concept that people are willing to pay a premium for a home located close to amenities such as parks and trails is known as the "proximate principle" (Crompton, 2001). This principle was initially employed in studies on the economic benefits of parks and open space, but more recently has been extended to examining the economic benefits of greenways and trails.

Most past studies attempting to document the influence of trails on property values have focused primarily on measuring people's perceptions of the trail's impact on their property. Measuring perceptions of increased valuation is generally done through surveys of homebuyers

[4] Rail-Trail is a shared use path, either paved or unpaved, built within the right-of-way of a former railroad. According to TrailLink of the Rails-to-Trails Conservancy, 11 of the identified 75 multi-use paths in Arizona are classified as "rail-trails." http://www.traillink.com/trailsearch.aspx?tn=&st=AZ&ct=&sp=N

or homeowners. While these studies provide useful insights on opinions, they measure potential actions rather than reality.

More recently, studies have utilized a "revealed preference" approach, which attempts to identify the actual influence of the trail on property values (Krizek, 2006). Typically, these studies utilize the hedonic method, a statistical analysis of property values. This method has the benefit of estimating values on real choices—therefore measuring the results of actual or observed behavior, rather than a hypothetical situation. As such, this method rests on the notion that property markets are good indicators of economic value. Both of these methods—stated and revealed preference approaches—are considered indirect methods because the increased value is a secondary, not a primary benefit of the amenity.

In general, there is a paucity of studies on this topic and conclusions about the effects of trails on property values indicate that there are a multitude of factors other than merely the trail itself that affects property valuation. Trails vary significantly in their use, location, length, and features that need to be considered separately to understand how they impact property values, either positively or negatively (Karadeniz, 2008).

### 1.3.3 Industry Orientation Focus: Economic Impacts Associated with Bicycle Tourism and Bicycling-Related Businesses.

#### *Background*

Economic impact studies of bicycling have been completed for a number of states and other regions (Argys and Mocan, 2000; Barnes, 2004; Bicycle Federation of Wisconsin, 2006; Birk and Roberts, 2006 and 2008; Lankford et. al., 2011; Grabow et. al., 2010; Wilbur Smith Associates, 2001; Resource Systems Group et. al., 2012). These states/regions (Colorado, Minnesota, Wisconsin, Iowa, Vermont, Maine, and Portland, Oregon) have a locus of economic activity related to bicycling (e.g., manufacturing of bicycles and parts and accessories) and/or tourism oriented around bicycling. The primary finding of these studies is that their respective bicycle-related industry represents an economic force and provides a source of both direct and indirect revenues and jobs.

In general, the economic activity associated with bicycle-related businesses and bicycle-related tourism is estimated and expressed in terms of various "metrics"—employment, personal income, (value of) output, and tax revenues. The effects of bicycle-related economic activity ripples outward throughout the region, providing businesses, earnings, and jobs both directly and indirectly. Direct economic impacts represent the sum of the initial bicycle-related activity of manufacturers, wholesalers, and retailers. Indirect economic impact is the economic activity

generated by suppliers to the various businesses involved in the direct economic activity and by suppliers to those suppliers. Induced economic activity is the activity generated within the region when bicycle-related employees and employees from related supplier firms spend their wages on consumer goods and services. All of this spending is income for the recipient businesses and, in turn, is re-spent in the economy, creating a spin-off or ripple effect as successive waves of spending occur. Each of these types of impacts affects regional employment, earnings, and output.

Data sources related to bicycle-related business activity range from confidential individual employer records obtained from state workforce/employment agencies to information obtained from business surveys. As on the consumer/user side, sampling procedures and survey results from businesses need to reflect the "universe" of bicycle-related businesses within the region.

### *Bicycle-related tourism*

The economic impact of bicycling tourism is based on the idea that facilities such as trails or events either attract people to visit a region or induce them to stay longer. While bicycle-related tourism has been shown to generate positive economic benefits to an area, there are significant methodological issues related to data and valuation attributed to bicycling activity. For instance, no one has been able to determine the magnitude and characteristics of visitors engaged in bicycling and what portion of their stay is associated with this bicycling activity. Moreover, there is the oft-neglected category of bicycle-related spending from in-state residents. For any particular sub-state region, there will be a number of state residents that are out-of-the-area and as such are classified as visitors. Furthermore, measurement and attribution of expenditures for bicycle-related tourism are problematic. Any assessment of bicycle-related tourism is dependent on survey data obtained from expenditure diaries or intercepts of bicycle visitors (Downward et. al., 2009).

The economic impact of bicycle-related tourism is usually calculated by estimating or counting the number of visitors (and local residents) who are participating in self-guided and organized tours, rides, and events. These studies use an average expenditure approach of tourism spending for food, lodging, and other goods and services while visiting to arrive at a total economic value of visitation. For example, the Maine Department of Transportation estimated that bicycle tourists in 2001 spent between $25 (day trips) to $115 per day (guided tours) on a combination of retail, services, lodging, food, and transportation. Such a method yields an estimate of economic activity attributable to bicycle-related tourism.

Bike events, such as races and tours, represent a subset of bicycle-related tourism that attract visitors to an area, either to participate or to watch. Economic impacts of these events are easier to quantify because many of the factors are known, such as the number of days in the region, number of participants and their origin, and their expenditure patterns. However, like other bicycle-related tourism, data on these events are collected via participant survey.

Bicycle racing is a growing sport in a number of areas, here in the United States and beyond. Organized racing can include road races, criterium races,[5] mountain biking, multi-sport races, and track racing in velodromes. Both the racers and their friends/family who travel to participate in the event and the spectators who watch spend money on food, lodging, and other shopping goods and services (Hong, 2007; Santos Tour Down Under, 2012).

### *Bicycling sector contribution to broader economy*

Recent efforts in Wisconsin, Iowa, Australia, and the United Kingdom have attempted to measure the holistic extent of bicycling's contribution to the broader economy. This comprehensive approach is analogous to an industry's contribution to the nation's gross domestic product. Indeed, one study dubbed the "gross cycling product of the United Kingdom" provided an economic overview of the bicycling sector and its associated benefits, determining that the gross cycling contribution to the UK in 2010 was £2.9 billion (Grous, 2011). The report also quantified the economic benefits generated by each individual cyclist, taking into account factors including bicycle manufacturing, cycle and accessory retail, and employment. In 2010, the annual gross cycling product was £230 per cyclist. In addition to the value of production from the bicycling sector, investment in bicycling infrastructure and health savings of cycling were added to the gross cycling product.

The Australia Bicycle Council (2012) utilized this same methodology to estimate its own gross cycling product in 2011. Accounting conventions in this economic overview differ in that the various "outputs" were not summed together, but reported in terms of various "accounts," such as savings from reduced congestion, worker productivity gains, etc. Such outputs include congestion and environment cost savings; reduced costs related to inactivity—health savings and improved worker productivity; bicycle-related industry production; bicycle tourism; cycling infrastructure spending; industry employment; and participation and ownership.

[5] Criterium Race: A bike race held on a short course that might consist of blocked-off city streets. The course is short, usually less than 5 km, and is a closed circuit, where riders complete multiple laps. Riders typically race for a given length of time, then complete a specified number of laps. Criteriums are especially convenient for watching in-person as the riders pass by a given point many times over the course of a race.

Recent efforts in Wisconsin (Grabow et. al., 2010) and Iowa (Lankford et. al., 2011) utilized an aggregated approach in their comprehensive economic accounts of bicycling. Coupled with the bicycle-related industry contribution and bicycling tourism/recreation were the monetized values of additional physical activity, improvements in air quality, and reductions in greenhouse gas emissions. The latter three effects account for about one-fifth of the estimated $1.928 billion contribution of bicycling to the Wisconsin economy for 2009. In similar fashion, researchers at Northern Iowa University included the economic and health effects of bicyclists, and bicycle tourism including the popular RAGBRAI (Register's Annual Great Bicycle Ride Across Iowa), as well as the value of bicycle business activity and bicycle organizations in their total economic impact of $522.5 million to the Iowan economy in 2010.

### 1.3.4 Summary and Conclusions

This review is intended to address a relatively narrow frame of economic benefits associated with bicycle-related activities. Based on the results of this review, it appears more is known about the direct economic impacts of bicycling from industry and tourism than about the increase of property valuation resulting from trails and other bicycling facilities. Still, the number of studies is relatively small in each of the above categories and needs to be expanded, both to provide further support for what is already known and to generalize findings beyond those areas studied. Furthermore, most of these cited studies present challenges with respect to data and analytical methods. Much of the requisite data obtained and utilized is via survey questionnaire from the bikeway user and/or bicycle-related business owner/operator. For many of these non-economic benefits, averages and estimates are often borrowed from previous studies. Analytical approaches—particularly economic impact methods—are better understood and more appropriately applied. Still, the key in using these economic models is determining the level and extent of bicycling as an "export" sector.

This review of studies indicates that bicycling as an industry and/or tourism activity has the potential to generate economic returns that exceed investments and make it an attractive business sector for some regions and communities. The presence of attractive facilities, such as trails, generates use by local residents and visitors. In addition, bicycle events and races attract both participants and spectators, similar to other sporting events, who also stimulate the local economy. The bicycle-related industry (including manufacturers, wholesalers, and retailers) contributes to the local and regional economy by its sales revenue, employment and earnings.

### 1.3.5 Sources Cited/Reviewed


Abelson, Peter. 2008. *Establishing a Monetary Value for Lives Saved: Issues and Controversies*. Working papers in cost-benefit analysis (WP 2008-02).Prepared for Office of Best Practice Regulation. Department of Finance and Deregulation, Government of Australia, Canberra. Submitted--November 2008.

AECOM Australia Pty Ltd. 2010. *Inner Sydney Regional Bicycle Network: Demand Assessment and Economic Appraisal*. Prepared for the City of Sydney, Australia. Submitted—15 April 2010.

American Public Health Association. 2010. *The Hidden Health Costs of Transportation*. Washington, DC: American Public Health Association.

Anable, Jillian, Geertje Schuitema, Yusak Susilo, Paulus Aditjandra, Mark Beecroft, and John Nelson. 2010. *Walking and cycling and socio-economic status in Scotland: analysis of statistical data and rapid review of the literature*. Edinburgh, Scotland, UK: NHS Health Scotland. http://www.healthscotland.com/uploads/documents/13734-REO15-WalkingAndCyclingInScotland.pdf

Argys, Laura M. and H. Naci Mocan. 2000. *Bicycling and Walking in Colorado: Economic Impact and Household Survey Results*. Prepared for the Colorado Department of Transportation, Bicycle/Pedestrian Program. University of Colorado at Denver, Center for Research on Economic and Social Policy.

Australia Bicycle Council. 2011. Australian Cycling: An economic overview. http://www.austroads.com.au/abc/images/pdf/the_australian_cycling_economy.pdf

Barnes, Gary. December 2004. *The Benefits of Bicycling in Minnesota. Prepared for the Minnesota Department of Transportation*. Humphrey Institute of Public Policy, University of Minnesota, Minneapolis.

Bassett, Jr., David R., John Pucher, Ralph Buehler, Dixie L. Thompson, and Scott E. Crouter. 2008 "Walking, Cycling and Obesity Rates in Europe, North America and Australia." *Journal of Physical Activity and Health*. 5: 795-814.

Bavousett, Brigitte and Gerald D. O'Neill, Jr. 2011. *Sustainable Economic Benefits of Human-Powered Recreation to the State of Arizona.* Prepared by Arizona State University School of Sustainability Graduate Program Alumni.

Beierle, Heidi. 2011. *Bicycle Tourism as a Rural Economic Development Vehicle*. 2011 Oregon Governor's Conference on Tourism. https://scholarsbank.uoregon.edu/xmlui/bitstream/handle/1794/11679/beierle%20bike%20tourism%206%207%2011.pdf?sequence=1

Bicycle Federation of Wisconsin and the Wisconsin Department of Transportation. 2006. *The Economic Impact of Bicycling in Wisconsin*. Prepared for the Governor's Bicycling Coordinating Council.

Birk, Mia and Jessica Roberts. 2008. *The Value of the Bicycle-Related Industry in Portland*. Portland, OR: Alta Planning + Design.

Bowker, J. M., John C. Bergstrom, and Joshua Gill. 2007. "Estimating the economic value and impacts of recreational trails: a case study of the Virginia Creeper Rail Trail." *Tourism Economics*. Vol. 13, No. 2, 241-260.

Buis, Jerome and Roelof Wittink. 2000. *The Economic Significance of Cycling: A Study to illustrate the costs and benefits of cycling policy.* The Hague, Netherlands: Interface for Cycling Expertise.

Burgess, Bruce. 1995. *Bicycle Touring in Vermont and Vermont's Scenic Byways Program*. Montpelier, Vermont: Vermont Agency for Transportation.

Cavill, Nick, Sonja Kahlmeier, Harry Rutter, Francesca Racioppi, and Pekka Oja. 2008. "Economic analyses of transport infrastructure and policies including health effects related to cycling and walking: a systematic review." *Transport Policy*. 15:291-304.

Cavill, Nick, Sonja Kahlmeier, Harry Rutter, Francesca Racioppi, and Pekka Oja. 2008. *Methodological Guidance on the Economic Appraisal of Health Effects Related to Walking and Cycling: Economic Assessment of Transport Infrastructure and Policies*. Copenhagen, Denmark: World Health Organization, Europe Regional Office.

Center for International Public Management. 1998. *Assessing Community Impacts from Greenways: Recommendations for Identifying, Measuring and Estimating the Benefits and Costs of Corridors*. Tallahassee, FL: Florida Department of Environmental Protection, Office of Greenways and Trails.

Chenoweth & Associates. 2009. *The Economic Costs of Overweight, Obesity, and Physical Inactivity Among California Adults, 2006*. A Study for the California Center for Public Health Advocacy. Davis, California.

City of Copenhagen. May 2011. *Copenhagen City of Cyclists: Bicycle Accounts 2010*. Copenhagen, Denmark: City of Copenhagen, Technical and Environmental Administration and Traffic Department. http://www.sfbike.org/download/copenhagen/bicycle_account_2010.pdf

City of Copenhagen. 2009. *Copenhagen City of Cyclists: Bicycle Life*. Copenhagen, Denmark: City of Copenhagen, Technical and Environmental Administration and Traffic Department.

Colegrave, Fraser. September 2011. *Economic Impact of the Proposed Cycling Centre of Excellence*. Prepared for the Waikato Regional Council, New Zealand. Covec, Ltd. http://www.waikatoregion.govt.nz/PageFiles/19732/covec%20report.pdf

Cook, Ina Katherine. 2007. *Bike/Ped: Transportation's Contribution to Quality of Life and Creative Class Migration*. Rural Transportation Newsletter: A Publication of RPO America, A Program Affiliate of NADO, and the NADO Research Foundation's Center for Transportation Advancement and Regional Development, http://66.132.139.69/uploads/nadort071107.pdf:

Crompton, J. L. 2001. "The impact of parks on property values: a review of the empirical evidence." *Journal of Leisure Research* 33(1): 1-15.

Cycling Promotion Fund. 2008. *Economic Benefits of Cycling for Australia*. Auburn, Victoria, Australia: Cycling Promotion Fund. http://www.cyclingpromotion.com.au/images/stories/downloads/CPF_CyclingBenefits.pdf

Davis, Adrian. 2010. *Value for Money: An Economic Assessment of Investment in Walking and Cycling*. National Health Service, Bristol, UK. Submitted March 2010.

Dill, Jennifer and Theresa Carr. 2003. "Bicycle Commuting and Facilities in Major US Cities: If You Build Them, Commuters Will Use Them—Another Look." Presented at the Annual Meeting of the Transportation Research Board (TRB), Portland Oregon.

Downward, Paul, Les Lumsdon, and Richard Weston. 2009. "Visitor Expenditure: The Case of Cycle Recreation and Tourism." *Journal of Sport and Tourism* Vol. 14, No. 1: 25-42.

Fishman, Elliot, Ian Kerr, Jan Garrard, and Todd Litman. May 2011. *Cost and Health Benefit of Active Transport in Queensland: Research and Review, Stage One Report*. Prepared for the Queensland, Australia Government. Produced by the Institute for Sensible Transport, University of Sydney, Victoria Transport Policy Institute, and CATALYST (Consulting in Applied Transport Access and Land Use Systems) for Health Promotion. http://www.sensibletransport.org.au/projects

Flusche, Darren. 2009. *The Economic Benefits of Bicycle Infrastructure Investments*. Policy Research Report. League of American Bicyclists. http://www.bikeleague.org/resources/reports/pdfs/economic_benefits_bicycle_infrastructure_report.pdf

Garrett-Peltier, Heidi. June 2011. *Pedestrian and Bicycle Infrastructure: A National Study of Employment Impacts*. Political Economy Research Institute, University of Massachusetts, Amherst. http://www.peri.umass.edu/fileadmin/pdf/published_study/PERI_ABikes_June2011.pdf

Genter, J. A., S. Donovan, B. Petrenas, and H. Badland. 2008. *Valuing the health benefits of active transport modes*. NZ Transport Agency Research Report 359. Wellington, NZ: New Zealand Transport Agency.

Gotschi, Thomas. 2011. "Costs and Benefits of Bicycle Investments in Portland, Oregon." *Journal of Physical Activity and Health* Vol. 8(Supplement 1): S49-S58.

Grabow, Maggie, Micah Hahn, and Melissa Whited. 2010. *Valuing Bicycling's Economic and Health Impacts in Wisconsin*. Prepared for Wisconsin State Representative Spencer Black. University of Wisconsin-Madison, Nelson Institute of Environmental Studies. http://www.sage.wisc.edu/igert/download/bicycling_final_report.pdf

Herby, Jonas. 2009. *Economic evaluation of cycle projects—methodology and unit prices*. Working paper produced by COWI for the City of Copenhagen, Denmark.

Hong, S. 2007. "Nearly nixed Tour de Georgia pumps up local economy." *Bicycle Retailer and Industry News* Vol. 16 (11): 19.

Jolicoeur, Marc, France Dumesnil, Gary Lawrence, and Gordon Martin. 2006. *Bicycling in Quebec, 2005*. Montreal, Quebec, Canada: Velo Quebec Association.

Karadeniz, Duygu. 2008. *The Impact of the Little Miami Scenic Trail on Single Family Residential Property Values*. Master of Community Planning Thesis. School of Planning, College of Design, Art, Architecture and Planning, University of Cincinnati, Ohio. http://atfiles.org/files/pdf/LittleMiamiPropValue.pdf

Lankford, Jill, Sam Lankford, Oksana Grybovych, Brian Bowles, Kristine Fleming, Kasee Fuller, Jordan Lankford, and Josh Printz. Fall, 2011. *Economic and Health Benefits of Bicycling in Iowa*. Prepared for the Iowa Bike Coalition. Sustainable Tourism and Environmental Program, University of Northern Iowa, Cedar Falls, Iowa. http://www.uni.edu/step/reports/economic_health_benefits_of_bicycling.pdf

Lawrie, Judson, John Guenther, Thomas Cook, and Mary Paul Meletiou. 2004. *The Economic Impact of Investments in Bicycle Facilities: A Case Study of the Northern Outer Banks*. Prepared for the North Carolina Department of Transportation, Division of Bicycle and Pedestrian Transportation. North Carolina State University, Institute for Transportation Research and Education. http://www.ncdot.gov/bikeped/researchreports/

Leadership Champlain Project. 2002. *Island Line Rail Trail: Analysis of Economic Impacts and Outline of Marketing Strategies*. Burlington, Vermont: Lake Champlain Regional Chamber of Commerce.

League of American Bicyclists. 2010. *American Community Survey Bicycle Commuting Trends, 2000-2008*. Washington, DC: Advocacy Advance Project of League of American Bicyclists and Alliance for Bicycling & Walking.

Macbeth, Andrew G., Roger Boulter, and Paul S. Ryan 2005. *New Zealand walking and cycling strategies—best practice*. Land Transport New Zealand Research Report 274. Wellington, NZ: Land Transport New Zealand. http://www.nzta.govt.nz/resources/research/reports/274/docs/274.pdf

MMM Group in association with Stantec and TransActive Solutions. 2008. *Town of Oakville Active Transportation Master Plan (Cycling and Walking Master Plan): Phase I Background Report*. Prepared for the City of Oakville, Ontario, Canada. Submitted 18 September 2008.

National Bicycle and Pedestrian Clearinghouse. 1995. *The Economic and Social Benefits of Off-Road Bicycle and Pedestrian Facilities*. Technical Assistance Series, Number 2.

Pedestrian and Bicycle Information Center. 2010. *The National Bicycling and Walking Study: 15-year Status Report*. US Department of Transportation, Federal Highway Administration.

PriceWaterhouseCoopers. 2009. *Evaluation of the costs and benefits to the community of financial investment in cycling programs and projects in New South Wales*. Sydney, New South Wales, Australia: Roads and Traffic Authority of NSW and NSW Department of Environment and Climate Change.

Pucher, John and Ralph Buehler. 2008. "Making Cycling Irresistible: Lessons from The Netherlands, Denmark, and Germany." *Transport Review* 28(4):495-528.

Rutter, Harry, Nick Cavill, Hywell Dinsdale, Sonja Kahlmeier, Francesca Racioppi, and Pekka Oja. 2008. *Health Economic Assessment Tool for Cycling (HEAT for cycling) User guide, version 2*. Copenhagen, Denmark: World Health Organization, Europe Regional Office.

Sælensminde, Kjartan. 2004. "Cost-benefit analyses of walking and cycling track networks taking into account insecurity, health effects and external costs of motorized traffic," *Transportation Research Part A*, 38: 593-606.

Santos Tour Down Under. 2012. "Santos Down Under Boosts S(outh) A(ustralia) Economy." http://www.tourdownunder.com.au/santos-tour-down-under-boosts-sa-economy.htm#

Schoutens, Robert J. 2006. *Trails and Revitalization: A Study of the Economics Associated with Public Trails*. Presented at the National Trails Symposium, Quad Cities of Iowa and Illinois.

Sjoquist, Gary. February 2003. The Economic and Social Benefit of Trails. Parks& Trails Council of Minnesota. http://www.americantrails.org/resources/economics/MNecon.html

Sloman, L. N. Cavill, A. Cope, L. Muller, and A. Kennedy. 2009. *Analysis and synthesis of evidence on the effects of investment in six Cycling Demonstration Towns*. London, UK: Report for the UK Department of Transport and Cycling England.

Snyder, Ryan. 2004. *The Economic Value of Active Transportation*. Los Angeles, CA: Ryan Snyder Associates, LLC

Southwick Associates and Harris Interactive. 2006. *The Active Outdoor Recreation Economy*. Produced for the Outdoor Industry Foundation, Washington, DC.

SQW. 2007. *Valuing the benefits of cycling: A Report to Cycling England*. London, UK: SQW, Ltd.

Steele, Kristen and Monica Altmaier. 2012. *Bicycling and Walking in the United States, 2012: Benchmarking Report*. Washington, DC: Alliance for Biking and Walking.

Sustrans. 2005. *An Economic Appraisal of Local Walking and Cycling Routes*. Bristol, UK: Sustrans, National Cycle Network Centre.

Sustrans. 2007. *The Economic Impact of Cycle Tourism in North East England*. Bristol, UK: Sustrans, National Cycle Network Centre.

Tayside and Central Scotland Transport Partnership (tactran). (c2008). *Walking and Cycling Strategy and Action Plan*. Perth, Scotland, UK.

Tin Tin, Sander, Alistair Woodward, Simon Thornley, and Shanthi Ameratunga.2009. "Cycling and walking to work in New Zealand, 1991-2006: regional and individual differences, and pointers to effective interventions." International Journal of Behavioral Nutrition and Physical Activity 6:64-75.

Vermont Agency of Transportation. *Economic Impact of Bicycling and Walking in Vermont*. Final Draft Report, May, 2012. Prepared by Resource Systems Group, Inc. in partnership with Economic and Policy Resources, Inc. and Local Motion. http://www.localmotion.org/reports

Victoria Transport Policy Institute. 2009. *Transportation Cost and Benefit Analysis: Techniques, Estimates and Implications*. Victoria, British Columbia, Canada. http://www.vtpi.org/tca/

Wang, G., Macera, C., Scudder-Soucie, B., Schmid, T., Pratt, M. and Buchner, D. 2005 "A cost-benefit analysis of physical activity using bike/pedestrian trails," *Health Promotion Practice*, 6(2): 174-179.

Wilbur Smith Associates. 2001. *Bicycle Tourism in Maine: Economic Impacts and Marketing Recommendations*. (Final Report April 2001). Office of Passenger Transportation, Maine Department of Transportation.
http://www.maine.gov/mdot/opt/pdf/biketourismexecsumm.pdf

## 1.4 Data Categories, and Identification and Preliminary Evaluation of Alternative Data Sources

### 1.4.1 Introduction

The information in this Part provides an inventory of alternative data sources based on the following data categories:

- Establishment-specific
- Business data with potential relevance to tourism
- Economic data

- National data with potential applicability in benchmarking certain statistics
- Trade organization-generated data
- Tourism data

The evaluation provides general information related to the year, geography, variables and relevant notes for each data source, and can be found in Appendix A1.3.

### 1.4.2 Other Data Notes

The *MoveAZ Long Range Transportation Plan* (report for ADOT by Cambridge Systematics, Inc. and Lima & Associates, 2004) included the table, "Estimated Daily Bicycle Trips from 2002 through 2025" (data by county). In deriving these estimates, the authors followed a prescribed methodology that combined certain national bicycle-usage factors (from Federal Highway Administration, National Household Travel Survey) with Arizona-specific data in the U.S. Census Journey to Work datasets (for 1990 and 2000), utilization data in the *MAG Household Survey* for Maricopa County, and other data such as on population projections.

## 1.5 Key Informant Contacts

Approximately two dozen key informant contacts were identified by the consultant team and the ADOT Project Manager who could represent the varied geographic and bicycle-activity interests across Arizona. They included government representatives (including members of this study's Technical Advisory Committee), advocacy groups, bicycle clubs, and event organizers. The intent of drafting the list was to contact some of these informants to solicit their guidance on data and related issues. For example, these individuals could provide input on:

- How best to structure outreach procedures, survey instruments, etc. in order to maximize research input from shop owners, event organizers, and others.
- Bike shop owners/managers who might be the most receptive to an economic survey.
- The relationship of Arizona's bicycle friendliness to bicycle-related tourism, etc.

# 2 Review and Refinement of Methodology

## 2.1 Introduction

This section begins with a presentation of data needs for this study followed by a discussion of data availability from various secondary sources. The resultant gaps within these secondary data sources necessitate a discussion of primary data collection sources and survey techniques with various methods recommended. Our recent interview series with key informants—summarized here—was especially helpful in providing guidance with respect to business contacts/event organizers and approaches and protocols. Specific research products—such as surveys and questionnaires—are tied to target data groups, and guidelines are presented for data analysis (e.g. missing data estimation, inclusion of non-quantifiable observations). Analytical systems for quantifying the economic impacts are discussed with particular attention to the input-output (I-O) model.

## 2.2 Data and Methodological Categories Addressed: Secondary and Primary Data

As noted in the previous section, economic impact studies of bicycling have been conducted in a number of states and regions. These states/regions have a locus of economic activity related to bicycling and/or tourism oriented around bicycling. In these studies, bicycling was found to be an economic force, providing a source of both direct and indirect revenues and jobs. The documentation of such benefits involved defining the components of bicycle-related activity that could be analyzed and devising a variety of analytical approaches.

### 2.2.1 Bicycle-related industrial classifications

What precisely is meant by bicycling-related activity? How should the bicycle-related industry be defined? Prior to examining the specific data/information requirements for this economic impact analysis of bicycling, the data need to be organized by detailed bicycle-related industry segment (Table 2-1). According to the latest (2012) *North American Industry Classification System* (NAICS), there is a group of twenty bicycle-related industries identifiable for this study.

**Table 2-1. Bicycle-related industries, North American Industry Classification System**

| NAICS | Title of Industry | Brief Description, bicycle-salient |
|---|---|---|
| ***Manufacturing*** | | |
| 31521 | Sports clothing cut & sew apparel contractors | Bicycle clothing |
| 31522 | Sports clothing, men's and boys' cut & sewn from purchased fabric | Bicycle clothing |
| 31524 | Sports clothing, women's and girls' cut & sewn from purchased fabric | Bicycle clothing |
| 31528 | Sports clothing, team uniforms, cut & sewn from purchased fabric | Bicycle clothing |
| 31519 | Sports clothing made in apparel knitting mills | Bicycle clothing |
| 31621 | Footwear manufacturing | bicycle shoes/cleated shoes manufacturing |
| 333912 | Air and gas compressor manufacturing | bicycle pumps manufacturing |
| 336991 | Motorcycle, bicycle & parts manufacturing | bicycle and parts manufacturing |
| 33992 | Sporting & athletic goods manufacturing | bicycle gloves manufacturing |
| ***Wholesale trade*** | | |
| 42391 | Sporting & recreational goods and supplies merchant wholesalers | bicycle merchant wholesalers |
| ***Retail trade*** | | |
| 45111 | Sporting good stores | bicycle shops (non-motorized) |
| 45331 | Used merchandise stores | bicycle shops, used (non-motorized) |
| ***Transportation & warehousing*** | | |
| 49221 | Couriers & express delivery services | bicycle courier |
| ***Real estate and rental & leasing*** | | |
| 53229 | Other consumer goods rental | bicycle rental |
| ***Administrative and support services*** | | |
| 56152 | Tour operators | bicycle tour operators |
| ***Arts, entertainment and recreation*** | | |
| 71131 | Promoters of performing arts, sports & similar events w/ facilities | Bicycle event organizers with facility, e.g. mountain bike center |
| 71132 | Promoters of performing arts, sports & similar events w/o facilities | Bicycle event organizers w/o facility |
| 71394 | Fitness and recreational sports centers | mountain biking trail centers |
| 71399 | All other amusement and recreation industries | bicycle tour guided services, bicycle riding clubs |
| ***Other services (ex. public administration)*** | | |
| 811490 | Other personal & household goods repair and maintenance | bicycle repair & maintenance w/o retailing new bicycles |

Source: US Office of Management & Budget. *North American Industry Classification System. United States, 2012.*

These industries cover the broad industry spectrum from manufacturing and trade to transportation and services. Manufacturing sectors include those that make bicycle clothing, shoes, gloves, and other accessories, and those that produce bicycles and parts/components, and bicycle pumps. Trade includes both wholesale and retail sales of bicycles and related equipment;[6] whereas Real Estate and Rental & Leasing include bicycle rentals. Bicycle repair shops (those without new bicycle sales) are found in Other Services category. The broad sectors of Transportation & Warehousing include bicycle couriers. Bicycle tour operators are covered under Administrative and Support Services. Finally, the Arts, Entertainment and Recreation sector includes mountain biking trail centers, bicycle tour guides, event organizers, and bicycle riding clubs. The latter two segments have significant levels of volunteerism.

Without exception, bicycle-related activity represents a minor portion of the overall production or services provided in each of these industry categories. In other words, none of the above five-six digit NAICS industries is solely about bicycle-related production or services. More often,

[6] Note that The Gluskin Townley Group estimates Internet sales of new bikes and parts hit $1.2 billion in 2011, about 20 percent of all bicycle-related sales.
http://www.bicycleretailer.com/sites/default/files/downloads/resource/Stats_7_1_12.pdf

bicycle-related activity is relegated to the "other" or "miscellaneous" within the underlying product detail (up to ten-digit product codes)[7]. Even within the motorcycle, bicycle & parts manufacturing (NAICS 336991) segment, almost three-fourths of the 2007 total production value is associated with motorcycles, based on the product code data.

### 2.2.2 Needed metrics and associated data for assessment

What are the various "metrics" used in assessing the economic effects of bicycling? Generally, the metrics utilized in these studies include: employment, earnings[8], output[9], and taxable revenues. Are there available data and information consistent with these metrics to accomplish the goals of this economic impact of bicycling in Arizona study? Specific data requirements are listed below under each of the two broad benefit categories—bicycle-related industry, and bicycle tourism and visitor spending.

***Bicycle-related industry, organized by detailed NAICS industry segment***

- Establishments or business units, with or without employees (i.e., sole proprietor);
- Number of employees by establishment;
- Amount of employee wages and salaries and (sole) proprietor income;
- Amount of annual sales or output value; and
- Portion of sales/output value sold to out-of-state residents/visitors.

***Bicycle-tourism and visitor spending associated with organized tours, rides, and races***

- Event, tour, ride or race by location;
- Number of participants (and their respective residences ) by event, tour or race;
- Number of "companions" with event participants; and
- Level of expenditures by event participants and their companions for such broad categories as:
- Event registration fees;
- Lodging;
- Food—restaurant and groceries;
- Gas; and
- Other/miscellaneous retail (including bicycle-related).

[7] Product codes are harmonized with their respective six-digit NAICS industries.
[8] Earnings include both wages and salaries of business employees as well as proprietors' income.
[9] Output is an economic term related to the value of production. Business sales or revenues are often used as a close proxy to output.

## 2.3 Analysis Systems

### 2.3.1 Secondary data: Overall processing and output formats, by type

Secondary economic data, by industry and county, will be tabulated for use as gross indicators of the extent of economic activity in the bicycle-related group of industries occurring in each county, appropriately qualified to make clear that these industry sectors include much more than bicycle-related activity. Similarly, general tourism data, on visitor activity in different regions throughout the state for example, can potentially be used to help sensitize the findings from the primary (survey) research involving bicycling events and related visitation. The final selection, application, and formatting of this type of data will depend on the actual output of the primary research, its level of completeness, compatibility with overall database, and similar considerations.

Secondary data that indicate sales by product line, at the national level, will be used as appropriate to supplement primary data and/or gaps in primary data related to department stores, for example.

Secondary data consisting of a compilation of various business lists has been brought together into a master database, which will require additional primary research, essentially by means of direct contact of establishments, to be more completely verified and establish additional contact information.

### 2.3.2 Primary data: Format, output from on-line surveys, and how adapted for this project

The online surveys will automatically tabulate results, and output of questionnaires sent directly to respondents will be set up for similar ease of data collation and tabulation of results, through some combination of electronically fillable forms or other methods. Survey data will be further summarized and also cross-tabulated according to the patterns of information received, response levels and profiles of respondents, what findings appear to be most interesting and informative, and similar considerations.

### 2.3.3 Synthesis of data: Combining information/data from secondary and primary collection activities

The survey results will include information about the organizations and establishments that responded to the survey. This information should facilitate comparison of the profile of the sample (that is, questionnaires actually received) to the profile of organizations/establishments from other databases compiled for this project. Depending on the extent to which the sample profile appears to be similar to the universe based on this kind of comparison, extrapolations of

the findings from the sample to the universe might require additional processing of the data, or at the very least qualitative assessments of these differences.

Where additional processing is required, a spreadsheet model format will be established that explicitly shows the input data, calibrating data/factors from other data sets, factors to adjust the sample data to the universe, and the resulting calculations, all by selected subareas. To the extent possible, this model format will be consistent across the various analysis categories.

### 2.3.4 Analysis reporting for sub-state areas

Ideally, bicycle-related activity (businesses and events) in Arizona should be analyzed at the county level. However, given the limited number of businesses and/or events in a number of nonmetropolitan/rural counties (as well as to preserve confidentiality of survey participants), it may be necessary for the purposes of this study to subdivide the state into sub-state regions (including the relevant Indian communities) such as the following:

(1) Northern – Coconino, Navajo, and Apache
(2) North Central – Yavapai and GIla
(3) Phoenix & Central – Maricopa and Pinal
(4) Tucson & Southern – Pima, Santa Cruz, Graham, Greenlee and Cochise
(5) Western – Yuma, La Paz, and Mohave

### 2.3.5 Impact analysis methodology—selecting an I-O model

The principal economic analytical tool used to measure bicycle-related impacts on the overall Arizona economy is an I-O model, which takes into account the direct impacts and the complex inter-industry connections of the broader economy. One of the most important uses of an I-O model is that it serves as the basis for estimating the multiplier or "ripple" effects of changes for one sector of the economy upon other sectors. Because the model takes into consideration the complex inter-industry connections within the regional economy, calculated impacts will include not only those people directly involved in producing goods and services for export, but also the indirect impacts, such as the increase in work and jobs in industries supplying direct-export businesses. It also includes induced impacts by spending of wages and salaries of these direct and indirect workers on consumer-related goods and services.

The multipliers described here are known in I-O parlance as Type II multipliers. Although Type II multipliers are only one of several types of multipliers available, they are most commonly used in regional economic impact analysis. Type II multipliers measure the direct effects on a metric (in this case jobs, output, or labor earnings) plus the indirect impacts that arise as the result of inter-industry linkages, and the impact induced by spending on household goods and services

from disposable income paid to workers in affected industries. This concept assumes that there is an association between industry output and household income, and a further association between household spending and income. Other types of multipliers may exclude household spending (Type I), or they may include state and local government spending (Type III). Type IV multipliers also include investment spending, on the assumption that this is directly responsive to demand for output. Types III and IV are generally larger than Type II and are generally considered more speculative.

There are many common misconceptions about multipliers. For instance, there is no such thing as the multiplier for an industry. For any industry, there are any number of multipliers depending upon the form in which the multiplier is expressed, the metric under consideration and other factors. The choice of unit can make the same multiplier look larger or smaller. Multipliers in static models (such as those available in the IMPLAN modeling package) are timeless. Production adjustments may take place in anticipation of changes in market demand, or in contrast, reaction time may lag resulting in delayed multiplier responses.

Prior studies have shown that multipliers do change over time. There are several reasons why multiplier values change. First, technological changes and inventions of new products and processes alter input purchasing patterns. Second, relative price changes across commodities induce substitution of the relatively cheaper inputs for the more costly ones. Finally, changes in interregional and/or international trade patterns (due in part to changes in transportation costs and exchange rates) could substantially alter patterns of trade, and hence multiplier values.

### 2.3.6 Impact analysis methodology—rationale for I-O model selection

In conducting an economic impact analysis, the direct effects—here, bicycle-related activity in Arizona—are generally provided or known. In contrast, the calculation of indirect effects cannot be measured and verified directly through records. Instead, indirect effects must be determined through the use of various estimating methodologies. The most common estimation techniques involve the utilization of I-O tools that involve a range from simple mathematical calculations on a spreadsheet (e.g. under U.S. Bureau of Economic Analysis RIMS II program) to integrated simulations using sophisticated dynamic I-O models. Even though these approaches vary in sophistication and structure, the general approach to this estimating process is essentially the same for all I-O tools in that they all use calculated coefficients based on detailed secondary data.

Dynamic I-O models, such as the Regional Dynamics Model (hereafter “Redyn Model”), simulate the economic relationships between sectors of an economy on several geographic levels through time. Linkages exist between sectors and regions that provide commodities or other inputs to each other. I-O models explicitly consider these linkages and allow analysts to

see how changes in individual or multiple sectors in a state or regional economy ripple throughout the system. Effects of an initial investment are felt in these other sectors and regions as increased employment, output, disposable income, and household earnings. MIG, Inc., the owner of the IMPLAN model, describes I-O analysis in another way as "…a means of examining relationships within an economy, both between businesses and between businesses and final consumers. It captures all monetary market transactions for consumption in a given time period. The resulting mathematical formulae allow examination of the effects of a change in one or several economic activities on an entire economy."

### 2.3.7 Recommended I-O model—Redyn

The Regional Dynamics (Redyn) Model is the newest and most sophisticated of the advanced I-O models available today. The Redyn Model has been used to assess the net job and other economic benefits associated with economic development projects, new businesses, certain types of policy changes, and utility power projects in various states throughout the country in a variety of analytical settings.

The Redyn Model will be employed in this economic impact of bicycling in Arizona study. The I-O model uses a dynamic (or a longitudinal) approach that simulates not only the relationship between sectors in an economy, but also the interconnectivity of regions. The dynamic element of the model has a well-developed transportation impedance database that is able to account for temporal effects due to competitive differences between either geographic regions and/or different sectors of the economy. Over time, these competitive pressures emerge and then tend to bring the regional economy back to equilibrium. The process, in that way, depicts the so-called "ripple effect" impact that economic changes have on a region.

The internet-based Redyn Model was developed by Regional Dynamics, Inc. currently of Scottsdale, Arizona, through its principal creator, the late Thomas Tanner, Ph.D., a former model manager at Regional Economic Models Inc. (known as REMI) of Amherst, Massachusetts. Dr. Tanner's work experience at REMI gave him the expertise to create an alternative to the REMI model. The result is an integrated I-O model of the counties and cities of the U.S. which has significant advantages over the existing menu of other commercially-available I-O models: REMI (which is prohibitively expensive); IMPLAN (as maintained by the Minnesota IMPLAN Group, Inc., originally developed for the U.S. Forest Service, which is a static I-O model); and RIMS II final demand and/or employment multiplier tables (which is maintained by the U.S. Department of Commerce, Bureau of Economic Analysis (BEA) and is also a static tool).

The Redyn Model employs a concept known as New Economic Geography (NEG), a theory first developed by Paul Krugman while at the Massachusetts Institute of Technology. NEG employs "fully general equilibrium" models that "derive aggregate behavior from individual

maximization." This competitive framework is translated into a model that makes the assumption that "commodities produced by an industry are truly joint in the production process, as prescribed by a uniform production function for all firms in each industry based on competitive pressures to diffuse advantages quickly across all firms in an industry."

NEG also focuses on agglomeration economies and the relationships between them in different levels of geographic space. To illustrate this, consider a tight group of commercial establishments configured as a mall, which is an agglomeration of retail establishments. This is the smallest level of an agglomeration economy. It is related to the regional commercial market, which is part of the national market and the world market. It is the linkages between these levels of economic agglomeration that NEG seeks to explain and illustrate.

Like all I-O models, the Redyn Model calculates the effects of a new final demand stimulus (for instance, a new bicycle manufacturer locating in Arizona) into three general categories. The first category includes the direct effects, which measure the changes in the bicycle manufacturing industry where the final demand change was effected. The second category refers to the indirect effects, which are those changes in inter-industry purchases as they respond to the new final demand change in the bicycle manufacturing sector. Lastly, there are those effects due to changes in spending from affected workers and their households as labor income either increases due to the change in final demand, known as induced effects. The Redyn I-O model software calculates all three of these effects just like any other I-O tool, but as a dynamic I-O model (like the dynamic REMI model), Redyn has the capability through its structure to analyze the impacts over time and its components as part of a single integrated development scenario.

In its simplest form, the estimation process is comprised of two fundamental steps: i) calculations to determine what are commonly referred to as national coefficients, which are based on production functions; and ii) determinations as to what proportion of those goods and services are purchased within the region. The first calculations estimate how much input is used in any given year to produce a given amount of output in any given year. The second group of calculations referred to above involves calculations of what are referred to as regional purchase coefficients (RPCs). These regional purchase coefficients estimate what proportion of those goods and services are purchased within the region in question.

The Redyn Model, like other I-O models such as IMPLAN and REMI, handles all these calculations within the model software based on the geography and type of stimulus specified by the analyst. The Redyn Model is geographically specified so that RPCs are calculated for all involved sectors based on purchases of goods and services from firms within the region. The matrix can be, and usually is, large and complex. RPCs tend to be higher for service-providing industry categories and lower for goods-producing industry categories. The Redyn Model

calculates indirect jobs through the I-O simulation process using quantified national relationships from the I-O tables and RPCs as calculated within the software algorithms embedded in the Redyn Model.

There is a crucial distinction to be made between I-O models, such as REMI and Redyn and tools that use an extracted single number I-O coefficient (such as a RIMS II multiplier), which measures an impact in a single year. The multiplier approach involves simple multiplication where a single number estimate of a change in "final demand" can be done in a spreadsheet. Redyn and REMI do not employ single multiplier calculations, but derive their predictive ability on interconnected matrices of "make" and "use" tables for specific industries and specific regions or geographies. Therefore, the I-O model tool uses a large matrix of multipliers that literally includes hundreds, and sometimes thousands, of multipliers. Impact assessment analyses undertaken using Redyn can treat a project as a single integrated development scenario and compare the economy under that scenario to a "base case" for the regional economy.

### 2.3.8 Redyn Underlying Data Sources

Redyn (similar to other recognized I-O models) is based on the concept of a production function, which determines what are called "make and use" tables. These tables quantify the amount of inputs that are required to produce a unit of output across a number of industries. The basic data underlying these tables are collected by the U.S. Department of Commerce (principally through its sub-agency, the BEA). The vast amount of data come from a variety of sources and the data collected are converted into production accounts on a national income basis and input-output accounts basis, called the National Income and Product Accounts (NIPA). These accounts are assembled into various tables including transactions tables (which track the economic flows between producers and users of commodities, as well as the commodity taxes, transportation charges, and wholesale and retail trade margins between producers and users) and final uses tables. These tables are the building blocks for the input-output accounts, from which various multipliers are derived.

Regional I-O models can be constructed using a geographically tailored I-O matrix. Such a matrix takes into account RPCs, which are calculated based on the proportion of goods and services required to produce one unit of output that are produced within a defined geographical region. These RPCs for most I-O tools are based on subsets of the same national data described above. For Redyn, the underlying matrix has all these coefficients embedded in the model, as it is for the REMI and IMPLAN tools.

In addition, Redyn uses a variety of supplemental data provided by U.S. Government entities. The industry structure for the model is the NAICS codes to the five-digit level. This allows the

model to provide detail for 703 industries and over 180 commodities for the geographic region specified in the model. This classification system and level of detail makes Redyn's output compatible for comparison to government reported statistics, as this is the system used for publishing economic data by the U.S. Department of Labor's Bureau of Labor Statistics (BLS), the U.S. Department of Commerce's BEA, and the U.S. Census Bureau. These government bureaus provide the original data that are accumulated and transformed into the Redyn Model's I-O (e.g. multipliers) and other specified relationships.

The Redyn Model also employs data from the U.S. Census Bureau's County Business Patterns (CBP). CPB data is the source for wage bill payroll data and employment data used in the model. The model's developers preferred this approach since it is an annual series that is more complete in its coverage of the workforce than the Quarterly Census of Employment and Wages (QCEW) series, as it includes self-employed persons (with no employees), employees of private households, agricultural production workers, and railroad workers. These workers are not "covered" by most state unemployment insurance systems and are therefore not reported in the QCEW series.

The CBP data set also is preferred because it provides detail about employment and wages down to the zip code level where concentration of industry is high enough to provide reportable data. The suppression of data due to confidentiality issues is a common problem of all types of wage and employment data used in specifying I-O models. Redyn has developed a method to fill in the blanks called row and column sum (RAS).

After performing the RAS technique on the CBP data it is reconciled with Regional Economic Information System (REIS) data from the BEA to confirm consistency. The REIS data are especially helpful for providing data in the agriculture and governmental sectors. The REIS data are also used to allocate national consumption numbers to the roughly 3,100 counties in the United States that are provided on the aggregate level by the NIPA. The levels of consumption of industries and households are a key building block in the creation of I-O models.

The input-output tables themselves are created using BEA I-O "make" and "use" tables (described above). The data in these tables are augmented by the biennial 10-year I-O forecast tables from BLS. A major difference between the Redyn Model and other I-O models is its use of a new distance impedance database supplied by the Oak Ridge National Laboratory. This allows the Redyn Model to add elements of trade flow and gravity theory based on distance impedance specific to road, rail, water, air, and proxy transport. The combination of these data sources gives the Redyn Model the power to predict with greater accuracy than ever before the economic impacts of a wide range of economic changes.

### 2.3.9 Inputs to Redyn for this Project

For this study, inputs to the model will be generated separately for each of the metrics that apply to this research project, for example, value of output (manufacturing, retail and wholesale sales), employment and labor earnings, and tourism spending. The input values will be based on the results of the primary research and the integration of that research with secondary data to produce overall estimates at the statewide and sub-state regional levels. Inputs related to bicycle-related business activity and bicycle events and visitor spending segments will be separated for related model-generated analyses.

## 2.4 Non-Quantifiable Elements

By undertaking an economic impact framework, it is inevitable that a number of considerations are introduced in the course of data gathering, but are otherwise for the most part left out of the overall calculus. Here are some examples:

- American Association of State Highway and Transportation Officials (AASHTO), US Bike Route System. ADOT is working with the neighboring states' Departments of Transportation, Adventure Cycling Association, and other organizations to coordinate four AASHTO-designated bicycle routes: 66, 70, 79, and 90 (see http://www.adventurecycling.org/routes/nbrn/USBRSCorridorMap.pdf). Such a designation does not necessarily imply that "pent-up" demand will be realized (as in "if we build [or here, designate] it, they will come") with increased bicycle use. A related matter is the indeterminate level of bicyclists (origin and destination; duration) involved in these cross-state routes.
- Arizona as destination for cycle training. Arizona offers year-round cycling for elite professional/amateur road biking teams/clubs. Unlike such sports as spring baseball, elite cyclist teams/clubs do not establish a "home road," rather training often migrates to various portions of the state.[10] These groups are often viewed as "under the radar" and hence their presence is difficult to quantify.[11]
- Arizona as destination for bicycle marketing. As in other transportation manufacturers, bicycle companies (such as TREK, Giant, Cannondale, Specialized, Raleigh, and Schwinn) will test and market their products in various natural and/or urban settings, be that the mountain biking trails around Flagstaff and Sedona, the

[10] See, for example. Jason Sumner, "Making a Winning Team Better," *Bicycling*, February 2012, http://www.bicycling.com/news/pro-cycling/making-winning-team-better
"Team director Gord Fraser and his 13-rider squad spent the second of week of February holed up in a spacious rental house in the saguaro cactus–dotted outskirts of Tucson. On-the-bike training was job No. 1, with media training, sponsor presentations, a round of anti-doping tests, and team-building exercises filling out the busy days."

[11] A velodrome for track cyclists is much different; as such, a velodrome represents a significant focal point for bicycle-related economic activity—both for participants and for spectators.

on-roads within the White Mountains, or the urban bikeways of Tucson and Phoenix metropolitan areas.[12]

- Arizona as retirees' winter destination. To the extent bicycling's popularity increases across the age-spectrum, retirees and seasonal vacationers will incorporate bicycling as one of their recreational pastimes. Increased bicycling undoubtedly translates into boosted sales for bicycles and ancillary products and increased participation in rides, events and tours.
- Integration of bicycling activity with overall tourism. The desirability of maximizing tourism officials' engagement in bicycle-related tourism, including defining, quantifying, and promoting Arizona's position, nationally, as a center for bicycling. There is also a broad economic development component of this, as in all forms of tourism, which involves the exposure of the state to people who subsequently relocate here.
- Public land management coordination. Federal and state land-management agencies can play pivotal roles in encouraging or discouraging off-road bicycle use, and there are "mixed reviews" regarding, for example, the role of the Forest Service in Arizona. The issue is particularly relevant for the smaller cities and rural area of northern/eastern Arizona.
- Rural area impacts compared to statewide impacts. Events in rural areas can be important to that locality, as components of the redistribution of tourism dollars within the state, even when participants are Arizonans and the statewide effects are neutral.

In addition, there are a number of data sets that have been compiled in support of ADOT Bicycle and Pedestrian Program planning efforts, but which are generally not directly applicable to this study. They are mentioned here for general information purposes and to add context to the discussion in this section of other bicycle-related issues.

- <u>ADOT Bicycle Safety Action Plan On-line Survey:</u> An on-line survey was completed for the ADOT Bicycle Safety Action Plan. Some of the available relevant data includes:
  - *List of bicycle clubs and organizations.* Respondents were asked to self-identify clubs and organizations with which they are affiliated. 811 individuals responded to this question, identifying 210 bicycle clubs and organizations. These range from informal riding groups to clubs with sponsorship.

[12] See, for example. The Bicycling Magazine Test Staff, "Storming the Desert: 2012 Editors' Choice Awards," *Bicycling*, June 2012, pp. 95 – 110. "Tucson's idyllic weather, cycling-friendly roads, and monster descents made it the ideal spot to test the best bikes of 2012."

- *Areas to improve to encourage more bicycling and walking:* Survey respondents were asked to identify what could be improved to encourage them to bicycle and walk more. A majority of respondents identified issues related to infrastructure, including a general lack of shoulders or narrow shoulders, unmaintained shoulders, debris in the shoulder, and disconnected bicycle lanes.

- State Highway Bicycle Infrastructure: ADOT accommodates bicyclists on state highways with shared roadways (including paved shoulders and wide curb lanes). An inventory of shoulder widths on the state highway system was compiled. The inventory identifies sections of state highway with shoulder width four feet or greater. Four feet is the minimum recommended shoulder width that is needed to accommodate bicyclists (AASHTO). The inventory shows that approximately 49% of the State Highway System has a shoulder width of four feet or greater.

- Traffic Volume Data: The shoulder width information can be superimposed onto shoulder width data to help bicyclists to identify roadway segments that are most comfortable for them. State highways with lower traffic volumes and a shoulder width of four feet or greater represent the minimum facility that is desired by most bicyclists when choosing to bicycle on the state highway system (see ADOT's *Cycle Arizona Bicycle User Map* at http://www.azbikeped.org/maps.htm).

- State Highway Shared Use Paths: An inventory of shared use paths that was compiled.

- Bicycle/Pedestrian Grade Separations: An inventory of pedestrian/bicycle grade separated crossings over state highways is available. There are 48 grade-separated crossings of state highways in Arizona.

- Bicycle Usage/Counts: Pima Association of Governments conducts an annual bicycle count at multiple locations and intersections throughout the City of Tucson and Pima County. The Flagstaff Metropolitan Planning Organization has also conducted a travel diary study that identifies the modes of travel used within by residents the Flagstaff region. The study found that 7.1% of trips are made by bicycling in the Flagstaff region. ADOT installed a permanent bicycle count station on SR 179 near Sedona in April 2011. The data show a higher ridership in the spring and fall seasons.[13]

[13] http://www.azbikeped.org/mpd/azbikeped/studyupdate/pdf/Working%20Paper%20No%20%202%20Assessment%20of%20Current%20Conditions%20and%20Needs.pdf, pp. 10 & 11.

# 3 Data Collection and Analysis

## 3.1 The Fundamental Challenges of Studying Topics Related to Bicycling

The focus of this study was clearly defined from the outset to be on estimating the economic benefits associated with (1) the bicycle industry of Arizona; and (2) bicycle tourism and visitor spending connected with bicycle tourism in the form of organized tours, rides, and races in Arizona. In part, this specificity reflects the data limitations that lie at the heart of any study dealing with bicycling in the United States. Not only is there little concerted effort to document bicycle usage, generally speaking, the information that is available cannot be considered reliable at even the statewide level.[14]

Virtually all aspects of the bicycle industry, from production to retailing to the staging of bicycle-related events (including those solely devoted to bicycling and duathlons/triathlons in which bicycling is only one component of activity), are highly competitive and dynamic – in terms of both growth and sometimes contraction/consolidation. The methodological consequence of this is that bicycling entities seem to be relatively protective of their business information. Despite the efforts of ADOT, advisors to the study, and the consulting team, efforts to obtain primary data from all categories of entities proved to be quite difficult.

This study was further defined by ADOT to generally emphasize the tourism and export components (both referring to out-of-state customers) of bicycling in Arizona. As such, it is a snapshot of certain kinds of economic activity, and economic implications of certain kinds of consumer behavior, but is understood to be a partial, perhaps most defensible, component of economic benefits to the state.

## 3.2 Overview

This section describes: 1) the methodologies for primary data collection and analysis, for compiling and analyzing secondary data (with a focus on the inventories of bicycle-related businesses and events), and for using the primary and secondary data in combination; 2) the findings and conclusions from the data received, compiled, and analyzed, quantified to the extent practical; and 3) designs and recommendations for updating the study in the future.

[14] For example, the *National Household Travel Survey,* US DOT, Federal Highway Administration.

## 3.3 Methodology – Overview

Table 3-1 (below) identifies the research questions and required information to be addressed for this phase of the study. This set of research questions acted as a guide to the approach and the processes involved with the collection, interpretation and analysis of data required to evaluate the various facets of the Arizona bicycling activity targeted in this study.

An overview of the tasks addressed in this section, including primary and secondary data collection, processing and subsequent analysis, is shown below on Figure 3-1. Roman numerals refer to applicable report sections.

To obtain the primary data, surveys were distributed and collected between October 2012 and February 2013. Surveys were distributed via e-mail and physical mail and collected from online platforms, e-mailed editable pdf files and returned surveys through the post. The distribution of questionnaires was preceded by a testing process, which involved certain key informants identified and consulted in prior phases of this study, along with other identified establishments[15] and organizations selected to take part in this process. The intent was to get representation from each of the primary categories (dealers, manufacturers, events and tours). Invitations for the testing process were drafted and sent to the group of testers in September of 2012. Feedback from the testing process, although very limited, was used to refine the survey questions.

In the process of compiling secondary data and collecting primary data through surveys, the intent was to obtain information for calendar year 2011. However, given the fact that data sources were limited, primary data were largely collected late in 2012, and survey responses were limited in number, the 2011 convention was not always adhered to. Data for 2012 were used where it was expedient to do so in order to expand the information base.

[15] Note that in this report the term "establishment" refers to a single store, and the term "firm" refers to an entity that might have several stores (establishments) under a single ownership.

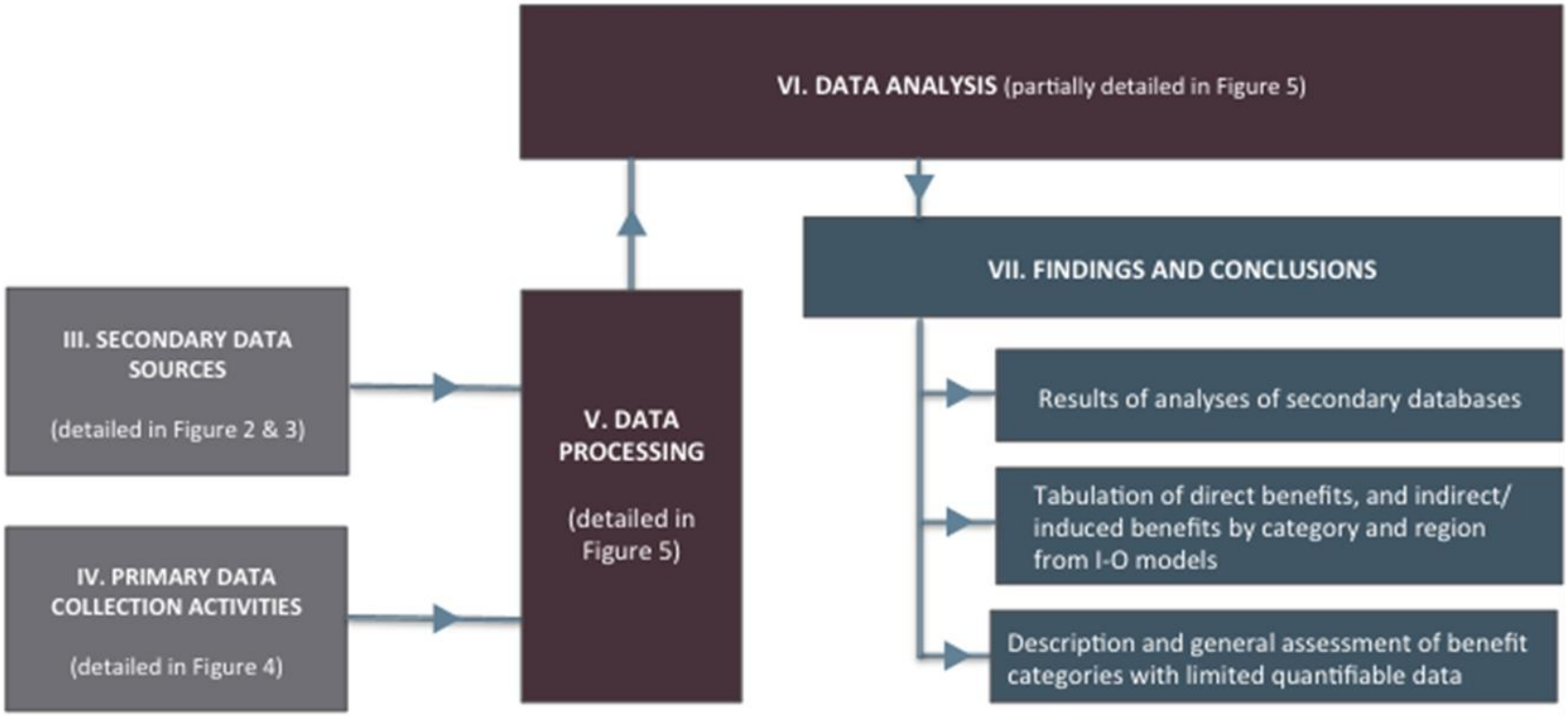
**Table 3-1. Research questions and required information**

| Questions we are attempting to answer: | | | |
|---|---|---|---|
| | To answer question need to know: | Information will come from/ be derived from: | Key considerations: |
| **How to estimate economic activity of interest in this project, in general** | | | |
| | Limitations of secondary data for estimating purposes | Background research on data sources | |
| | Primary data concepts and challenges | Background research on surveying options | |
| | Ancillary data available to supplement primary sources | Background research on surveying options | |
| **Total annual bicycle sales in Arizona** | | | |
| | Distribution of sales by channel of trade: bicycle shops, sporting goods stores, department stores, etc., by volume and $ | National data from trade organizations | Arizona's similarity to nation |
| | In big-box stores, bicycle-related sales as % of total | National data from trade organizations; economic census | Has some use as calibrating factor |
| **Annual sales by bicycle shops in AZ** | | | |
| | Number of shops and characteristics | Inventory of establishments | |
| | | Other databases (e.g. *Sweat* magazine) | |
| | | Project survey data for shops | |
| | | National data from trade organizations | Arizona's similarity to nation |
| **Retail sales to tourists** | | | |
| | Proportion of sales to tourists by channel of trade | Assumptions based on sales by dollar amount, in national data from trade organizations | |
| | Proportion of sales to tourists in bicycle shops | Project survey data for shops | |
| | | Assessment of similarity of survey sample to universe | |
| | | Project survey of event participants | |

| Questions we are attempting to answer: | | | |
|---|---|---|---|
| | To answer question need to know: | Information will come from/ be derived from: | Key considerations: |
| **AZ bicycle-related manufacturing export sales** | | | |
| | Products produced, sales volume | Inventory of establishments | |
| | | Project survey data for manuf. | Number of firms and survey data limited; protect from disclosure |
| | Proportion of sales exported | Project survey data for manuf. | |
| **Bicycle events/tours in AZ with a potential tourist draw** | | | |
| | Number and categorizations of events | Inventory compiled from secondary sources | Listings in constant state of change |
| | | Project survey data for event/tour operators | |
| | | Online posted event results | |
| **Annual spending by out-of-state participants in events/tours - total and attributable primarily to bicycling event/tour** | | | |
| | Number of events/tours with measurable tourism participation | Project survey data for event/tour operators | |
| | Number of tourist participants | Project survey data for event/tour operators | |
| | Spending in AZ by tourist participants | Project survey of event participants | Spending for bicycle-related goods is accounted for above |
| | | General data on tourism spending in AZ | |
| | Proportion of spending attributable primarily to bicycle activity | Project survey of event participants | |
| **Regional economic context in which bicycle-related economic activity occurs** | | | |
| | How regions compare in economic activity in bicycle-related industries | Federal or Economic Modeling Specialists International (EMSI) employment data | |
| | | Tourism indicators from Arizona Office of Tourism (AOT) | |
| **Regional distribution of event/tour activity** | | | |
| | Event/tour locations | Inventory compiled from secondary sources | |
| | | Project survey data for event/tour operators | |

| Questions we are attempting to answer: | | | |
|---|---|---|---|
| | To answer question need to know: | Information will come from/ be derived from: | Key considerations: |
| **Regional distribution of bicycle-related tourism spending** | | | |
| | Spending by tourist participants, by AZ region | Results of analysis of regional distribution of events/tours | |
| | | Results of analysis of spending by participants | |
| **Regional distribution of retail sales activity** | | | |
| | Establishment locations | Inventory of establishments | |
| | Mix of establishment types by region, and proportionality of mix among regions | Inventory of establishments | |
| | | | |
| **Identifiable trends that are of interest to this study** | | | |
| | Event/tour activity trends | Project survey data for event/tour operators | |
| | | Inventory compiled from secondary sources | |
| | Bicycle sales trends | National data from trade organizations | |

**Figure 3-1. Overall structure for the data collection and analysis phase**



## 3.4 Methodology – Data elements and processing

### 3.4.1 Secondary data

#### *Types of data sources, general*

Secondary data used for the topics discussed in this section were compiled from a variety of sources. Business data sources included: InfoUSA, other online bicycle business directories, individual business websites and other online resources. National-level data on bicycle-related businesses were obtained primarily from business-organization websites, such as the National Bicycle Dealers Association (NBDA) site. Event and tour data were obtained primarily from event websites and listings of events and event results.

#### *Overview of data available, and completeness and other limitations of data, in secondary databases*

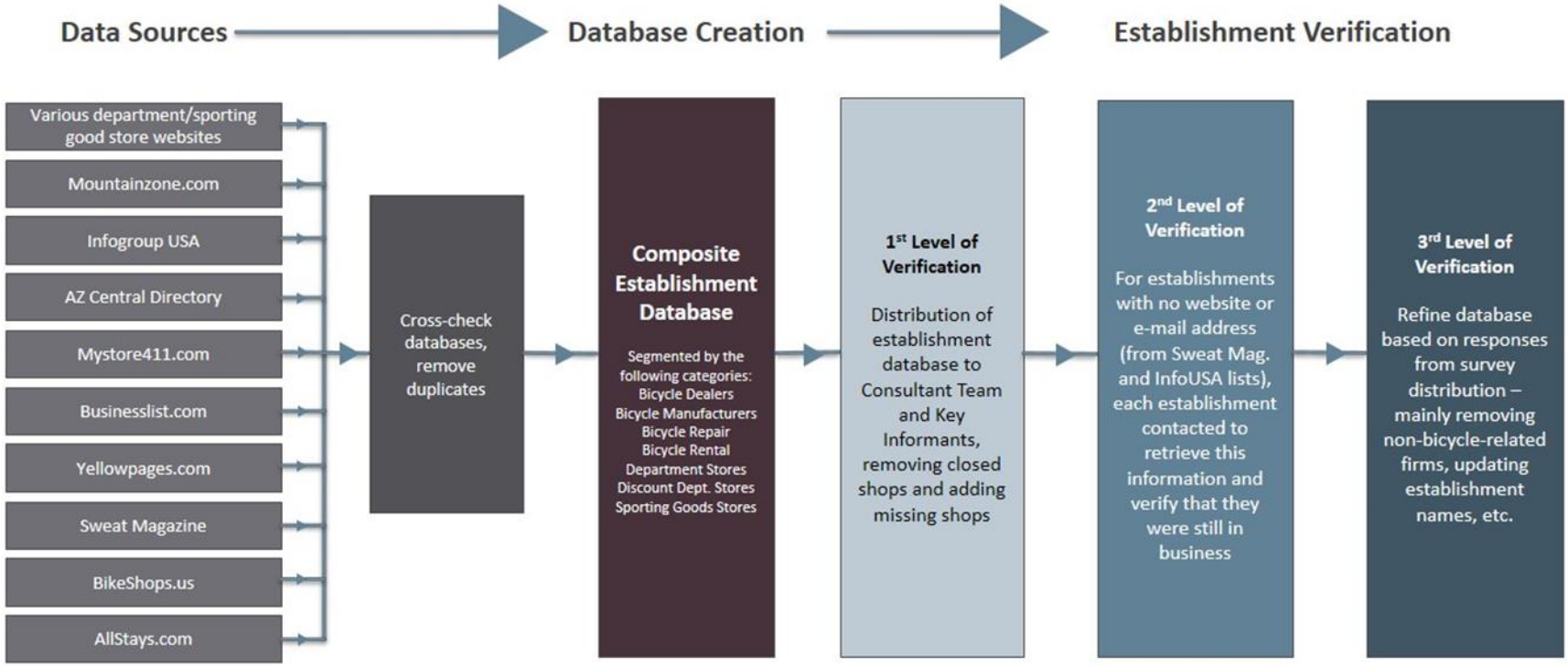
#### Businesses

The following diagram (Figure 3-2, below) outlines the processes involved with the identification of data sources, database creation and the verification of the identified bicycle-related retail and manufacturing establishments. The database of bicycle dealership establishments was derived from eight directory websites, local data compilations such as that prepared by *Sweat Magazine,* and the individual firm websites. Mass merchants and other major retailers and sporting goods stores were primarily identified through corporate websites. Secondary data were also available from sources such as national trade organizations.

The result of this effort is a listing of approximately 450 identified bicycle-related retail businesses in operation in Arizona, including department stores and other retailers for which bicycles are only one of many product lines, and including 11 manufacturing/wholesaling establishments. The inventory is included as Appendix A3-1.

Data variables from secondary data of interest in the analysis include business name and location, along with estimated data as available (including "formula-based" estimates from some sources that were largely disregarded) on revenues and number of employees, and contact information (websites, phone numbers, e-mail addresses).

**Figure 3-2. Business database compilation methodology**



### *Tour/Event organizations*

## Overview of Events/Tours

An inventory of bicycle events held throughout the state was developed for this study, through the process summarized in Figure 3-3. Most of these are annual events that have an established history and were most recently held in 2012 or are planned to be held in 2013. Some events are either being held for the first time in 2013 or were held for the first time in 2012. All events were divided into the following categories:

- Road and Criterium Bicycling Events
- Mountain Bike Events
- Bicycle Tours
- Triathlon and Duathlon Events
- Cyclo-cross Events
- Training Camps
- BMX (limited data for this unique category)

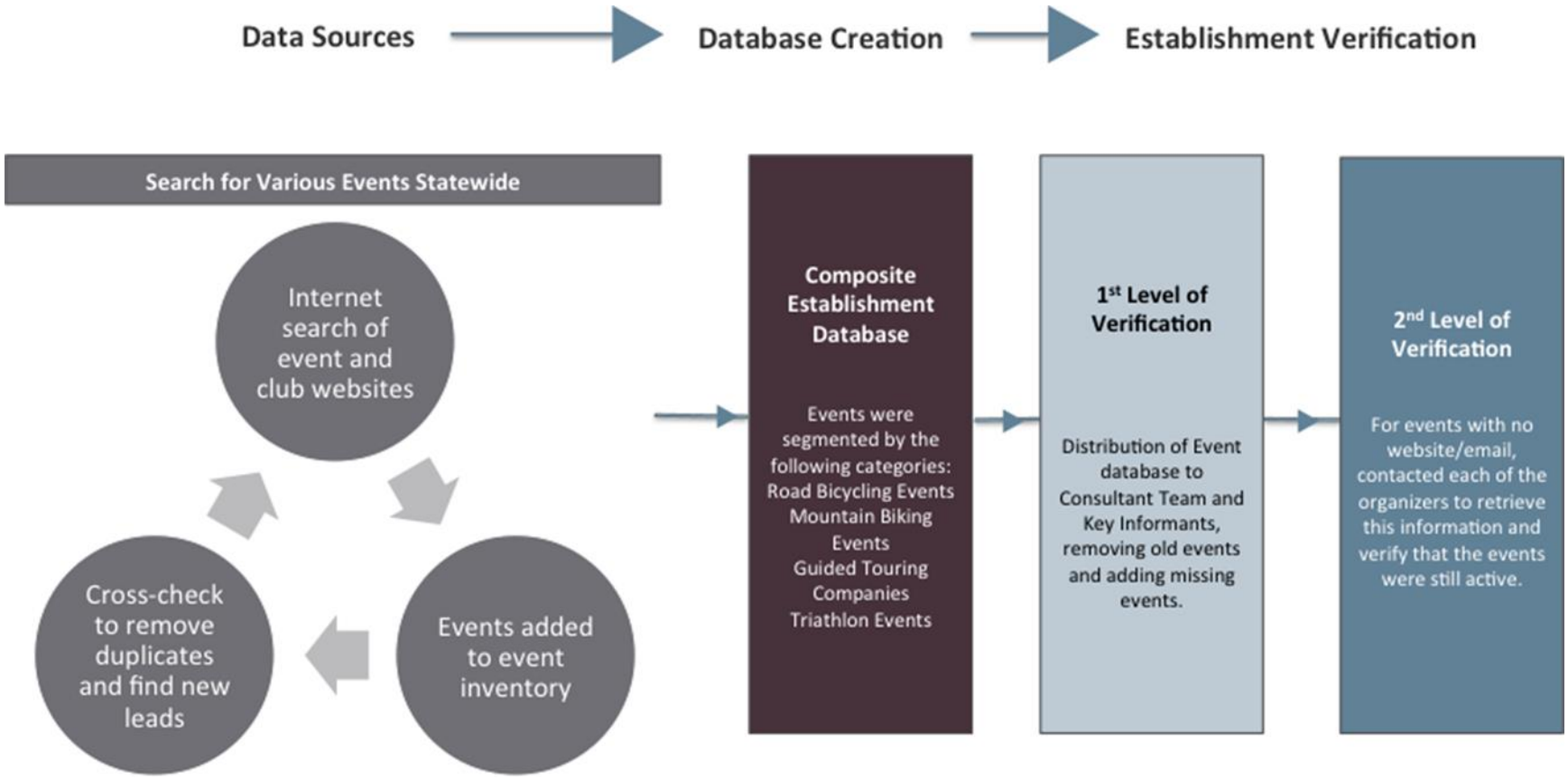
Bicycling events can attract participants from the local or regional area, from across the state, and from outside the state, who gather in the event location and provide local economic benefit. To make a clear distinction between local benefits and state-level benefits, this study focuses on the out-of-state component of participants and their travel parties. Economic benefits are associated with event participants, friends and family, and support staff who travel from out-of-state and require lodging, food and other goods and services. Although "bicycle tourism" also involves visitors who independently travel to Arizona primarily to ride, or are traveling through Arizona on a regional or cross-country tour, this study does not attempt to directly capture that component.[16]

Figure 3-3 on the following page illustrates the process used to complete the event inventory. With the broad range of bicycling events around the state, it is possible that not all bicycling events that occur throughout the state were identified. For example, while bicycling clubs that host rides were included in the inventory, there are likely many informal clubs that host riding events throughout the state. However, the inventory is considered to be representative of and include the majority of formal bicycling events in Arizona. The complete inventory of events is provided in Appendix A3-2.

[16] However, a few respondents to the Participant Survey were independent travelers, as the survey was posted (by others) on a website accessible to the bicycling public.

The event inventory includes the time of year the events are held, event location, event duration (some events are single-day events, whereas others are multiple-day events), average event distance, a brief event description, and event contact information. Where data were available or could be obtained from direct contact, the complete event database includes information on number of participants. The events range from annual events to those held weekly. Some events are nationally organized and part of race circuits while others are leisurely rides for social purposes or to raise money for a cause. The intent of the database is to include events that are current and have also occurred in the past.

**Figure 3-3. Event and tour database compilation methodology**



### 3.4.2 Primary data

***Data collection implementation activities, overall process***

The primary data collection efforts were focused on the following sources of economic benefits, which fall into two primary categories, with the subcategories listed within:

1) Revenues, especially from out-of-state purchasers, generated by bicycle shops, other retailers selling bicycles and bicycle-related goods, including sporting goods and mass merchants (i.e. big-box stores), and manufacturers and wholesalers;
2) Bicycle events and tours, and the out-of-state participants in those events/tours.

For each category and sub-category, primary data collection required unique:

- Survey instruments and contact strategies
- Survey testing outreach
- Preparation and refinement of contact databases – the "universe" of the targeted survey group. (In the case of participants, the database of events was the key to outreach to this group)
- Follow-up on low-response groups
- Follow-up on event/tour responses, for contacting their participants
- Follow-up with selected bicycle dealer survey respondents to attempt to retrieve additional data related to out-of-state sales (based on "permissions" given in the questionnaire response)
- Follow-up with selected event participant respondents to verify expense data reported by category

An overview of the primary data collection activities is detailed on Figure 3-4 (below). The following survey materials can be found in the Appendix document:

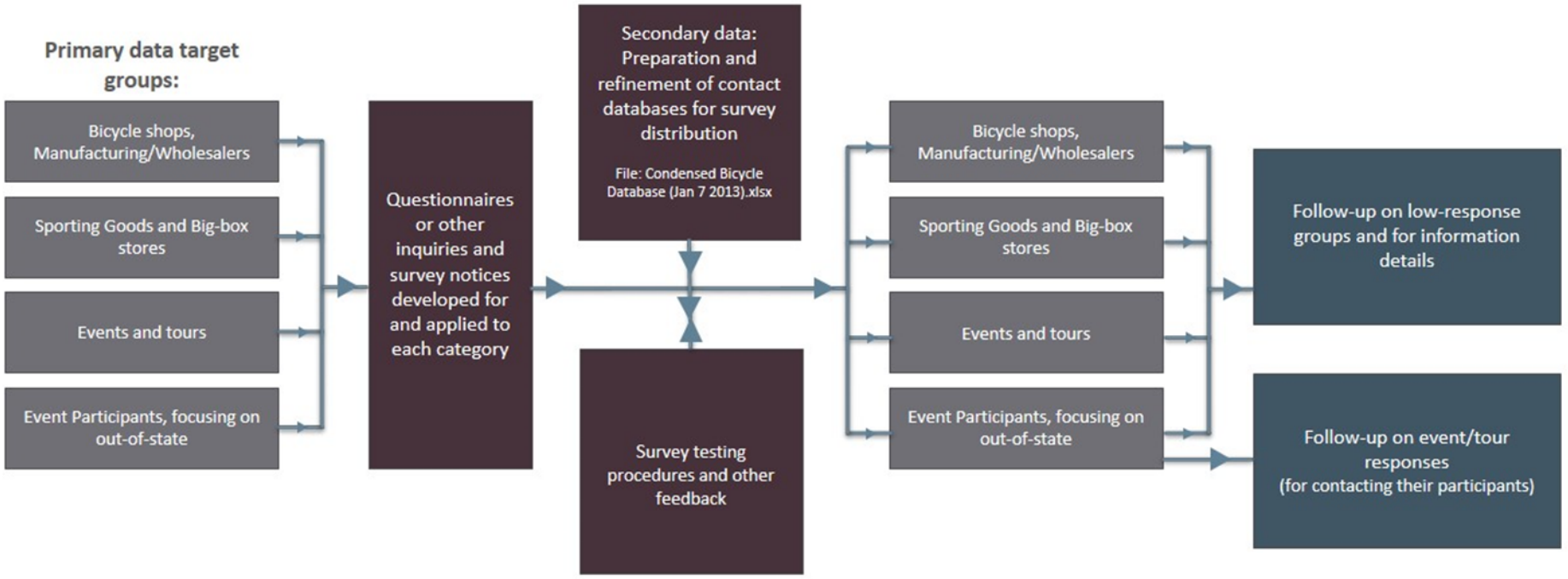
- Invitation for key informants to participate in discussions (Appendix A2-1)
- Advance notices to participate in surveys (Appendix A2-2)
- Questionnaire Drafts (Appendix A2-3)

### *Economic-benefit categories that present particular challenges in documenting due to limited availability of primary and secondary data*

The project consultants had anecdotal evidence that racing teams, product promotions, and other private bicycling activities occur in Arizona on a regular annual basis. The Team was able to obtain some information on elite (professional/amateur) racing teams, but other specific information on product promotions for instance could not be documented.

Based on previous research experience, the consulting team had minimal expectations that data relevant to this study would be forthcoming from any attempts to contact the retail store types engaged in the sale of bicycles and bicycle-related products *other than* the bicycle shops; that is, the mass merchants, sporting goods stores, and the like. Although attempts were made to obtain information from stores of these types, these attempts were unsuccessful.

**Figure 3-4. Primary data collection and implementation activities**



### 3.4.3 Data processing and analysis

***Overall processing and analysis (model development)***

The overall process for the collection, processing and analysis of the primary and secondary sources is outlined on Figure 3-5 (below). The Team developed a set of Computational Matrices that brought together primary and secondary sources to serve as reference material for refining estimates that would be included in the report of findings. This information would also be used as inputs for other analysis models and to calibrate input to the I-O model. The following sections will detail:

- Data processing methods for secondary data
- Processing methods for data categories for which no or minimal primary data were collected
- Processing methods for primary data collected via survey for:
  - Bicycle retailers
  - Manufacturers/wholesalers
  - Event/tour organizations
  - Event/tour participants

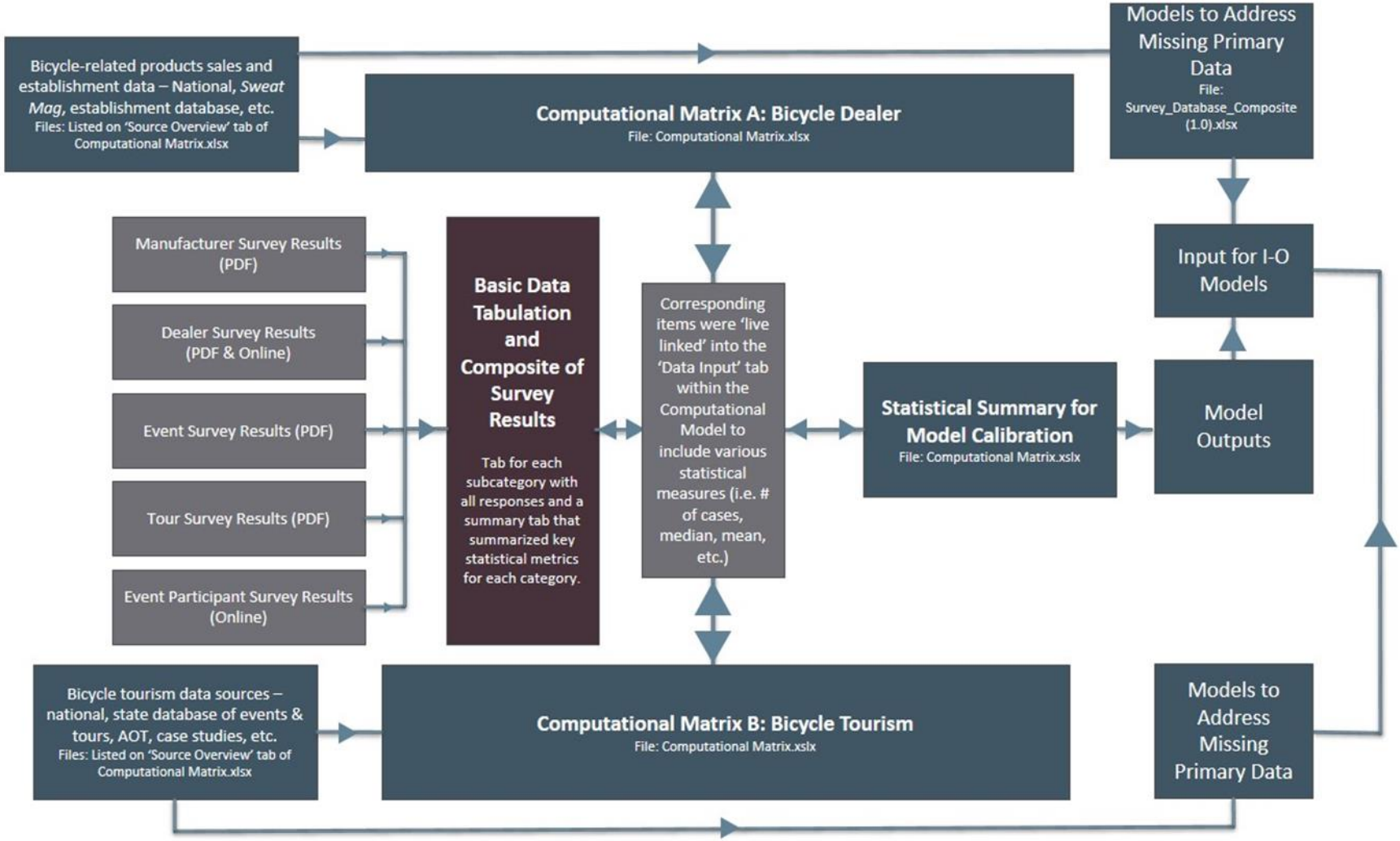
#### Data processing methods for secondary business and event/tour databases

The wide variety of secondary sources, including the previously identified establishment and event/tour databases, were segmented by these two types and added to the two correspondingly themed Computational Models. The computational models act as an intermediary platform for the primary and secondary data sources. Combining the two data types in one modeling system made it easier to compare the findings from the two data types, and to make comparisons such as the sample size from primary data to the full database compiled from secondary data. Where appropriate, the primary data could be calibrated to reflect conditions demonstrated by the secondary data.

#### Data processing and analysis methods for data categories for which no or minimal primary data were obtained

Even though no primary data were obtained from retail store types engaged in the sale of bicycles and bicycle-related products *other than* the bicycle shops – that is, the mass merchants, sporting goods stores, and the like – it was possible to estimate the contribution to total sales of bicycles and bicycle related parts in Arizona made by these kinds of establishments, based on national data that indicate the share of sales attributable to the various categories of stores.

**Figure 3-5. Data schematic for analysis model development**



## Processing of primary data from survey results

*Bicycle dealers and manufacturers/wholesalers*

Results from an on-line survey, and from direct-mailed questionnaires in some case, were collected from 41 bicycle dealer/retailer establishments representing 55 locations throughout Arizona. The distribution of establishment types is shown in Table 3-2 (below).

Results to an on-line survey, and from direct-mailed questionnaires in some case, were collected from 41 bicycle dealer/retailer establishments representing 55 locations throughout Arizona. The distribution of establishment types is shown in Table 3-2 (below).

**Table 3-2. Distribution of respondents to bicycle dealer survey by type**

| Type of establishments | Response count | % of respondents |
|---|---|---|
| Single location | 36 | 87.8% |
| Multiple locations | 5 | 12.2% |
| **Total Responses** | **41** | |
| **Total Number of Establishments Reported** | **55** | |

Source: Arizona Bicycle Dealer Questionnaire, 2012

Survey results, from an e-mailed questionnaire,[17] were obtained from three manufacturers/ wholesalers: one firm engaged in manufacturing only and the other two in both manufacturing and wholesaling. No results were obtained from attempts to contact mass merchants (big-box stores) or sporting goods stores.

*Event and Tour Operators*

Five event sponsors and one touring company responded to the survey that they received by e-mail. Information on 2012 bicycling events and bicycle tour operators in Arizona was also obtained by using Internet search engines. For nearly every bicycling event, participant results were posted by the respective event coordinator on their website or by a third-party "umbrella" group, such as Cycling Event Promotions, Inc. (www.ceptiming.com), Athlinks (www.athlinks.com), and AZ Race Results (www.azraceresults.com).

[17] In a few instances, questionnaires were sent by regular mail to businesses and event sponsors where no other options were available.

*Out-of-State Event Participants*

A total of 132 responses were received through the on-line survey from out-of-state bicycling visitors to Arizona, all but a few of these from event participants (the other were independent tourists). Within the process of distributing surveys to event organizers, the organizers were encouraged to invite their participants to the on-line participant survey. Out-of-state/country participants were also encouraged via Facebook and other social media to provide expenditure information during their event participation stay in Arizona. As noted above, most events posted results of participants. Standard posted results information includes name, place and time of finish, team affiliation, and, often, city/state/country of residence.

### *Relationship of benefit categories to potential assessment of indirect/induced effects using I-O model, and rationale for establishing relationships*

*Direct* economic benefits of the following types can be extended to *indirect* and *induced* benefits that are estimated by the application of models that quantify the multiplier effect within the local economy from such activities:

- For establishments dealing in bicycle and related products, the annual retail sales to out-of-state visitors, as a special subset of all sales.
- Bicycling events and tours that include participation by out-of-state visitors: Spending of all types within the state by out-of-state participants, focusing on the extent of their visitation that can reasonably be related to the bicycling event (and acknowledging the potential for double-counting of tourist spending recorded in the data for bicycle shops).

Note that the key aspect of these two categories is the out-of-state connection.

## 3.5 Findings and conclusions: organization and results

### 3.5.1 Geographic scales of data reporting; state and regions

### *The basis for and definition of study regions*

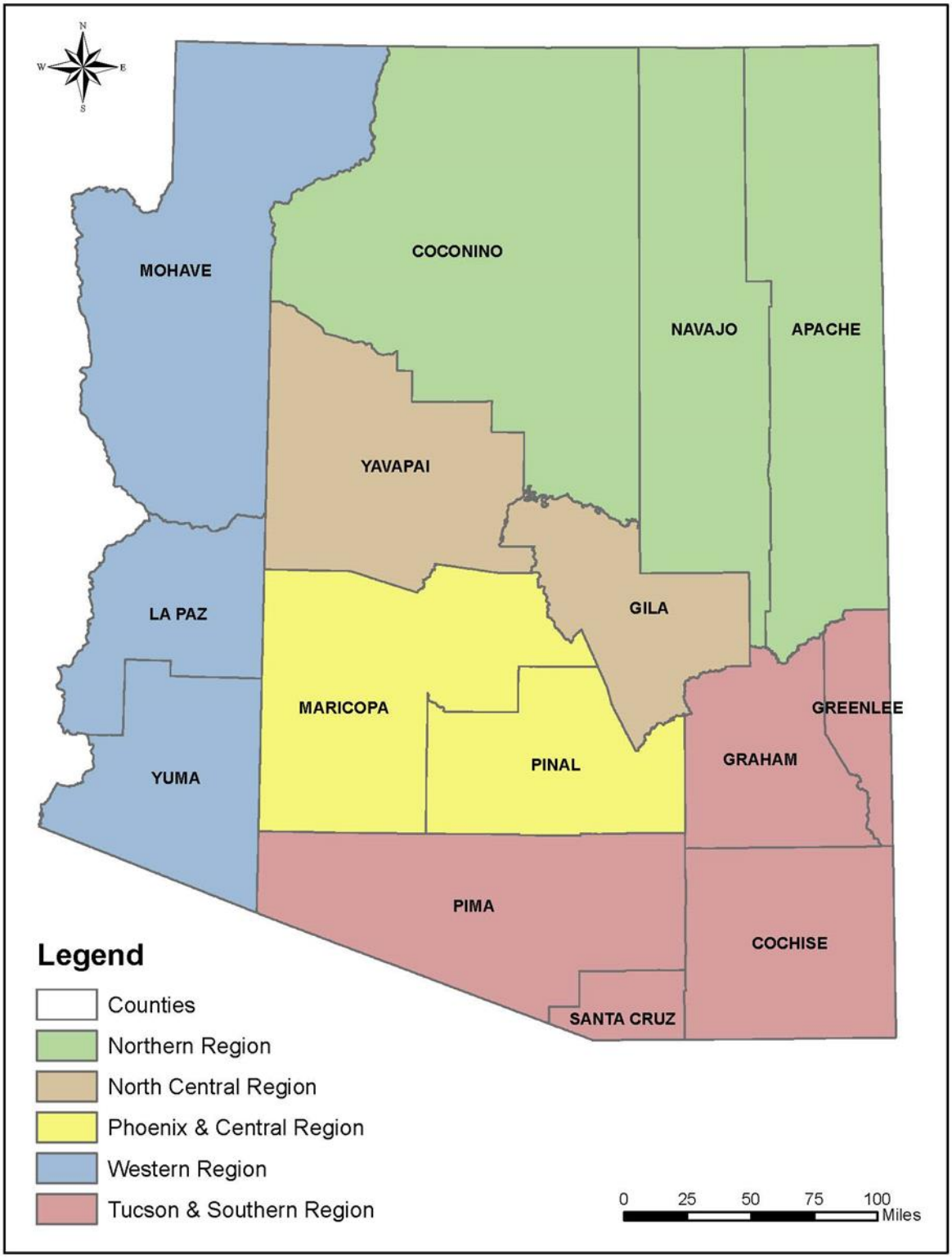
The regions utilized in this study were based on the five (5) regions used by the Arizona Office of Tourism (AOT). The counties that comprise these regions are defined in Table 3-3 and shown on Figure 3-6 (below).

**Table 3-3. Arizona Office of Tourism (AOT) regions and included counties**

| AOT Region | Arizona Counties |
|---|---|
| **Northern** | Apache, Coconino, Navajo |
| **North Central** | Gila, Yavapai |
| **Phoenix & Central** | Maricopa, Pinal |
| **Tucson & Southern** | Cochise, Graham, Greenlee, Pima, Santa Cruz |
| **West Coast** | La Paz, Mohave, Yuma |

Source: Arizona Office of Tourism

**Figure 3-6. Arizona Office of Tourism regions and included counties**




Source: AOT, Kimley-Horn and Associates

### *Counties aggregated to regions for purposes of confidentiality*

The regional framework for reporting study results was particularly useful and appropriate, given the limitations of the primary data collected. Table 3-4 below shows the number of survey responses by type and region. A total of 41 dealer responses were received, half of which were located in the Phoenix & Central region. Three manufacturing/wholesaler responses were received along with five responses from event organizations and one from a touring company.

**Table 3-4. Distribution of survey responses by region**

| Region | Dealer | Manufacturing/ Wholesalers | Event | Tour |
|---|---|---|---|---|
| Northern | 5 | | | |
| North Central | 3 | | | |
| Phoenix & Central | 21 | 2 | | |
| Tucson & Southern | 11 | 1 | | |
| West Coast | 1 | | | |
| **Total** | **41** | **3** | **5** | **1** |

Note: The distribution of event organizers and tour operators are not shown by geography since survey responders had events/tours that spanned multiple regions.
Source: Impacts of Bicycling in Arizona questionnaires (Manufacturing/Wholesale, Bicycle, Event and Tour), 2012

Limited primary (survey-based) data means that many data elements are reportable only at the statewide, or at best regional level, in order to preserve confidentiality and to maximize the confidence of any results. Consequently no attempt has been made in this study to report findings at the county level.

### *Data elements and regional breakdowns*

Based on the survey response counts and therefore data usability, comparisons among regions in this report are generally treated as follows:

- Quantitative data are sometimes discussed in relative terms rather than tabulated
- Non-quantitative data are generalized

Data elements (variables) with this treatment include:

Employment
Total annual revenue

Revenue by product category
Out-of-state revenue estimates
Seasonality of out-of-state purchases
Recession impact

### 3.5.2 Bicycle retailing

The overall goals of the bicycle retailer analysis were to:

1) Use total sales figures as an indicator of economic activity;
2) Use sales data for bicycle dealers as a way to estimate sales from all store types; and
3) Estimate retail sales to out-of-state visitors.

#### *Overall structure of the bicycle retailing environment*

Retail sales of bicycles and related products take place in several distinct establishment types: bicycle shops (dealers), mass merchants such as Wal-Mart and other discount or big-box stores, chain sporting goods stores, and mail order or Internet sites. Bicycle shops account for, depending on the particular data tabulation reviewed (the primary source for this information, cited later in this section, uses differing figures to describe the total bicycle market), either slightly more than or less than half of revenues from sales of all bicycle-related goods. Mass merchants, the big-box stores, account for roughly one-quarter of sales, with the rest going to chain sporting goods stores and the Internet. Among these "channels of trade" (categories of stores including mass merchants, chain sporting goods, etc.), *volume* (units sold) percentages vary significantly from *sales dollar* percentages. Mass merchants for example have a much higher percentage of total unit sales (e.g. 70% in 2011 compared to 20 percent for bicycle shops/OSR,[18] according to the same source cited for the table); since, in general, the bicycles sold in bicycle shops tend to have higher unit prices.

This type of data, showing the allocation of sales dollars among establishment types, was particularly useful to this study. The data facilitated the process of estimating *total* sales from all store types, based on sales estimates for bicycle shops derived from the primary data.

[18] OSR: Outdoor Specialty Retailers, which includes such stores as Scheels, All Sports and Sun & Ski.

### *Broad national trends for bicycle shops*

Nationally, bicycle retailing has experienced a number of trends that have major influences on how these businesses are faring. Although a full discussion of this is beyond the scope of this study, it is instructive to note the following, summarized from *Bicycle Retailer* magazine:[19]

- The number of bicycle dealers nationwide has decreased every year since 2003, from 5,358 (in 2003) to 4,089 in 2012.
- Internet sales have continued to increase as a percent of total sales, with some estimates (the NBDA source cited) claiming that Internet sales are 20% of total bicycle sales as of 2012.
- Internet direct sales from foreign suppliers, in Europe and Asia, are also increasing.
- Data commonly reported in trade magazines do not provide good source material for tracking actual sales trends (in dollars) of bicycles and related products, but available information suggests that sales can fluctuate considerably from year to year.

### *Bicycle-related sales estimates for Arizona retailers*

Estimating total annual sales of bicycle-related goods and services in Arizona involved the following steps:

- Preparing a modeling format that recognized the nature of the information available to generate such estimates; namely that information about revenues to any particular store type was limited to bicycle shops (due to the lack of response to our primary research efforts from big-box and sporting goods retailers) .
- Estimating revenues for bicycle shops based on a combination of Arizona-specific primary (from the survey) and secondary (shop inventory) data. Survey results at the regional level were also examined to help calibrate estimates where regional results varied significantly from the state average.
- Segmenting retail sales within bicycle shops from revenues derived from bicycle servicing and rentals.
- Given that the intent of this analysis was to use bicycle shop data to "back out" the sales figures for other store types, based on national data, verifying that the mix of stores in Arizona was similar to the nation. This analysis is summarized in Table 3-5 below, which shows that total bicycle-related sales by store type, as a percent of total bicycle-related sales for *all* store types, is similar for the US and Arizona.

[19] Annual Stats Issue, July 1, 2012. A publication of the National Bicycle Dealers Association (NBDA). Bicycleretailer.com

- Combining data on bicycle-related retail-sales revenues from bicycle shops with national data showing the percentage of sales of these products among different channels of trade, then calculating total sales based on the percent of sales applicable to bicycle shops, from that percentage data.

The results of this analysis are summarized below in Table 3-6 and Table 3-7.

**Table 3-5. Bicycle-related sales by store type, US and Arizona**

| Store category | Products and services code | Products and services code description | | Product line sales | | Total bicycle-related sales by store type as % of total bicycle-related sales for all store types | |
|---|---|---|---|---|---|---|---|
| | | | | US | AZ | US | AZ |
| Sporting goods stores | 20512 | Bicycles, parts & accessories | | $2,543,565,000 | $55,165,000 | 77.0% | 78.8% |
| Hobby, toy, and game stores | 20512 | Bicycles, parts & accessories | | $299,825,000 | $4,688,000 | 9.1% | 6.7% |
| Department stores (except discount department stores) | 20512 | Bicycles, parts & accessories | | (amounts are negligible) | | | |
| Discount department stores | 20512 | Bicycles, parts & accessories | | $459,531,000 | $10,111,000 | 13.9% | 14.5% |
| Sub-total *without* warehouse category (suppressed for AZ in source data) | | | | $3,302,921,000 | $69,964,000 | 100.0% | 100.0% |

Source: 2007 Economic Census, Product Lines Statistics. Data for the store category of Warehouse Clubs and Supercenters was suppressed for Arizona, so is not included in this analysis. Nationally, this store type accounted for 14 percent of sales in the "bicycles, parts & accessories" product line.

## Sample-based revenue/establishment size

Table 3-6 (below) shows the average reported revenue and establishment size for the survey respondents. Based on the data collected, the average establishment revenue (accounting for responding firms with multiple locations) is $528,616. The total revenue reported for the 17 respondents (representing 21 establishments) providing revenue data, out of the 41 total responses received, was $11.1 million. Applying the same per-establishment average from the survey results to the total bicycle shop inventory yields an estimated annual revenue for all bicycle shops of $76.7 million. Average revenue per establishment is low compared to the national average of $866,817 reported by the National Sporting Goods Association (for 2011).

**Table 3-6. Reported 2011 revenue and establishment size**

| | Responding firms (R) / Establishments (E) (1) | Response average | Establish-ment average | Estimated total 2011 revenue |
|---|---|---|---|---|
| Annual revenue, 2011 | 17R; 21E | $652,997 | $528,616 | $11,100,944 |
| Establishment size, in square feet | 28R; 31E | | 3,073 sq. ft. | $172/SF |
| All Arizona bicycle dealers | 158E | | | $76,651,170 |

(1) Accounts for multi-location operations

Source: Impact of Bicycling in Arizona Bicycle Dealer Questionnaire, 2012

Although the sample sizes within regions were small, especially for the regions outside the Phoenix area, and therefore findings have limited reliability, average revenues were lowest in the North Central region and lower in the Tucson & Southern region than in Phoenix & Central.

## Total revenue estimates

Table 3-7 (below) combines data on bicycle-related retail-sales revenues estimated for Arizona bicycle shops with national data showing the percentage of sales of these products among different channels of trade. Applying these same percentages to Arizona bicycle shop sales produces an estimate of total sales. (Note that cells in the table are blank where data do not exist or are irrelevant.)

**Table 3-7. Arizona sales estimates based on allocation of sales by channels of trade**

| Channels of trade (types of retail stores) | Adjusted market share, with assumption of 20% to Internet (2) | Total est. AZ bicycle shop revenues excluding service/rentals | Estimates for other channels of trade, based on AZ bicycle shop sales | Total for Arizona (3) |
|---|---|---|---|---|
| Bike shops + OSR (1) | 45.7% | $65,139,495 | | |
| Mass merchant | 22.4% | | $31,874,083 | |
| Chain sporting goods | 11.9% | | $16,948,917 | |
| Other [represents Internet sales in this table] | 20.0% | | $28,484,299 | |
| Total AZ sales, all channels, excluding service/rentals and *including* Internet | 100.0% | | | $142,446,794 |
| Total retail sales in AZ from all channels of trade, *excluding* Internet sales | | | | $113,962,494 |

(1) OSR: Outdoor Specialty Retailers, which includes such stores as Scheels, All Sports and Sun & Ski.
(2) Source: Figures are adjusted from data in BicycleRetailer.com (NBDA), Annual Stats Issue. July 1, 2012 (data for 2011), to reflect other material (in the same source) that states Internet sales constitute 20% of the total.
(3) Authors.

### *"Bicycle" sales by categories of goods sold by retailers*

According to the survey data, Arizona bicycle shops secure on average about 45 percent of their revenues from the sale of bicycles, based on 25 survey responses representing 30 establishments. Approximately one-fourth of revenue comes from bicycle parts and accessories sales. The final component of revenues is divided among clothing and shoe sales (10%, based on 23 responses representing 27 establishments), and bicycle repair and rentals (18%, based on 25 responses representing 30 establishments). Among regions, clothing/shoes was a higher proportion of revenues in the Phoenix & Central region.

These figures for Arizona overall are similar to national data (NBDA, see Table 3-7 for source), which show that, excluding revenues from servicing and rentals, bicycle sales are 60% of revenues and parts, accessories, etc. are 40%. The corresponding figures for Arizona (ignoring the service/rental category) are 62% and 38%.

The database from *Sweat Magazine* provides additional insight into the product lines and other operations within Arizona bicycle shops. Table 3-8 (below) shows the percent of shops that carry the product lines or engage in the services or other activities listed in the table.

**Table 3-8. Products and services in Arizona bicycle shops**

| Product lines | % of AZ shops |
|---|---|
| Cycling Clothes | 96.2% |
| Nutrition Products | 84.9% |
| Women's Only Products | 89.6% |
| Sell Used Bikes | 50.0% |
| **Services/activities** | |
| Club/Team Affiliation | 74.5% |
| Group Discounts | 72.6% |
| Store Seminars | 56.6% |
| Rentals | 45.3% |
| Group Rides From Store | 66.0% |

Source: *Sweat Magazine*. The Bike Issue 2012. Vol. 21, No. 2. S.W.E.A.T. Marketing, Inc. Used with permission.

### *Arizona bicycle shop sales to out-of-state visitors*

Purchases of bicycle-related goods and services in Arizona by visitors from other states constitute a specific tourism-related benefit associated with bicycling activity in the state. Estimating such purchases within this study involved two survey-based approaches:

1. Asking bicycle shop owners or managers, in the survey directed to them, to estimate sales to out-of-state visitors;
2. Asking out-of-state visitors attending Arizona bicycling events, within the survey directed to that group, about their expenditures, including bicycle-related purchases, while they were in Arizona.

The first approach included the assumption that most sales to visitors would be made within bicycle shops, rather than mass merchants, sporting goods stores, etc. This assumption is somewhat conservative, but is also based on the reality that we were unable to obtain sales information of any kind from the mass merchants or sporting goods stores. The assumption also reflects the intuitive notion that bicycle tourists are most likely to be interested in the kind of specialized products more likely to be found in bicycle shops rather than mass merchandise outlets.

Results of the survey of bicycle shops indicated that a relatively high proportion of sales are made to out-of-state visitors, as shown in Table 3-9 (below). However, the sample size for this information was small, 13 responses representing 15 establishments. Respondents were asked whether the estimates they gave were based on a "review of sales records," or a "best guesstimate." Estimates based on review of sales records (5 responses) tended to be smaller than the guesstimates, so our reported estimates, shown below, were adjusted to reflect this and the fact that the small overall sample size calls for a conservative approach to these estimates (although service/rental activity might not be fully captured in either the survey of shop owners or the participant surveys, and this topic should receive additional attention in any future updates).

**Table 3-9. Bicycle shop revenues and out-of-state sales estimates**

| Estimated Total Revenues, Bicycle Shops | | Estimated % Out-of-State Sales | | Estimated Dollars, Out-of-State Sales | | |
|---|---|---|---|---|---|---|
| For parts, clothing, etc. | Bicycles only | For parts, clothing, etc. | Bicycles only | For parts, clothing, etc. | Bicycles only | Total |
| $29,465,968 | $35,673,527 | 35.0% | 25.0% | $10,313,089 | $8,918,382 | $19,231,470 |

Source: Arizona Bicycle Dealer Questionnaire, 2012, McClure Consulting, LLC

### Seasonality of out-of-state purchases

Respondents were asked, "Which season(s), if any, do you estimate that sales to out-of-state visitors are higher than the annual average?" According to the 32 responses to this question (representing 41 establishments), spring and winter are essentially tied for the top seasons for sales to out-of-state visitors (indicated by over 70% of respondents), fall is second (46% of respondents), and summer (14%) a distant last. In the North Central and Northern regions, winter was the low season and the other seasons had roughly equal designations as the top sales seasons.

Of 30 firms responding, 21 stated that they observed an increase in sales to out-of-state visitors when major bicycling events were occurring in the city (county) where their establishment was located.

## *Employment, shop area, and other characteristics of Arizona shops, and comparisons of Arizona to national data*

### Employment

The surveyed firms represented 294 full- and part-time employees (including seasonal workers), constituting an estimated 232 Full Time Equivalent (FTE) employees, as shown in Table 3-10 (below).

**Table 3-10. Bicycle dealer employment, by type, survey respondents**

| Type of establishments | Response count | Total | Establish-ment average |
|---|---|---|---|
| Full Time Equivalent work force | 41 | 231.9 | 5.2 |
| Total for full-time, part-time, seasonal/temporary workers | 41 | 294.0 | 6.5 |
| Full-time | 36 | 163.0 | 3.6 |
| Part-time | 31 | 101.0 | 2.5 |
| If applicable, average hours per week for a part-time worker | 30 | | 22.8 |
| Seasonal/temporary | 14 | 30.0 | 1.36 |
| If applicable, average number of weeks for seasonal/temporary workers | 14 | | 8.57 |

Source: Arizona Bicycle Dealer Questionnaire, 2012

According to the survey data, the average full-time equivalent (FTE) employment for all establishments is 5.15. Based on this number, an estimate for all Arizona bicycle shops is 814 FTE (figures based on numbers that are not rounded). The Tucson & Southern and Northern regions produced the highest FTE averages based on the survey responses. North Central and West Coast figures were lowest. The overall establishment average for the total employment count (including full-time, part-time, seasonal/temporary workers) is 6.5. Average figures for seasonal/temporary employment (per establishment) among the regions range from less than 1 to 3.5. These figures are based on:

- Full-time: 36 responses representing 45 establishments
- Part-time: 31 responses representing 40 establishments
- Seasonal/temporary: 14 responses representing 22 establishments

## Employment, estimate of total for all bicycle retailing in Arizona

The following process was used to estimate total employment in *all* types of bicycle-related establishments in Arizona:

- Translating estimates of total employment in bicycle shops to "retail only" employment, based on data in Sweat Magazine, which indicate that an average

of 2.7 employees per establishment are mechanics (based on 103 cases in the magazine's database).20

- Taking the retail-only employment in bicycle shops as a starting point, assume that employment in other store types is proportional to sales dollars attributable to store types other than bicycle shops (a more conservative assumption than one based on proportionality of units).
- Adding back the estimated number of bicycle-shop mechanics.

This process yielded a total employment estimate, for all store types, of 1,110 FTE, including mechanics.

Survey respondents were asked whether the Recession constituted a "minimal" or "significant" economic effect to their business. The results are shown below in Table 3-11.

**Table 3-11. Degree of impact of the Recession on business activities**

| | |
|---|---|
| Minimal economic effect | 36.7% |
| Significant economic effect | 63.3% |
| **Total responses** | **30** |

Source: Arizona Bicycle Dealer Questionnaire, 2012

Survey data indicated that the average size of an Arizona bicycle shop was 3,073 square feet (28 firms responding, representing 31 separate establishments). The *Sweat Magazine* database indicates that the average size of Arizona bicycle shops, based on input from 101 shops, is 3,893 square feet. This difference suggests that the estimates in this report, based on the survey data, are conservative.

The median number of years that stores have been open is 16, according to *Sweat*.

[20] The *Sweat Magazine* database and the inventory database assembled for this study, derived from a variety of sources and largely confirmed through direct contact, do not exactly match, at least in part due to the different time periods over which the databases were assembled and the volatility of this business type (in Arizona and also elsewhere in the U.S.). However, the type of database summaries from the magazine included in this report should remain relatively valid, even with some additions and subtractions to the list. Data are used with permission.

### *Retailing data by Arizona region*

## Survey responses

Table 3-12 (below) provides a breakdown of the bicycle dealer survey responses by region. However, not all questions were addressed by every respondent, as noted in the preceding discussions of individual report topics. While compilations of survey data by region were prepared for the topics of employment, revenues, sales by type of goods/services, and sales to out-of-state buyers and the seasonality of those sales, limited responses to some of the questions necessitated that regional-level data be consolidated for some data elements.

**Table 3-12. Survey response count and number of establishment reported by region**

| Arizona region | Total responses | Number of establishment reported | Total number of bicycle dealers identified, universe | % of establishments represented |
|---|---|---|---|---|
| North Central | 5 | 5 | 8 | 62.5% |
| Northern | 3 | 4 | 10 | 40.0% |
| Phoenix & Central | 21 | 32 | 95 | 32.6% |
| Tucson & Southern | 11 | 13 | 42 | 31.0% |
| West Coast | 1 | 1 | 8 | 12.5% |
| **AZ Total** | **41** | **55** | **163** | **33.1%** |

Source: Arizona Bicycle Dealer Questionnaire, 2012

## Regional comparisons

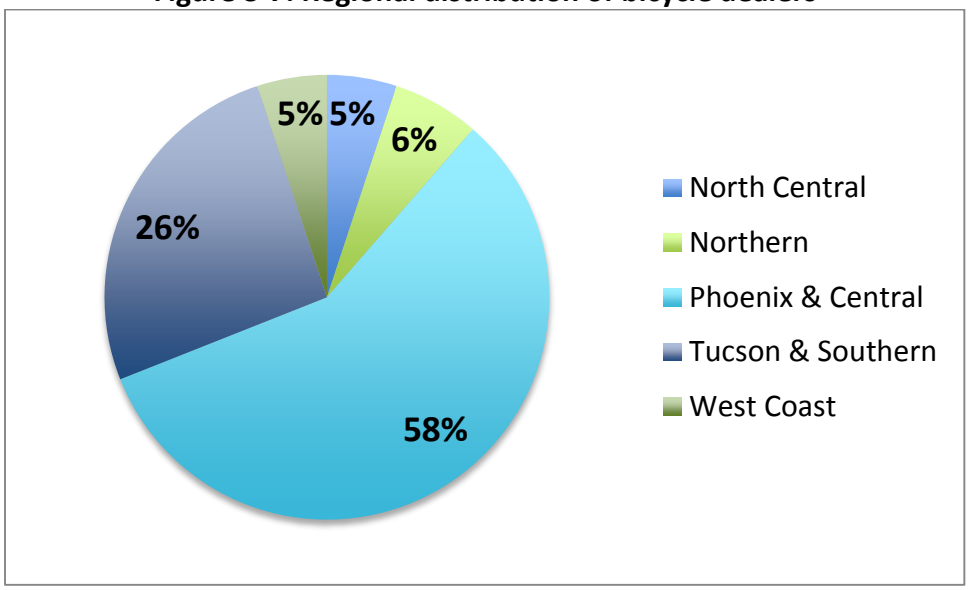
The following series of bullets provides a summarized comparison of estimates to bicycle-related activity in the Arizona bicycle dealer industry, by region, based on data received during the surveying process:

- **North Central region**: Of the regions with reportable data, the North Central region had the lowest reported average annual revenue per establishment. This region accounts for the second lowest percentage of annual revenue attributable to bicycle sales and the highest percentage for bicycle parts/accessories and bicycling clothing, shoes, etc. For bicycle rental and service, the region is comparable to figures reported within the Phoenix & Central region.
- **Northern region**: Only one survey respondent from this region; unreportable.

- **Phoenix & Central region**: The Phoenix & Central region had the second-highest average annual revenue per establishment, but this figure was, however, still well below the US bicycle shop average of $866,817 for 2011. The region also had the highest reported percentage of annual revenue attributable to bicycle sales, and the second-lowest reported percentage of revenues for bicycle parts/accessories and the lowest for bicycle servicing and rentals. For bicycle clothing/shoes, the region has the highest reported revenue percentage.
- **Tucson & Southern region**: The Tucson & Southern region has the lowest reported percentage of annual revenue attributable to bicycle sales and the highest report value for bicycle servicing and rentals. The region yielded the second lowest reported percentage of revenues for bicycle clothing/shoes and the second highest for bicycle parts/accessories.
- **West Coast region**: Only one survey respondent from this region; unreportable.

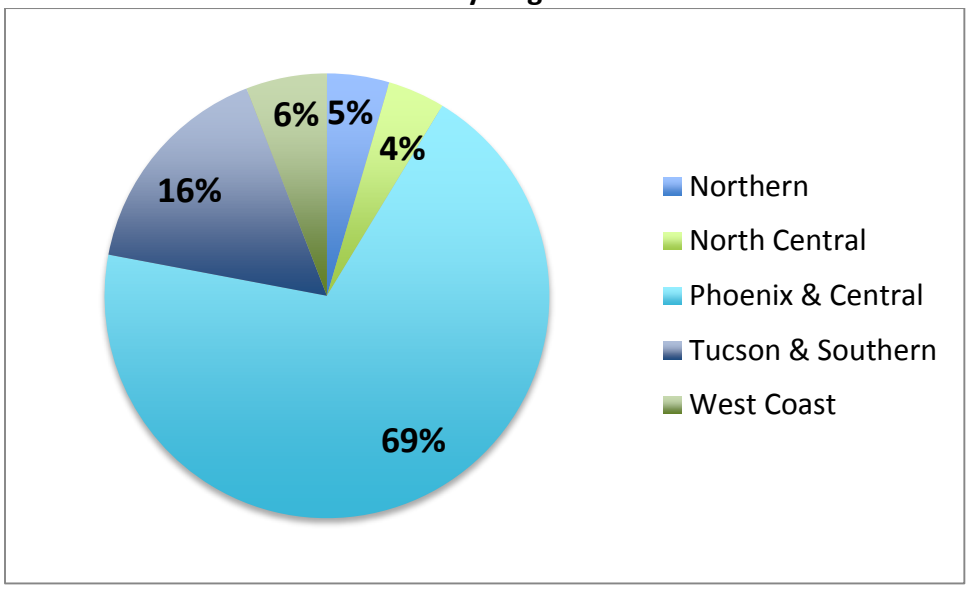
Figure 3-7 and Figure 3-8 (below) together compare the percent of bicycle dealers in Arizona regions with the regions' share of Arizona employment in 23 industries with a potential connection to bicycling. (Figures are approximate because actual data are not available for all industries in all counties.) A comparison of the two charts indicates that Tucson has a much higher percentage of bicycle dealers than employment in the underlying industries.

**Figure 3-7. Regional distribution of bicycle dealers**




Source: Table 3-12

**Figure 3-8. Regional share of Arizona employment in industries with a potential connection to bicycling**




Source: EMSI employment data for Arizona counties, 2011.

### *Use of I-O models in the analysis of economic benefits*

The principal tool used in ascertaining economic impacts associated with bicycling activity is an I-O model. At its roots, an I-O model is an accounting method to describe a specific regional economy. One can actually think of an I-O model as a spreadsheet of the regional economy where the columns represent the buyers (demand) and the rows are the sellers (supply). Any particular cell where a column and row intersect is the dollar flow between the buyer and seller of a particular good or service. The sum of a particular row is the total supply (in dollar value of output or sales) of that particular industry and the sum of any particular column is the total demand of the industry. Given the laws of supply and demand within competitive markets, total demand must be equivalent to total supply.

The utility of the input-output approach lies not solely in its effective data accounting framework, but in its ability to trace small changes in one part of the economy throughout the entire regional economy. There are several measures used to gauge the economic effects, including industry output (sales), income, and employment. Because the input-output approach is based on dollar flows or sales, the impacts are generally displayed in total output or sales. In practice, impacts are most readily understood when industry output (sales) are converted to income and employment.

The derived economic multipliers from the input-output analysis are composed of three segments. The first part is the direct effect that caused the initial change in the economy.

This initial direct action will have a rippling effect throughout the economy. This rippling effect is captured by the second component of the economic multiplier (indirect effect) and the third component, referred to as the induced effect. Indirect effects are generally business-to-business transactions. Induced effects refer to wages and salaries paid to employees and the spending of their incomes in the regional economy.

There are a number of input-output modeling systems available for use in this study of the economic effects of bicycling activities in Arizona. In this report, we are utilizing the Redyn modeling system to ascertain the scope and scale of economic effects of bicycling activities in Arizona.

In comparison to results of studies of the economic impact of bicycling in other states, reviewers of this report might ask why these economic effects of bicycling activities in Arizona are rather modest. First, an economic impact assessment focuses on export activity—product/service sales to customers located outside of the region. Such export activity introduces new spending into the regional economy. This new injection of money into the economy causes a ripple (or "multiplier") effect throughout the rest of the economy. Through the use of an I-O model, we can track and measure this economic impact. Second, the dominant market niche of Arizona in bicycling activities is hosting various events—bicycle road races, "ironman" triathlons, extreme (e.g., 24 hours) mountain bike events, elite training camps, and unique operated bicycle tours. All of these events draw thousands of participants to the roads, trails, and scenic vistas of Arizona, but only for a brief period of time—for instance, a competitive event with an additional two to three vacation days in Arizona with the participants' family.

### *Estimates from I-O modeling: retail and manufacturing*

Impact results based on out-of-state bicycle-related retail sales were estimated through the use of a calibrated I-O model for Arizona. Retail sales figures were adjusted to reflect the fact that only the margins are applicable to local impacts, which more accurately and conservatively expresses the multiplier effects of these purchases than the full retail sales figures.

Bicycle-related retail sales to non-residents include purchase/rental of bicycles and related equipment; clothing, shoes, and accessories; parts and tires; and miscellaneous. The total economic activity associated with these "export" retail sales is presented below in Table 3-13. The table shows the total and direct (as a sub-set of the total) effects, for the Redyn model output categories of:

Jobs
Total output

Disposable income, and
Labor income

Due to the modest size of bicycle manufacturing and distribution activity in Arizona (see following section), particularly at the regional level, impact modeling estimates for these sectors were included within findings from the retail trade sector.

**Table 3-13. Economic effects of bicycle retailing and manufacturing/wholesaling, Arizona**

| | Total Effects | | Direct Effects |
|---|---|---|---|
| **Jobs** | | | |
| North Central | 16 | | 9 |
| Northern | 13 | | 9 |
| Phoenix & Central | 221 | | 97 |
| Tucson & Southern | 54 | | 29 |
| West Coast | 13 | | 9 |
| Arizona Statewide Total | **317** | | **154** |
| | | | |
| $2013 (000s) | | | |
| **Output** | | | |
| North Central | $1,400,964 | | $863,332 |
| Northern | $1,116,846 | | $792,622 |
| Phoenix & Central | $47,152,362 | | $22,847,444 |
| Tucson & Southern | $6,725,950 | | $3,826,439 |
| West Coast | $1,221,457 | | $842,505 |
| Arizona Statewide Total | **$57,617,579** | | **$29,172,344** |
| | | | |
| $2013 (000s) | | | |
| **Disposable income** | | | |
| North Central | $833,596 | | $476,083 |
| Northern | $505,121 | | $342,851 |
| Phoenix & Central | $13,455,591 | | $6,193,731 |
| Tucson & Southern | $2,829,893 | | $1,426,317 |
| West Coast | $528,204 | | $362,866 |
| Arizona Statewide Total | **$18,152,405** | | **$8,801,848** |

Source: Authors; Redyn model.

### *Qualifications of the findings*

The findings reported in this document are, as described throughout the text, often based on small survey samples. The findings were reviewed in comparison to other data available, at both the local and national level. Based on these reviews, figures used in the report represented either conservative or consistent results, in comparison to other information. However, many of the findings should still be considered tentative and at best estimates rather than statistically valid conclusions that can be extended to the entire "population" of interest, for example Arizona bicycle retailers, with confidence.

### 3.5.3 Manufacturing and wholesaling

#### *Overview of domestic production versus imports, nationally*

The manufacture of bicycles, and bicycle parts and accessories, of course occurs worldwide. Nevertheless, based on information in *Bicycle Retailer,*[21] imported bicycles constituted only 16% of the US bicycle retail market in 2011. A casual review of the literature suggests that locations, demand for specific types or brands of products, and other aspects of bicycle-related manufacturing change fairly rapidly and extensively. A full discussion of this kind of activity is beyond the scope of this report, but this simple observation is worth noting in terms of how prospects for additional manufacturing activity in Arizona can be perceived.

#### *Summary of information obtainable for manufacturing and wholesaling in Arizona*

Bicycle-related manufacturing and wholesaling in Arizona is limited to a few small firms, as shown below in Table 3-14. Only eleven firms were identified in the process of compiling a database for these activities, distributed among the regions used for this study as shown below. Of these, three responded to the survey designed for manufacturers and wholesalers. A limited amount of data was obtained through Internet searches of the remaining firms. Given the small number of firms and survey responses, only very generalized information about Arizona manufacturing/wholesaling firms can be shared in this report.

**Table 3-14. Distribution of manufactures/wholesalers by Arizona region**

| Region | # of Bicycle Manufacturers/ Wholesalers |
|---|---|
| North Central | 0 |
| Northern | 1 |
| Phoenix & Central | 8 |
| Tucson & Southern | 2 |
| West Coast | 0 |
| **Totals** | **11** |

Source: Arizona Manufacturer/Wholesaler Dealer Questionnaire, 2012, and Internet searches.

We estimate that total Arizona FTE employment for this group is approximately 75-90, based on a combination of web-based sources and survey responses. Several firms have only 1 to 3 employees. This employment estimate can be converted to an "earnings" estimate using data

[21] Annual Stats Issue, July 1, 2012. A publication of the National Bicycle Dealers Association. Bicycleretailer.com

from EMSI on average earnings by industry for Arizona.[22] Using this factor, the earnings estimate is $3.6 million to $4.32 million.

The firms produce a range of goods, both individually and as a group, including different types of bicycles and custom bicycles, nutrition products, bicycling accessories, and bicycle racks. Several firms are involved in both manufacturing and wholesaling (including Internet sales). One firm is both a custom bike builder and a dealer of bicycles manufactured by others. Only three firms are, to the best of our knowledge, exclusively engaged in wholesaling (in Arizona operations). Two of the three survey respondents stated that their exports (from Arizona) constituted 90% of their business; the third stated 20%. Given the nature of the other firms, it is probably safe to assume, as an estimate, that out-of-state sales constitute well over 50% overall. Survey responses from two of the three firms indicated that their experience with the Recession constituted a "significant (as opposed to minimal) economic effect."

### 3.5.4 Bicycle tourism in Arizona

#### *Nature of bicycle tourism as subset of sports tourism—a spectrum of bicycle tourism*

Sports tourism is an emerging component of tourism/economic development. According to sportanddevelopment.org, self-described as "the international platform on sport and development," "Today, more and more national and international development organisations [sic] are using sport to add to their approaches in local, regional and global development . . ."

Bicycle tourism, especially if defined as travel associated with organized, sometimes competitive events, is a subset of the growing sports tourism phenomenon.

#### *Focus on discrete events—organized rides*

Bicycle event categories addressed in this report include the following:

- Road Bicycling Events
- Mountain Bike Events
- Bicycle Tours

[22] The figure applied $48,000 (2011 dollars), is a rounded average of the earnings per employee, for Arizona, for two industries (the earnings figures of the two are similar): Motorcycle, Bicycle, and Parts Manufacturing, and Sporting and Recreational Goods and Supplies Merchant Wholesalers.

- Triathlon and Duathlon Events
- Cyclo-cross Events
- Training Camps
- BMX events, to a limited degree

***Aspects of bicycle tourism***

### Most involve travel (other than bicycle) between places

Bicycling events are (except for the very largest, such as the Tour de France for example) primarily participatory rather than primarily spectator events, and therefore involve "committed" attendees who might include per-event training or other associated activity along with direct event participation. Participant attendance involves therefore not just travel but travel with distinct purposes. It is less "discretionary" than typical leisure travel.

### On-road bicycling and off-road mountain biking

While on-road cycling has a direct connection to roadways that are of particular interest to ADOT, off-road mountain biking, especially in a place like Arizona where opportunities for such activity are abundant, also attracts out-of-state tourists. These visitors might participate in a mountain-bike event or simply use mountain biking trails independently.

### Individual and group bicycle tours

Although there are individuals who travel to Arizona primarily to tour on their bicycles, or are traveling through Arizona on a regional or cross-country tour, no attempt has been made to document this type of activity for this study. However, there are also commercial tours that feature bicycles and operate in the state, and these tour operators might be based in Arizona or elsewhere in the US. This study identified 11 tour operators for which data (mostly secondary data) were compiled and analyzed.

### Day bicycle rides where bicycling is one of a number of activities undertaken during vacation excursion

For visitors using their bicycles while on vacation in Arizona, riding could be an incidental activity or a primary purpose of the trip.

### Some cycling takes place within a rather restricted spatial context

While road events and tours could have a wide geographic extent, some bicycling events operate within specific areas, in relation to special facilities. These include mountain biking events, which might occur on National Forest land, and cyclo-cross events. For these cases, event benefits are more likely to be concentrated in a specific community.

## Role of recreation in bicycling

An "independently recreating bicyclist" (not participating in an event) could represent any one of a number of conditions:[23]

- "Self-contained travelers: These cyclists and travelers take their gear along on the ride and mainly need camping, grocery, and Internet access.
- Ride-centered travelers: These cyclists and travelers tend to stay overnight in one location and go riding during the day.
- Event-centered travelers: These travelers participate in organized rides or event rides. These kinds of travelers also include spectators at racing events.
- Urban-cycling travelers: These travelers arrive in a community and spend all or some of their time in the community traveling by bicycle. These travelers may also sightsee locally by bicycle."

### *Bicycle tourism definitions*

For the purpose of this study, bicycling events and tours are considered "bicycle tourism" and are the core component of information through which economic benefits of bicycle tourism in Arizona are estimated. Although local benefits accrue to locations where events are held from any participant party that travels to that location from another community, the focus in this study is on state-level benefits and consequently on out-of-state participants and their travel parties. When compiling data for such participants, whether by survey or reviewing postings of event results, the possibility that seasonal residents of Arizona might be listed (or responding to a survey) based on their permanent address. Seasonal residents will not necessarily have the same spending patterns as tourists. Future studies can include methods for taking this possibility into account.

### *Bicycle tourism spectrum in Arizona*

All bicycle tourism activity was categorized as follows:

- **Road Bicycling Events**. Road bicycling events include races and events that are held on paved surfaces. These events vary by level of difficulty and type. Some are competitive races or time trials, but many are social rides or rides for charities. Most road bicycling events are held during the daytime, but many are held over multiple days.

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[23] Heidi Beierle, (Department of Planning, Public Policy & Management, University of Oregon) *Bicycle Tourism as a Rural Economic Development Vehicle*, June, 2011, p. 6.

- **Mountain Bike Events**. Mountain bike events take place on unpaved or natural surfaces. Mountain bike events can be leisurely rides or races, including time trial races. In a time trial race, participants ride multiple laps of a fixed course. Although most mountain biking events are held during the daytime, there are more nighttime events for mountain bikes than for any other type of event.
- **Bicycle Tours**. Events categorized as Bicycle Tours are those that are hosted by touring companies that take tourists of all levels, ages, and abilities on rides as part of a vacation package or training. Most of these rides are for multiple days and vary by degree of difficulty; some are family friendly, while others are geared towards more competitive cyclists. Some of these tours specialize in training cyclists for major rides, such as the Tour de Tucson. Most of bike-operator tours provide inn accommodations and meals in their package price. These particular tours were selected as part of this inventory because they are notable and are focused solely on bicycling. These tours may pass or stop at historical or cultural sites, but the main experience for the tour is the bicycling.
- **Triathlon and Duathlon Events**. Triathlon and duathlon events are mostly held during the daytime for a single day. In addition to the traditional triathlons, some triathlons and duathlons are held indoors. Duathlon events were only inventoried if one of the legs included bicycling. As with the road and mountain biking types of events, these events include both qualifying races and less competitive rides.
- **Cyclo-cross**. Cyclo-cross is a form of bicycle racing, generally consisting of a number of laps of a short course featuring pavement, wooded trails, grass, steep hills and obstacles requiring riders to quickly dismount, carry their bikes while navigating the obstruction and then remount. Cyclo-cross bicycles are similar to racing bicycles (e.g., lightweight, narrow tires, and drop handlebars), but also share characteristics with mountain bikes such as knobby tread tires and cantilever style brakes for clearance needed due to muddy conditions.
- **Training Camps**. Arizona, primarily the greater Tucson area, is home to several elite bicycle and triathlete training camps. These multi-day residence camps—operated during the spring and late fall months--provide coach-directed road training and nutrition-based meals. In addition, southern Arizona has become a training venue for world-class professional cycling teams.
- **BMX (bicycle motocross)** racing also occurs in Arizona, and while this category of bicycling is, in the context of this study, a "fringe" activity with little direct connection to bicycle infrastructure for which ADOT would be responsible, BMX events do involve bicycles, even if these are very specialized, and BMX events attract

participants from outside Arizona. BMX event riders use specialized tracks (sometimes indoors) and typically do not rely on on-street infrastructure. For these reasons, BMX events are included only selectively in the event tallies discussed below, as noted.

Data pertaining to the BMX Winter and Southwest National events were retrieved from the USA BMX (The American Bicycle Association) website (http://www.usabmx.com). BMX tracks in Arizona, according to available data, are found in the cities of Phoenix, Tucson, Surprise, Chandler, Goodyear, Yuma, and Bullhead City, and a track is expected to be developed in Mesa. A major BMX organization, USA BMX, has its offices in Gilbert, Arizona.

### *Bicycle tourism coverage—link with survey data*

When the on-line survey instruments for out-of-state participants were designed for this study, the working assumption was that these people would be contacted by the event sponsors via the sponsors' e-mailing lists, so that the potential respondents would be screened for the desired cohort – that is, the out-of-state event attendees. In practice, the notice of the survey was publicly posted on one or more organizational websites (by others acting independently), with the emphasis on out-of-state participants somewhat obscured in the process. Consequently, both in-state and out-of-state bicyclists responded to the survey. Nevertheless, the latter group consisted of 132 questionnaire respondents through the online survey system, approximately half of which submitted usable expenditure information, and most of the other travel characteristics described below are based on usable responses from 50 to 65 percent of respondents. Some interpretation was applied to the expenditure results, given the nature of some of the response patterns.[24]

While this report refers to this group as "event participants," the fact that the notice of the survey became public means that out-of-state respondents who were individually touring could also have participated. In the questionnaire, respondents were asked, "How did you become aware of the event?" Of the 127 respondents who answered this question (a very high response rate for an open-ended question, and an (informal) indicator of the level of interest in Arizona

[24] For example, although the expenditure question asked about "per day" expenditures, submitted transportation costs were modified in some cases, because they appeared to reflect total transportation costs for the entire trip, not per day. Also, the nature of open-end responses to most of the "other expenditure" category entries suggested that these items were "per trip" rather than per day expenditures. Since some respondents provided follow-up contact information, the consulting team contacted some of the respondents with these ambiguous figures and obtained some level of confirmation on these assumptions. Some assumptions had to be applied to the trip-length answer (among available options) of "5 or more days." In all of these cases, conservative factors were applied in order to produce calculations from certain imprecise or somewhat ambiguous data entries.

bicycling by this group), only seven stated that they did not come for a specific event. Another survey question asked respondents, "Was the bicycling event in which you participated the primary purpose of your visiting Arizona?" Seventy-two percent answered "yes" to this question. The most frequently listed alternative reason for visiting was "vacation/leisure" (although 13 of the 30 respondents in the "no" category did not provide additional information about their trip purpose). These results would tend to confirm that event participants were in fact well represented in the survey.[25] In this section of the report, the term "participant" is intended to represent the group of respondents to this survey, although some respondents might be independent travelers.

## *"Economic footprint" of bicycle tourism—methods and approach*

### Understanding economic impacts of bicycle tourism

Preparing estimates of economic benefits from out-of-state event participants is primarily a matter of applying expenditure data obtained through the participant survey to the Redyn modeling system. Because the expenditure data were available by the following categories, expenditures were input to the model according to their corresponding industry categories. Retail sales figures were adjusted to reflect the fact that only the margins are applicable to local impacts, which more accurately and conservatively expresses the multiplier effects of these purchases than the full retail sales figures.

- Lodging/camping
- Restaurant and grocery
- Transportation (in-state, including fuel)
- Purchases of bicycle-related goods (expenditures in this category were excluded from the I-O analysis for Bicycle Tourism to avoid double-counting, because retail bicycle-related sales were addressed in the Retail portion of the analysis)
- Recreation/tour's/entrance fees, etc.
- Other (respondents were asked to list)

Travel related expenditures varied somewhat among regions, according to the participant responses received.

[25] Of course, some of the "no" respondents could still be event participants, and some who answered "yes" could have been independent travelers who interpreted this question differently. In any case, future survey instruments could be adjusted to more directly address this issue.

### *Findings: secondary and primary data*

Because the participant survey notice became unexpectedly public (see Page 3.43, above), both in the state and out-of-state cyclists responded to the survey. Of the 224 surveys received, 41% were from Arizona residents. The in-state responses were not analyzed for this report.

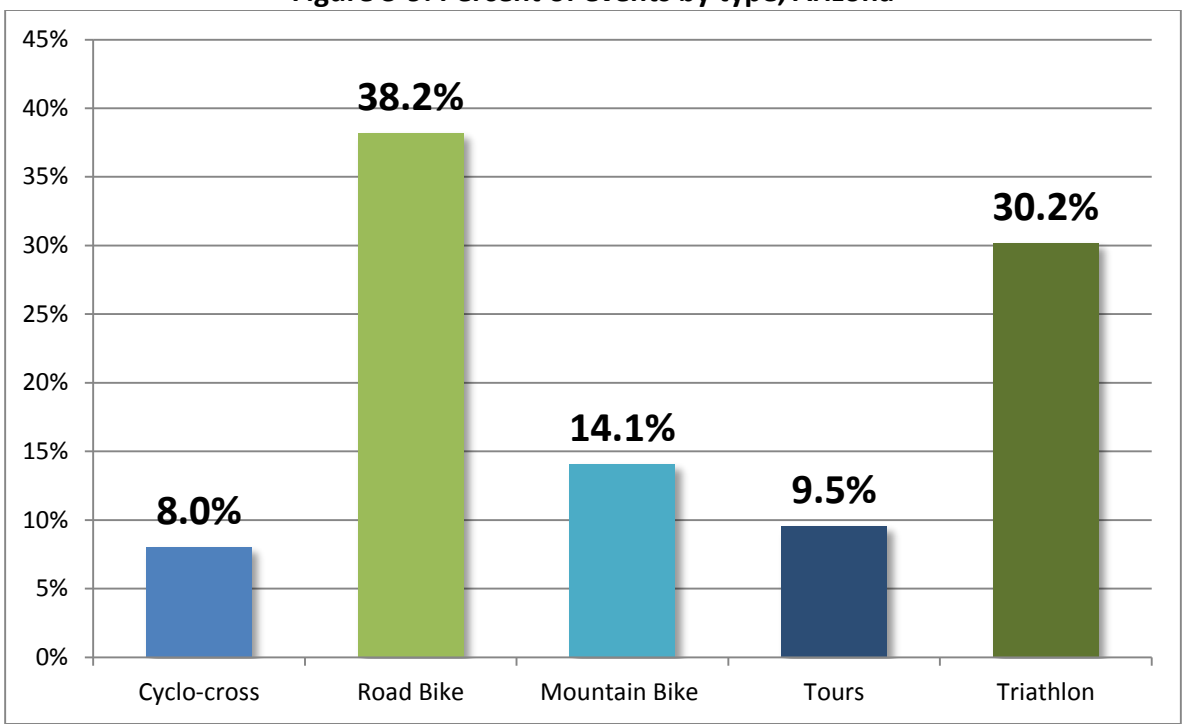
## Overview of events/tours/training camps

Below is a summary of the inventory of bicycling events held in 2012 or that are expected to be held in 2013 throughout Arizona. Note that data for tours reflect the number of programs, and individual programs typically have more than one event per year. Data were also obtained on two "national scale" BMX events that occur in the state: the Winter Nationals and Southwest Nationals, which have been held in Phoenix and Tucson respectively (although both are scheduled for 2013, only one was held in 2012, and this report includes data for the single event, in the I-O table of impacts only).

- 199 total events/tour programs (not counting multiple tour events)
  - 76 Road Bike Events
  - 28 Mountain Bike Events
  - 16 Cyclo-cross Bike Events
  - 19 Guided Touring Programs (most with multiple events)
  - 60 Triathlon/Duathlon Events
- Event Times (for events for which data are compiled)
  - 129 daytime events
  - 4 night events
  - 2 day and night events
  - 42 multi-day events

Figure 3-9 (below) depicts the percentage of each event type.

**Figure 3-9. Percent of events by type, Arizona**




Source: Report authors' bicycle event inventory.

## Distribution of events/tours

The location and time-of-year data were used to analyze how events are distributed throughout the State. The distribution analysis contributes to an understanding of when and where money is coming into the state from bicycling events, which can inform how these bicycling events impact regional as well as overall state economics.

## Geographic distribution of events/tours

The inventory of events includes the location of the event (i.e. the city, town, park, etc.). However, since most events cross multiple jurisdictions, a regional level of analysis was considered more appropriate for determining the distribution of the events. (The regional level also fit best with the data limitations of this study.) For this study, the Arizona regions are consistent with those used by the Arizona Office of Tourism (AOT), details of which can be found in Section 3.5.1.

Table 3-15 (below) depicts how many events are held in each of the five regions. Additionally, Figure 3-10 (below) visually summarizes the data. The table and figure show that in the Tucson & Southern region there are almost as many road bike events than there are other types of events combined. The Phoenix & Central and Western regions have more triathlon events than any other single type. The North Central region is the only region that has as many mountain

bike events as other types of bicycling events combined. Figure 3-10 (below) shows that most events are held in the Phoenix & Central region, followed by the Tucson & Southern region.

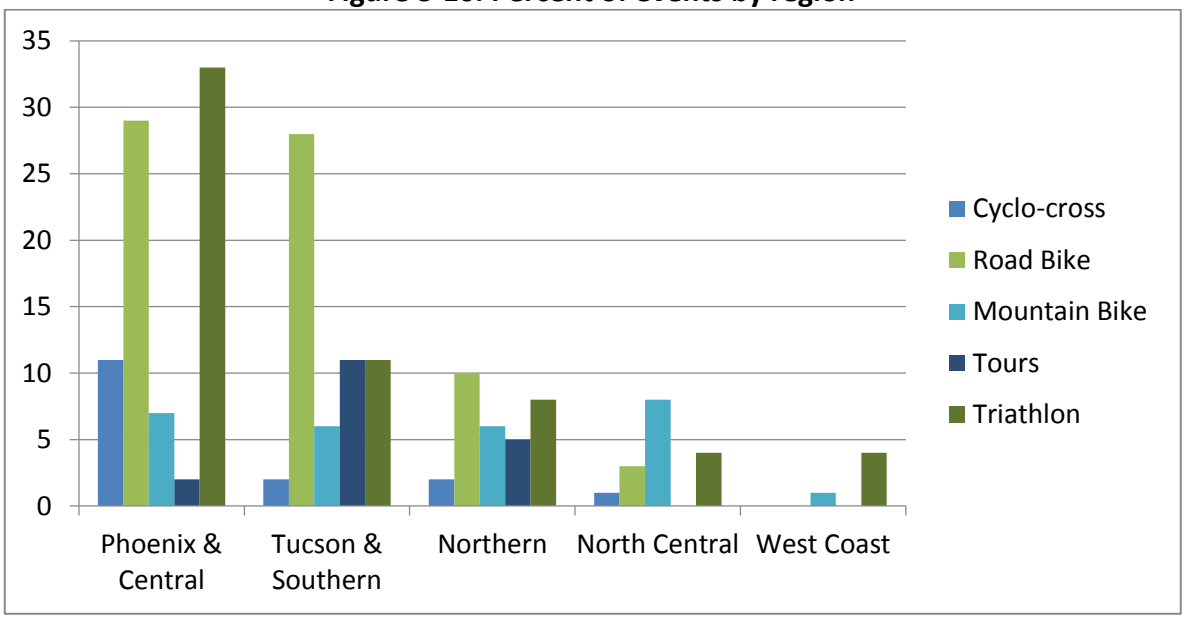
**Table 3-15. Geographic distribution of events**

| Event Type | Phoenix & Central | Tucson & Southern | Northern | North Central | Western | Multiple regions | AZ Total |
|---|---|---|---|---|---|---|---|
| Cyclo-cross | 11 | 2 | 2 | 1 | 0 | 0 | 16 |
| Road Bike | 29 | 28 | 10 | 3 | 0 | 6 | 76 |
| Mountain Bike | 7 | 6 | 6 | 8 | 1 | 0 | 28 |
| Tour Programs | 2 | 11 | 5 | 0 | 0 | 1 | 19 |
| Triathlon | 33 | 11 | 8 | 4 | 4 | 0 | 60 |
| **Total** | **82** | **58** | **31** | **16** | **5** | **7** | **199** |

Source: Report authors' bicycle event inventory.

NOTE: Not included in this table are three road bike cross-state events and one touring cross-state event (these are cross-country events and the information stated that the events ride through Arizona; no specific region was identified), two road bike events that span the Southern and Central regions, and one road bike event that spans the Northern and North Central regions.

**Figure 3-10. Percent of events by region**



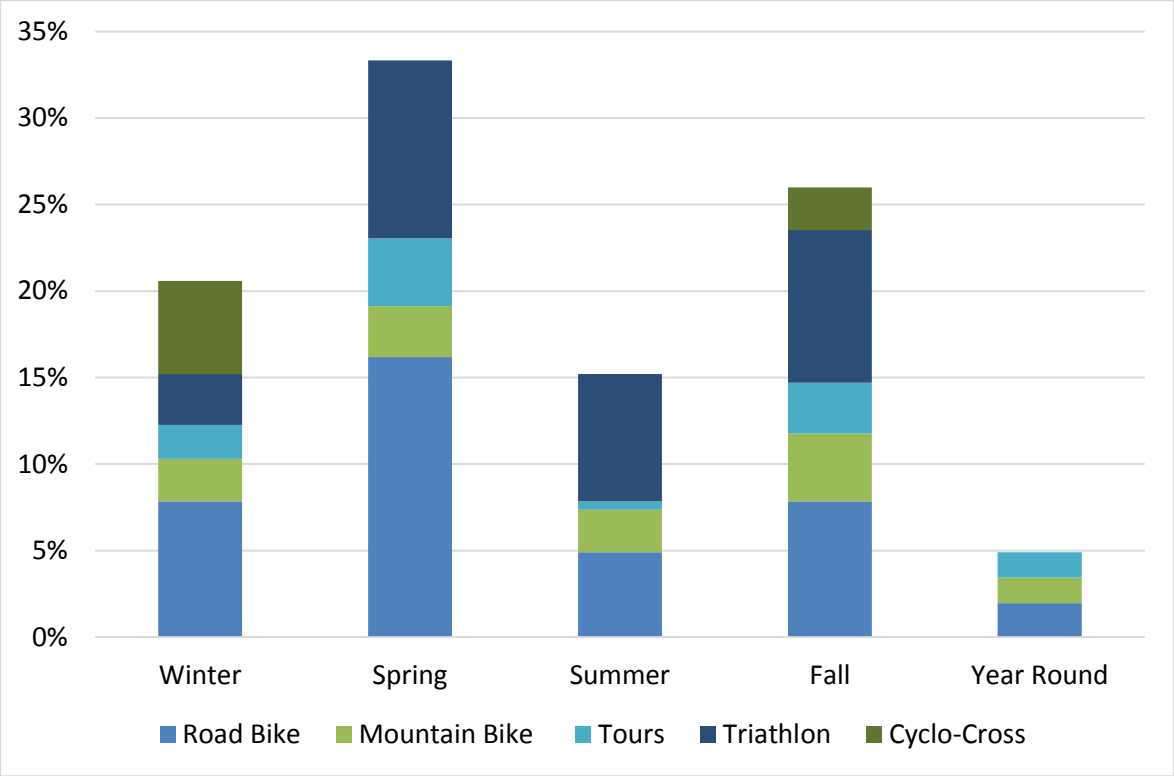

Source: Table 3-15

## Seasonal distribution of events

The seasonal distribution of events was also examined, based on the event database. There are more events by time of year than listed in the inventory because some events are held multiple times throughout the year in different seasons. When an event is held in multiple seasons, it was counted multiple times to account for its presence in all relevant seasons.

Figure 3-11 (below) shows the percent of events by season by type of event. All event types experience two peaks throughout the year: one in the spring and another in the fall. With the exception of mountain biking events, all of the events experience a higher peak in the spring. Mountain bike events have a higher peak in the fall. All events take a rest in the summer season. In the spring, nearly 16 percent of all events are road bike events. In the summer, that drops to about 5 percent. Another interesting observation is that, for the tours in this database, tours drop to an almost non-existent level in the hot summer months, suggesting that tours operating in more temperate areas of the state are few in number or otherwise underrepresented in the database. Very few events are held year- round.

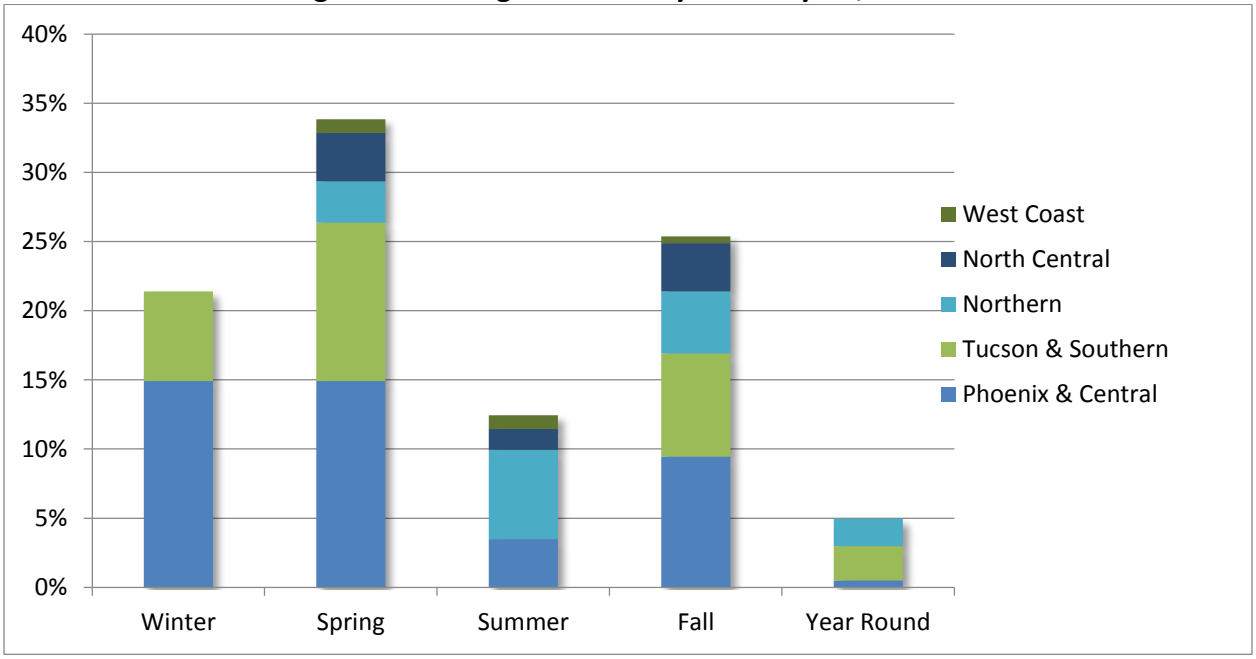
**Figure 3-11. Type of event by time of year, season**




Source: Report authors' bicycle event inventory.

The number of events held in each region seasonally was also analyzed. Figure 3-12 (below) illustrates the percentage of total events held in each region for each season. As expected, the number of events in the Phoenix & Central, Southern, and North Central regions declines during the summer season. In contrast, in the northern and western regions where summers are more temperate, bicycling event activity peaks in the summer. Similarly, the Northern region has cold, snowy winters, and therefore, as expected, there are very few events held in the winter. Additionally, Figure 3-12 (below) shows the small component of year-round events, by the three regions that host such events.

**Figure 3-12 . Region events by time of year, season**

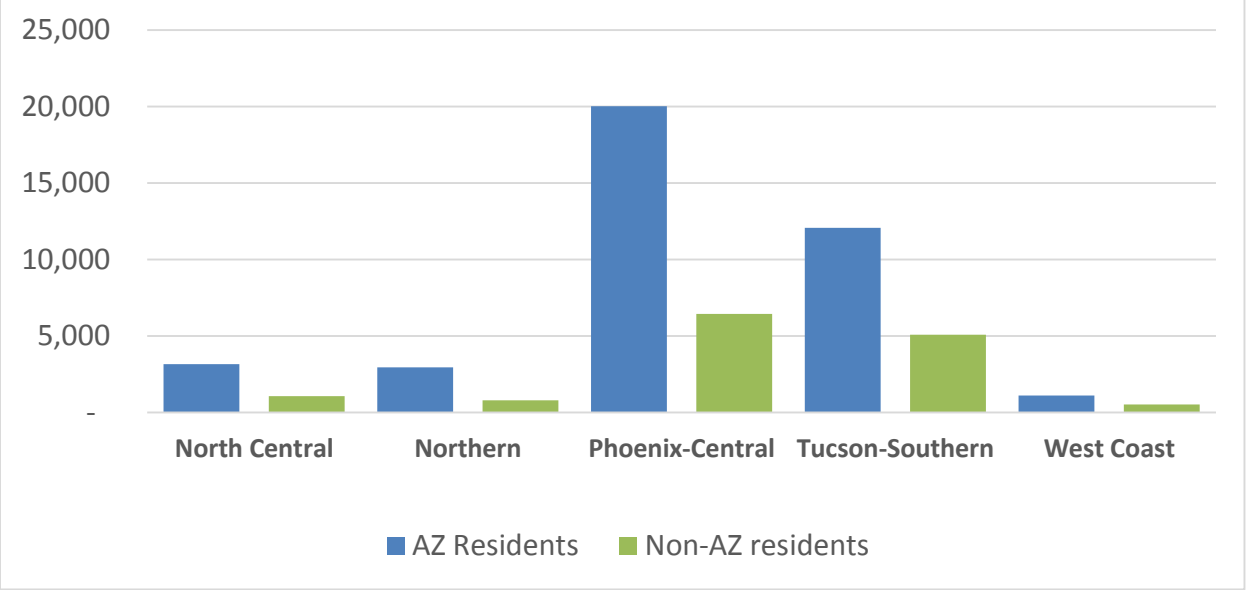



Source: Report authors' bicycle event inventory.

Data could be obtained on two "national scale" BMX events that occur in the state: the Winter Nationals and Southwest Nationals, which have been held in Phoenix and Tucson respectively (although both are scheduled for 2013, only one was held in 2012, and this report includes data in the I-O modeling process for the single event).

Figure 3-13 (below) shows the number of Arizona and non-Arizona participants, by region, for 2012.

**Figure 3-13. Participants by AZ/non-AZ residency, by region, 2012**




Source: Report authors' bicycle event analysis.

## Event Participants: Expenditures and characteristics

The expenditure results for event participants shown in Table 3-16 and Table 3-17 (below) are based on calculations involving only out-of-state event participants who responded to the survey. Note that the average of total expenditures (per person per day or per trip) is based on the sum of expenditures, line item (individual travel party) by line item, divided by the number of respondents who reported at least one expense (68 respondents). This method was also used to calculate the averages for the individual expense categories, as well, in an attempt to make the results more consistent and provide a more accurate average of overall event-participant spending patterns. The data indicate substantial levels of spending, especially compared to data for tourist spending compiled by AOT (see following section). Regionally, the Tucson & Southern region is on the higher end of the spectrum ($353) in terms of per person per day spending, while the West Coast ($95) and North Central ($148) regions are on the lower end.

The expenditure results underscore the need for reviewing this portion of future surveys of participants, and finding ways to obtain responses that are as reliable as possible. For example, it is possible that the visiting bicyclist parties are less "household oriented" than a typical tourist party, and consequently having more unrelated people with individual lodging. The 70 respondents to the question about number of people in travel party, which represented 173 attendees, reported having only 13 children under the age of 18.

Just under half of respondents stated their trip length was "five or more nights."[26] Twenty-four percent reported that they stayed with friends or family as their primary means of accommodation. Respondents were a relatively affluent and well-educated group: 45% had annual household incomes of $105,000 or more, and 45% held advanced degrees.

The regional breakdowns in the tables are based on the answer to the question, "In what city did you stay most of the time during [the visit being reported about]." The data show that a disproportionate share came from people staying in the Tucson area, which could in part reflect the popularity of the Tour de Tucson with out-of-state visitors.

[26] Future surveys will need to take this finding into account and adjust the options for answering this question accordingly. In general, the questionnaire was structured to mirror the questions typically included in surveys of visitors sponsored by the Arizona Office of Tourism.

**Table 3-16. Average per day expenditures (per person) by category and expenditure total**

| | Event fees | Lodging/ camping | Restaurant/ Grocery | Transportation (including fuel) | Bicycle-related goods | Recreation/tour's/ entrance fees, etc. | Other expenses | Total expenses | Respondents who identified one or more expenses |
|---|---|---|---|---|---|---|---|---|---|
| North Central | (insufficient data) | | | | | | | | |
| Northern | $6.33 | $71.81 | $49.88 | $44.48 | $15.83 | $12.22 | $15.83 | **$203.43** | 12 |
| Phoenix & Central | $10.33 | $63.85 | $53.49 | $26.75 | $26.67 | $10.98 | $27.38 | **$189.22** | 21 |
| Tucson & Southern | $43.88 | $71.06 | $49.20 | $40.69 | $103.50 | $37.83 | $36.83 | **$352.63** | 30 |
| West Coast | (insufficient data) | | | | | | | | |
| **AZ Total** | **$23.73** | **$67.74** | **$49.60** | **$35.35** | **$57.98** | **$23.78** | **$27.50** | $260.01 | **68** |

Source: Event Participant Questionnaire (2012)

**Table 3-17. Average per trip expenditures (per person) by category and expenditure total**

| | Average length of stay | Event fees | Lodging/ camping | Restaurant/ Grocery | Transport (including fuel) | Bicycle-related goods | Recreation/ tour's/ entrance fees, etc. | Other expenses | Total expenses | Avg. party size | Respondents who identified one or more expenses |
|---|---|---|---|---|---|---|---|---|---|---|---|
| N. Central | (insufficient data) | | | | | | | | | | |
| Northern | 3.47 | $6.33 | $215.56 | $157.90 | $94.13 | $15.83 | $12.22 | $15.83 | **$517.80** | 2.8 | 12 |
| Phoenix & Central | 4.12 | $10.33 | $244.15 | $226.07 | $111.22 | $26.67 | $10.98 | $27.38 | **$656.79** | 2.3 | 21 |
| Tucson & Southern | 4.07 | $43.38 | $267.75 | $182.30 | $122.58 | $103.50 | $37.83 | $36.83 | **$794.18** | 2.9 | 30 |
| West Coast | (insufficient data) | | | | | | | | | | |
| **Arizona** | **4.00** | **$23.50** | **$251.19** | **$190.24** | **$109.08** | **$57.98** | **$23.78** | **$27.50** | **$683.28** | **2.6** | **68** |

Source: Event Participant Questionnaire (2012)

## Event participant comparisons with visitor data from the Office of Tourism

In this section, data from the survey of event participants are compared to similar traveler data from the Arizona Office of Tourism.[27] [28]

*Spending*

Overall, the event participants reported considerably higher travel expenditures than are shown in AOT reports for traveler segments that are reasonably comparable to the event participants (see footnote referenced above). For example, the participant figures for the Phoenix and Tucson regions, where the sample sizes are largest, are essentially double those reported in the AOT/LI data, and this difference generally applies across all the expenditure categories. This result raises the question of whether other differences between the two groups might explain this kind of expenditure difference. Available data on demographic and travel characteristics (age, income, accommodations, and travel mode) for the two groups are discussed in the following sections.

In summary, the comparisons indicate that the participants, compared to the AOT/LI figures: 1) are slightly older (this applies to the actual respondents, not necessarily the composition of the travel party; however there were few children under the age of 18 in the participants' travel parties), 2) had considerably higher incomes, 3) had similar accommodation patterns, and 4) used private autos to a greater degree. Although comparable data on education are not available for the AOT/LI dataset, the participant group is highly educated. While these findings suggest that participant expenditures could be expected to be somewhat higher, limitations in sample size, the possibility that survey respondents could be overstating their expenditures (respondents were aware of the purpose of the study and might not have the same level of objectivity as a typical tourist), and a bias to err on the side of conservatism have resulted in the consultants lowering the expenditures levels by 30 percent for input to the I-O model.

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[27] Demographic and (non-budgetary) travel characteristics provided by AOT (sourced from Longwoods International) are from detailed tables provided by AOT to the consultant team that are the basis of the AOT flyer "2011 Arizona Domestic Overnight Visitor Profile, Regional," and are not directly comparable to the bicycle-event participant population surveyed in this report, as the data provided by AOT (sourced from Longwoods International) include both in-state and out-of-state overnight travelers, and business as well as leisure travelers. Expenditure data from AOT/Longwoods are from a segment more closely aligned with the bicycle event participants – out-of-state leisure travelers. However, the factors to convert expenditure figures to per-person/per-day values are not specific to this segment but to the same group as the regional profile.

[28] The aforementioned reports were provided by AOT and originally sourced from Longwoods International. Future references to this data source in the text will be attributed to AOT/LI.

Future studies could incorporate methods to refine the expenditure data from participants, for example by creating a control testing or focus group to probe how respondents interpret and react to these types of questions.

*Age*

Table 3-18 (below) displays data related to median age for event participants (based on 69 total survey responses) and tourists (data from AOT/LI), by region. The data reveal that, on average, surveyed event participants have a higher overall median age (49) compared to AOT/LI data (47). The Northern regions had the oldest median age figures for event participants (64). The North Central (45) and Phoenix & Central (45) regions had the lowest reported median age figures.

**Table 3-18 Age data comparison**

| | Median age, survey results | Response count | | Median age, AOT/LI |
|---|---|---|---|---|
| North Central | 45.2 | 5 | | 51.6 |
| Northern | 64.0 | 12 | | 46.1 |
| Phoenix & Central | 45.1 | 21 | | 48 |
| Tucson & Southern | 46.3 | 29 | | 47.8 |
| West Coast | 53.0 | 1 | | 45 |
| **Arizona total** | **49.1** | **68** | | **47.2** |

Source: Event Participant Questionnaire (2012), Longwoods International

*Income*

Due to differences in household income ranges, direct comparisons between survey and AOT/LI data were not possible. However, an approximate comparison can be made by comparing the percentage of event participant respondents that reported a household income above (and below) $85,000, to AOT/LI percentages of visitors with incomes above (and below) $75,000. Overall, over 63% of event participant respondents had a median household income greater than $85,000, while only 44% of AOT/LI respondents had an income over $75,000. The Tucson & Southern (75%) and Phoenix & Central (70%) regions represented the highest percentage of respondents with a median household income of at least $85,000. According to the AOT/LI data, the Phoenix & Central region revealed the highest percentage of respondents (48%) with a median household income of at least $75,000.

*Education*

Overall, the event participant data (below in Table 3-19) show that 38% of respondents have a Bachelor's degree and 45% have an Advanced degree, based on 71 responses. For regions that had more than one response, the North Central (80%) and Phoenix & Central (52%) regions had the highest percentage of respondents with an Advanced degree.

No comparable data were available in the AOT/LI tables. When compared to the American Community Survey (ACS) figures for Arizona (for 2011) as shown in Table 3-19 below, the percentage of event participants with a Bachelor's or Advanced degree is far greater than the figures for Arizona residents (for the population 25 years and older).

**Table 3-19. Highest level of education completed**

| | High School | Associates degree | Bachelor's degree | Advanced degree | Response count |
|---|---|---|---|---|---|
| **Survey Results** | | | | | |
| North Central | 0.0% | 20.0% | 0.0% | 80.0% | 5 |
| Northern | 0.0% | 0.0% | 76.9% | 23.1% | 13 |
| Phoenix & Central | 0.0% | 14.3% | 33.3% | 52.4% | 21 |
| Tucson & Southern | 3.3% | 20.0% | 33.3% | 43.3% | 30 |
| West Coast | 0.0% | 0.0% | 0.0% | 100.0% | 1 |
| **Arizona total** | **2.8%** | **14.3%** | **38.6%** | **45.7%** | 70 |
| **ACS 2011 1-yr estimates (1)** | | | | | |
| **Arizona total** | **38.90%** | **34.50%** | **17.10%** | **9.50%** | |

Source: Event Participant Questionnaire (2012), American Community Survey 2011 1-Yr estimates

(1) For population 25 years and older.

*Accommodation*

Table 3-20 (below) shows the distribution of accommodation usage by region for the event participant and AOT/LI datasets. Overall, the figures between the two datasets are nearly identical, with the exception of the higher rate of "Campground/RV Park" usage by event participants. According to the survey data, the North Central (83%) and Northern (73%) regions yielded the highest percentage of stays in "Hotel/motel/resort" accommodations. Over 36% of Tucson & Southern region event participants "Stayed with friends and/or family," a higher percentage than the Phoenix & Central region (20%).

*Transportation*

Due to issues of data compatibility, the “mode of transport” results for the survey and AOT/LI data are not directly comparable. With this in mind, the data showed a higher percentage for “Private auto” use by event participants.

**Table 3-20. Accommodation by type and region for survey and AOT datasets**

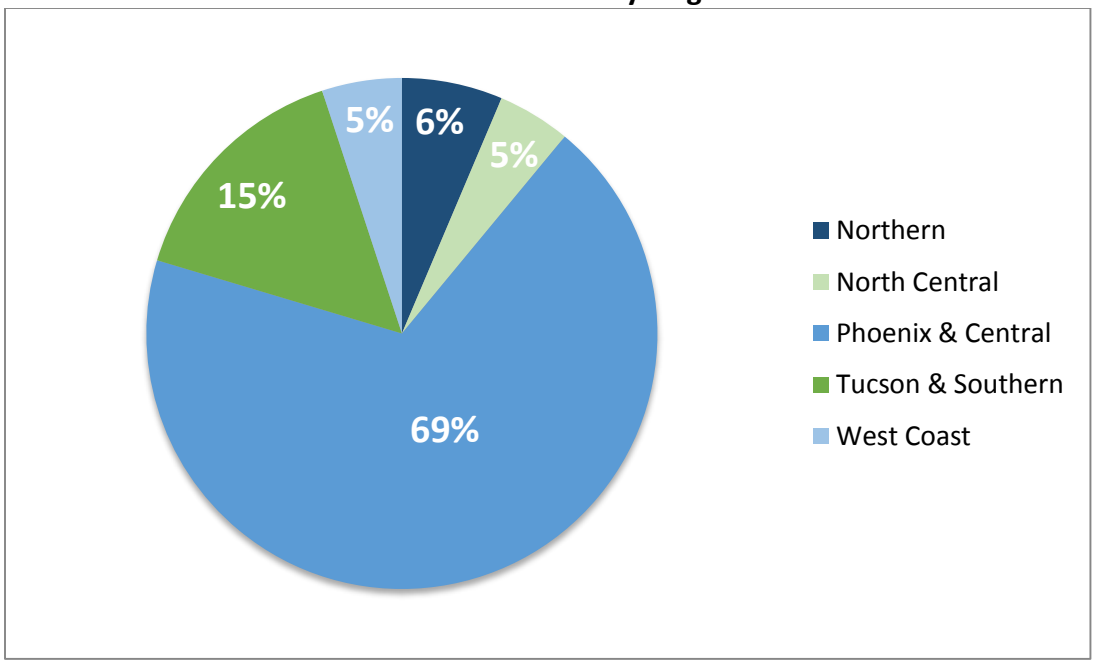
| | Campground/ RV Park | Hotel/ Motel/ resort | Second home | Stayed with friends and/or relatives | Other | Total | No. of responses |
|---|---|---|---|---|---|---|---|
| **Event Participant Survey data** | | | | | | | |
| North Central | 16.7% | 83.3% | 0.0% | 0.0% | | 100.0% | 6 |
| Northern | 18.2% | 72.7% | 0.0% | 9.1% | | 100.0% | 11 |
| Phoenix & Central | 12.0% | 64.0% | 4.0% | 20.0% | | 100.0% | 25 |
| Tucson & Southern | 0.0% | 57.6% | 6.1% | 36.4% | | 100.0% | 33 |
| West Coast | 100.0% | 0.0% | 0.0% | 0.0% | | 100.0% | 1 |
| **Arizona total** | **9.2%** | **63.2%** | **3.9%** | **23.7%** | | **100.0%** | 76 |
| **AOT/LI Data** | | | | | | | |
| North Central | 7.2% | 62.8% | 4.9% | 20.0% | 5.1% | 100.0% | |
| Northern | 8.2% | 65.1% | 2.8% | 18.6% | 5.3% | 100.0% | |
| Phoenix & Central | 1.9% | 57.5% | 4.1% | 28.7% | 7.8% | 100.0% | |
| Tucson & Southern | 3.4% | 57.0% | 1.2% | 30.4% | 8.0% | 100.0% | |
| West Coast | 4.9% | 68.9% | 3.7% | 16.7% | 5.9% | 100.0% | |
| **Arizona total** | **4.8%** | **63.6%** | **3.5%** | **22.0%** | **6.2%** | **100.0%** | |

Source: Event Participant Questionnaire (2012), Longwoods International

### *Regional comparison with bicycle-specific economic base*

Figure 3-14 shows the proportion of Arizona employment in each region, in 18 non-retail industries with a potential connection to bicycling. These industries represent about 38,000 employees statewide. (Retail categories were excluded because they tend to overshadow the other industry figures combined, retail distribution by region is addressed elsewhere in this report, and this compilation was thought to be worthy of assembling.[29] (Figures are approximate because actual data are not available for all industries in all counties.) When compared to the distribution of events by region, Figure 3-10, it is clear that, with the exception of the West Coast, events are much more evenly distributed throughout the state than the underlying economic activity.

**Figure 3-14. Regional share of Arizona employment in all non-retail industries with a potential connection to bicycling**




Source: EMSI employment data for Arizona counties, 2011.

### *Findings: Direct and indirect impacts (from I-O model)*

Economic effects of bicycle tourism are organized under four categories:

1. Road-bicycle, cyclo-cross, and touring (non-commercial) events
2. Mountain bike events

[29] In fact, the regional figures with retail included are similar on a percentage basis to those shown in Figure 3-14.

3. Triathlon and duathlon events
4. BMX, training camps, and commercial tours

### Category 1. Road-bicycle, cyclo-cross, and touring (non-commercial) events

Estimated economic effects for this category of events are shown in Table 3-21 and Table 3-22. The first table shows the industry categories through which the Redyn model performs the estimates, by the Redyn model output categories listed below. The inputs generated for the model are described in preceding sections on the results of the analysis of event participant data, and are also based on additional detail on attendees at this category of event and that yield an estimated number of out-of-state participants totaling 5,200. The second table shows the total and direct (as a sub-set of the total) effects, for the following Redyn model output categories:

Jobs
Total output
Disposable income, and
Labor income

**Table 3-21. Detail of direct effects for road-bicycle, cyclo-cross, and touring (non-commercial) events, Arizona**

| Industry | NAICS | Direct effects ($2013, 000s) | | | |
|---|---|---|---|---|---|
| | | Jobs | Wage bill | Output | Disposable Income |
| Grocery stores | 445 | 3.21 | $127.725 | $276.993 | $136.328 |
| Gasoline stations | 447 | 2.55 | $98.163 | $212.870 | $105.963 |
| Sporting goods stores | 45111 | 0.00 | $0.000 | $0.000 | $0.000 |
| Department stores | 452 | 5.28 | $207.560 | $450.098 | $222.573 |
| Tour Operators | 56152 | 0.00 | $0.000 | $0.000 | $0.000 |
| Sports & Recreation Instruction | 61162 | 0.00 | $0.000 | $0.000 | $0.000 |
| Promoters-Per. Arts, Sports & Events w/o facilities | 71132 | 8.34 | $193.892 | $342.139 | $206.690 |
| Amusement, gambling & recreation industries | 713 | 30.52 | $577.093 | $1,296.847 | $619.736 |
| Travelers accommodation | 7211 | 30.67 | $1,080.112 | $2,737.398 | $1,157.689 |
| Restaurants & other eating places | 7225 | 20.20 | $443.233 | $999.973 | $473.088 |
| **Total** | | **100.77** | **$2,727.778** | **$6,316.318** | **$2,922.066** |

Source: Authors; Redyn model

**Table 3-22. Economic effects of road-bicycle, cyclo-cross, and touring (non-commercial) events, Arizona**

| | Total Effects | | Direct Effects |
|---|---|---|---|
| **Jobs** | | | |
| North Central | 8 | | 6 |
| Northern | 3 | | 3 |
| Phoenix & Central | 37 | | 21 |
| Tucson & Southern | 113 | | 70 |
| West Coast | 1 | | |
| **Arizona Statewide Total** | **162** | | **101** |
| | | | |
| **$2013 (000s)** | | | |
| **Output** | | | |
| North Central | $447.34 | | $335.69 |
| Northern | $212.15 | | $149.19 |
| Phoenix & Central | $3,829.56 | | $1,625.59 |
| Tucson & Southern | $6,939.65 | | $4,205.85 |
| West Coast | $64.90 | | |
| **Arizona Statewide Total** | **$11,493.59** | | **$6,316.32** |
| | | | |
| **$2013 (000s)** | | | |
| **Disposable income** | | | |
| North Central | $261.43 | | $188.86 |
| Northern | $100.21 | | $68.08 |
| Phoenix & Central | $1,594.92 | | $693.61 |
| Tucson & Southern | $3,272.72 | | $1,971.52 |
| West Coast | $28.25 | | |
| **Arizona Statewide Total** | **$5,257.54** | | **$2,922.07** |
| | | | |
| **$2013 (000s)** | | | |
| **Labor income** | | | |
| North Central | $200.24 | | $144.66 |
| Northern | $94.66 | | $64.30 |
| Phoenix & Central | $1,618.82 | | $704.00 |
| Tucson & Southern | $3,012.60 | | $1,814.82 |
| West Coast | $27.64 | | |
| **Arizona Statewide Total** | **$4,953.96** | | **$2,727.78** |

Source: Authors; Redyn model

### Category 2. Mountain bike events

Estimated economic effects for this category of events are shown in Table 3-23 and Table 3-24. The first table shows the industry categories through which the Redyn model performs the estimates, by the Redyn model output categories of total output, wages, jobs, disposable income, and labor income. The inputs generated for the model are described in preceding sections on the results of the analysis of event participant data, and are also based on additional detail on attendees at this category of event and that yield an estimated number of out-of-state participants totaling 2,000. The second table shows the total and direct (as a sub-set of the total) effects, for the following Redyn model output categories:

Jobs
Total output
Disposable income, and
Labor income

**Table 3-23. Detail of direct effects, mountain bike events, Arizona**

| Industry | | Direct effects ($2013, 000s) | | | |
|---|---|---|---|---|---|
| | NAICS | Jobs | Wage bill | Output | Disposable Income |
| Grocery stores | 445 | 1.27 | $37.020 | $80.260 | $41.001 |
| Gasoline stations | 447 | 1.09 | $31.050 | $67.314 | $34.678 |
| Sporting goods stores | 45111 | 0.00 | $0.000 | $0.000 | $0.000 |
| Department stores | 452 | 1.98 | $57.620 | $124.950 | $63.741 |
| Tour Operators | 56152 | 0.00 | $0.000 | $0.000 | $0.000 |
| Sports & Recreation Instruction | 61162 | 0.00 | $0.000 | $0.000 | $0.000 |
| Promoters-Per. Arts, Sports & Events w/o facilities | 71132 | 3.18 | $57.900 | $102.156 | $64.223 |
| Amusement, gambling & recreation industries | 713 | 11.54 | $155.640 | $349.769 | $171.937 |
| Travelers accommodation | 7211 | 13.13 | $320.840 | $813.134 | $356.341 |
| Restaurants & other eating places | 7225 | 7.92 | $128.430 | $289.749 | $142.245 |
| **Total** | | **40.11** | **$788.500** | **$1,827.332** | **$874.166** |

Source: Authors; Redyn model

**Table 3-24. Economic effects of mountain bike events, Arizona**

| | Total Effects | | Direct Effects |
|---|---|---|---|
| **Jobs** | | | |
| North Central | 16 | | 13 |
| Northern | 5 | | 4 |
| Phoenix & Central | 7 | | 4 |
| Tucson & Southern | 31 | | 19 |
| West Coast | 0 | | |
| **Arizona Statewide Total** | **60** | | **40** |
| | | | |
| **$2013 (000s)** | | | |
| **Output** | | | |
| North Central | $856.67 | | $648.99 |
| Northern | $320.55 | | $250.43 |
| Phoenix & Central | $764.34 | | $318.71 |
| Tucson & Southern | $1,846.75 | | $1,147.05 |
| West Coast | $26.39 | | |
| **Arizona Statewide Total** | **$3,814.70** | | **$2,365.19** |
| | | | |
| **$2013 (000s)** | | | |
| **Disposable income** | | | |
| North Central | $462.05 | | $345.04 |
| Northern | $142.27 | | $109.52 |
| Phoenix & Central | $321.29 | | $137.34 |
| Tucson & Southern | $874.53 | | $539.56 |
| West Coast | $11.91 | | |
| **Arizona Statewide Total** | **$1,812.04** | | **$1,131.47** |
| | | | |
| **$2013 (000s)** | | | |
| **Labor income** | | | |
| North Central | $374.75 | | $279.67 |
| Northern | $140.30 | | $107.92 |
| Phoenix & Central | $322.79 | | $138.04 |
| Tucson & Southern | $801.83 | | $494.95 |
| West Coast | $11.59 | | |
| **Arizona Statewide Total** | **$1,651.26** | | **$1,020.59** |

Source: Authors; Redyn model

### Category 3. Triathlons/Duathlons

Estimated economic effects of triathlon/duathlon events are shown below in Table 3-25 and Table 3-26. The first table shows the industry categories through which the Redyn model performs the estimates, by the Redyn model output categories of total output, wages, jobs, disposable income, and labor income. The inputs generated for the model are described in preceding sections on the results of the analysis of event participant data, and are also based on additional detail on attendees at this category of event and that yield an estimated number of out-of-state participants totaling 5,400. The second table shows the total and direct (as a sub-set of the total) effects, for the following Redyn model output categories:

Jobs
Total output
Disposable income, and
Labor income

**Table 3-25. Detail of direct effects, triathlons/duathlons, Arizona**

| Industry | | Direct effects ($2013, 000s) | | | |
|---|---|---|---|---|---|
| | NAICS | Jobs | Wage bill | Output | Disposable Income |
| Grocery stores | 445 | 2.91 | $126.004 | $273.221 | $126.697 |
| Gasoline stations | 447 | 1.89 | $78.877 | $171.032 | $80.153 |
| Sporting goods stores | 45111 | 0.00 | $0.000 | $0.000 | $0.000 |
| Department stores | 452 | 4.02 | $172.716 | $374.569 | $174.798 |
| Tour Operators | 56152 | 0.00 | $0.000 | $0.000 | $0.000 |
| Sports & Recreation Instruction | 61162 | 0.00 | $0.000 | $0.000 | $0.000 |
| Promoters-Per. Arts, Sports & Events w/o facilities | 71132 | 7.03 | $202.344 | $357.034 | $203.111 |
| Amusement, gambling & recreation industries | 713 | 21.36 | $443.259 | $996.061 | $450.076 |
| Travelers accommodation | 7211 | 27.05 | $985.884 | $2,498.576 | $994.841 |
| Restaurants & other eating places | 7225 | 18.79 | $437.176 | $986.359 | $439.589 |
| **Total** | | **83.05** | **$2,446.260** | **$5,656.853** | **$2,469.265** |

Source: Authors; Redyn model

**Table 3-26. Economic effects of triathlons/duathlons, Arizona**

| | Total Effects | | Direct Effects |
|---|---|---|---|
| **Jobs** | | | |
| North Central | 2 | | 1 |
| Northern | 5 | | 5 |
| Phoenix & Central | 81 | | 48 |
| Tucson & Southern | 30 | | 19 |
| West Coast | 14 | | 11 |
| **Arizona Statewide Total** | **133** | | **83** |
| | | | |
| **$2013 (000s)** | | | |
| **Output** | | | |
| North Central | $100.60 | | $62.87 |
| Northern | $341.14 | | $269.61 |
| Phoenix & Central | $8,364.76 | | $3,621.73 |
| Tucson & Southern | $1,865.31 | | $1,137.39 |
| West Coast | $797.00 | | $565.25 |
| **Arizona Statewide Total** | **$11,468.81** | | **$5,656.85** |
| | | | |
| **$2013 (000s)** | | | |
| **Disposable income** | | | |
| North Central | $68.46 | | $42.26 |
| Northern | $152.19 | | $116.86 |
| Phoenix & Central | $3,467.47 | | $1,538.12 |
| Tucson & Southern | $902.80 | | $537.38 |
| West Coast | $328.50 | | $234.64 |
| **Arizona Statewide Total** | **$4,919.42** | | **$2,469.26** |
| | | | |
| **$2013 (000s)** | | | |
| **Labor income** | | | |
| North Central | $43.89 | | $27.09 |
| Northern | $151.32 | | $116.19 |
| Phoenix & Central | $3,536.00 | | $1,568.52 |
| Tucson & Southern | $824.52 | | $490.79 |
| West Coast | $341.14 | | $243.67 |
| **Arizona Statewide Total** | **$4,896.87** | | **$2,446.26** |

Source: Authors; Redyn model

## Category 4. BMX, training camps, and commercial tours

Estimated economic effects for this category of events are shown in Table 3-27 and Table 3-28. The first table shows the industry categories through which the Redyn model performs the estimates, by the Redyn model output categories of total output, wages, jobs, disposable income, and labor income. The inputs generated for the model are described in preceding sections on the results of the analysis of event participant data, and are also based on additional detail on attendees at this category of event and that yield an estimated number of out-of-state participants totaling 1,300. The second table shows the total and direct (as a sub-set of the total) effects, for the following Redyn model output categories:

Jobs
Total output
Disposable income, and
Labor income

**Table 3-27. Detail of direct effects, BMX, training camps, and commercial tours, Arizona**

| Industry | | Direct effects ($2013, 000s) | | | |
|---|---|---|---|---|---|
| | NAICS | Jobs | Wage bill | Output | Disposable Income |
| Grocery stores | 445 | 0.85 | $33.601 | $72.878 | $35.616 |
| Gasoline stations | 447 | 0.20 | $8.426 | $18.269 | $8.705 |
| Sporting goods stores | 45111 | 1.02 | $39.050 | $84.668 | $42.356 |
| Department stores | 452 | 0.53 | $22.327 | $48.402 | $23.174 |
| Tour Operators | 56152 | 3.53 | $170.607 | $498.855 | $185.049 |
| Sports & Recreation Instruction | 61162 | 8.24 | $241.174 | $257.724 | $261.591 |
| Promoters-Per. Arts, Sports & Events w/o facilities | 71132 | 0.45 | $13.707 | $24.189 | $13.501 |
| Amusement, gambling & recreation industries | 713 | 1.68 | $36.461 | $81.926 | $36.978 |
| Travelers accommodation | 7211 | 7.82 | $279.499 | $708.350 | $297.040 |
| Restaurants & other eating places | 7225 | 5.34 | $116.620 | $263.099 | $123.612 |
| **Total** | | **29.66** | **$961.473** | **$2,058.360** | **$1,027.622** |

Source: Authors; Redyn model

**Table 3-28. Economic effects of BMX, training camps, and commercial tours, Arizona**

| | Total Effects | | Direct Effects |
|---|---|---|---|
| **Jobs** | | | |
| North Central | 0 | | |
| Northern | 0 | | |
| Phoenix & Central | 8 | | 5 |
| Tucson & Southern | 40 | | 25 |
| West Coast | 0 | | |
| **Arizona Statewide Total** | **49** | | **30** |
| | | | |
| **$2013 (000s)** | | | |
| **Output** | | | |
| North Central | $23.88 | | |
| Northern | $15.31 | | |
| Phoenix & Central | $815.80 | | $353.22 |
| Tucson & Southern | $2,898.73 | | $1,705.14 |
| West Coast | $21.10 | | |
| **Arizona Statewide Total** | **$3,774.83** | | **$2,058.36** |
| | | | |
| **$2013 (000s)** | | | |
| **Disposable income** | | | |
| North Central | $20.37 | | |
| Northern | $9.38 | | |
| Phoenix & Central | $339.69 | | $150.68 |
| Tucson & Southern | $1,482.03 | | $876.94 |
| West Coast | $9.19 | | |
| **Arizona Statewide Total** | **$1,860.66** | | **$1,027.62** |
| | | | |
| **$2013 (000s)** | | | |
| **Labor income** | | | |
| North Central | $11.84 | | |
| Northern | $7.24 | | |
| Phoenix & Central | $344.87 | | $152.98 |
| Tucson & Southern | $1,366.36 | | $808.50 |
| West Coast | $9.02 | | |
| **Arizona Statewide Total** | **$1,739.33** | | **$961.47** |

Source: Authors; Redyn model

## Summation of economic benefits from bicycle tourism

The sum of the Economic Effects tables for all four categories of bicycle tourism assessed for this report (in preceding tables, and including: road bicycle, mountain bike, cyclo-cross, triathlons/duathlons, and BMX, camps, and commercial tours), is shown in Table 3-29 (below).

**Table 3-29. Economic effects of the preceding four categories of bicycle tourism combined, Arizona**

| | Combined, Total Effects | | Combined, Direct Effects |
|---|---|---|---|
| **Jobs** | | | |
| North Central | 26 | | 20 |
| Northern | 14 | | 11 |
| Phoenix & Central | 134 | | 78 |
| Tucson & Southern | 214 | | 134 |
| West Coast | 16 | | 11 |
| **Arizona Statewide Total** | **404** | | **254** |
| | | | |
| **$2013 (000s)** | | | |
| **Output** | | | |
| North Central | $1,428.48 | | $1,047.55 |
| Northern | $889.15 | | $669.24 |
| Phoenix & Central | $13,774.46 | | $5,919.26 |
| Tucson & Southern | $13,550.44 | | $8,195.42 |
| West Coast | $909.38 | | $565.25 |
| **Arizona Statewide Total** | **$30,551.92** | | **$16,396.72** |
| | | | |
| **$2013 (000s)** | | | |
| **Disposable income** | | | |
| North Central | $812.30 | | $576.16 |
| Northern | $404.05 | | $294.46 |
| Phoenix & Central | $5,723.38 | | $2,519.76 |
| Tucson & Southern | $6,532.08 | | $3,925.40 |
| West Coast | $377.84 | | $234.64 |
| **Arizona Statewide Total** | **$13,849.66** | | **$7,550.42** |
| | | | |
| **$2013 (000s)** | | | |
| **Labor income** | | | |
| North Central | $630.73 | | $451.41 |
| Northern | $393.51 | | $288.42 |
| Phoenix & Central | $5,822.47 | | $2,563.54 |
| Tucson & Southern | $6,005.30 | | $3,609.05 |
| West Coast | $389.40 | | $243.67 |
| **Arizona Statewide Total** | **$13,241.42** | | **$7,156.10** |

Source: Authors; Redyn model

### *Description and general assessment of non-quantifiable benefit categories*

Although the Team was able to obtain some information on elite (professional/amateur) racing teams, other specific information on product promotions for instance could not be documented, although the Team is aware of such activities through anecdotal evidence. Discussions of how to add to the information about this type of activity appear in the Plan Update section.

## 3.6 Plan for periodic updating of the study

### 3.6.1 General structural considerations

The rationale for periodically updating this baseline study is to better understand the dimensions of growth and other change in Arizona's bicycle-related industry as well as the comparative opportunities in bicycle-related tourism. Periodic updating also helps assess the effectiveness of public policies and private sector efforts pertaining to bicycling in Arizona.

Updating the economic impact analysis of bicycling in Arizona presents similar challenges as conducting this inaugural study. Significant issues for updating the report could be grouped under what, who, how and when? What data and methods are required? Who should assume the on-going responsibility in monitoring bicycle-related business and event activity in Arizona? How should the work be accomplished and under what time frame? Finally, what would be the cost associated with the update?

To the extent possible, research methods and approaches used in the inaugural report will need to be replicated in updating the report, particularly if the intent is to "re-benchmark" the analysis. The most useful secondary data sources identified in this report, those that contributed to building the inventory, represent the starting point for updating the information base for this study. These will play a key role in updating the "universe" of bicycle-related businesses and bicycle events occurring during the year. As with this original report, crosschecks from other secondary sources along with informed experts are desirable for both bicycle-related business and bicycle event databases.

Future efforts will require adherence to the following:

- A recognition of the full range of industry coverage, consistent with the group of bicycle-related industries identified from the NAICS;
- A data collection plan for bicycle-related industry establishments and bicycle-related events in Arizona that is at the least consistent with the original effort, and at best takes advantage of the kinds of institutionalized database

management concepts described below, for example leading to a calendar of bicycle-related events in Arizona; and

- A comparable methodology and analytical approach consistent with this inaugural study for integration into the survey databases and computational models.

Furthermore, it is assumed that overall responsibility for these periodic updates will occur within the same organizational context of the ADOT Pedestrian and Bicycle Program. Concomitantly, it is advisable for ADOT to keep in place a working technical advisory group consisting of state and local agencies, tribal governments, and leading state bicycle coalition groups, which might also become involved in monitoring bicycle business activity and bicycle events in Arizona.

Comparable methods and analytical approaches (including application of the same economic impact model) should be maintained in future updates of this study. A third-party independent research and analysis organization should be contracted to conduct such an updated economic impact analysis study. Depending on the rate of the state's growth, and indications of the growth of bicycling at a national level (or in Arizona if the data-monitoring processes exist to track this), the frequency of such an update could vary between five and 10 years.

The survey databases and computational models generated for this report, and which will be turned over to ADOT at the conclusion of the study (stripped of firm-level data to ensure confidentiality), have been created with future updating in mind. This system, however, does require a comparable methodology and survey structure to ensure compatibility within the existing system. Future survey results can be easily integrated into the existing system, which automates variable summarization and integration into the computational model and other analysis components. Secondary data used in the computational models, which act as calibrating factors for our primary data, will also need to be refreshed for future updates. If this system is to be used, a data file package and a more detailed manual of usage and updating instructions can be provided.

There are a few refinements that could be made to the methodology and incorporated into an update process, even if this means deviating from the original format:

- The survey of event sponsors focused on obtaining data about participants, and for the sake of minimizing the burden on responding organizations (and thereby encourage responses), plus the fact that events can involve a number of volunteers, the survey of event sponsors did not ask about data for the

organization itself, as a business. However, there are a few event sponsors that have substantial levels of employment, and by proportioning their employees to their out-of-state participants, some employees could be assigned to "export," that is, money-importing, status. This concept of course is highly dependent on convincing event sponsors to actually respond to the survey. In this study, these organizations were very underrepresented in survey responses.

- The survey of participants needs to be more controlled or else adaptable to the condition, as in this study, where the survey became public to Arizona residents as well as the targeted out-of-state participants.

### *Addressing data challenges*

There are a number of features of this study that underscore the challenges in periodically updating this report. One of the most significant challenges is monitoring bicycle-related business activity within Arizona. All industries undergo a dynamic process called churning, with its various member businesses opening, closing, expanding or contracting in any given calendar year. As a result, the scope and scale of each industry—including the bicycle-related industry—will be different each year. Experience with this report has shown that bicycle shops, in particular, could be prone to this type of churning.

Similarly, Arizona's calendar of bicycle events will undoubtedly change and hence will require monitoring. There are alternative means by which to accomplish this. One way is to establish a coordinating body involving the various Arizona bicycle organizations, and designating some group such as the Coalition for Arizona Bicyclists—or perhaps establishing a separate group—to serve as an umbrella organization expressly for purposes of keeping this kind of information current. For example, the group could serve as a clearinghouse for maintaining an overall annual calendar of Arizona bicycle events. To make this list as effective as possible, a uniform reporting format would need to be devised and distributed to those organizations that would be submitting information for the calendar. Specifically for the purposes of updating the economic study, the reporting format would need to include one or more data variables that would provide an indication of the extent to which out-of-state participants would be expected to attend these events.

The same group could perhaps also take on other aspects of monitoring bicycling activities that are relevant to this study. ADOT could play a central or peripheral role in such an organization. This current research effort can serve as a means of leveraging relationships with bicycle event sponsors (and perhaps touring company operators as well) for on-going data collection efforts, most notably for the following information: (a) events and their schedule; (b) historic and projected number of participants; (c) place of residence of participants; and (d) entry fees.

To establish some consensus on concepts for institutionalizing an ongoing database management/update process (beginning with consensus on whether this concept has any hope of being realized), a "Bicycle Community Building" meeting could be set up. This might be a dedicated conference or sessions at some existing regularly held function, such as a statewide Arizona Bicycle Conference held in prior years.

The Arizona Office of Tourism, which is currently underrepresented in documenting bicycling activity throughout the state, could be encouraged to take a more active role in data-gathering as part of an enhanced appreciation of the role of bicycling in tourism, in general. Within this concept there would appear to be an opportunity for shared, enhanced marketing of bicycling events in Arizona, which could benefit all the parties involved in this data maintenance project.

What are some cost-effective options for monitoring the dynamic change in bicycle-related business activity in Arizona? One recommendation is to establish a state agency confidential data exchange with the Arizona Department of Revenue, Tax Policy and Research Division, to obtain business counts within each of the twenty bicycle-related industries, at a level of detail more precise than the generally available six-digit NAICS so that bicycle-specific firms are counted. If this level of inter-agency cooperation is not obtainable, then a data collection plan for bicycle-related business establishments is recommended. The umbrella clearinghouse-type organization described above could potentially play a role in this. Alternatively or in concert with such a group, public and private personnel throughout the state could be tasked with monitoring and recording changes to the baseline set of bicycle-related industry establishments in Arizona. An informal data-gathering organization such as *Sweat Magazine* could be encouraged to take on this responsibility and share certain aspects of the information obtained for the purpose of facilitating the update. ADOT's Pedestrian and Bicycle Program could assume various levels of leadership in these business-monitoring efforts.

Future updates could also be improved, and the existing study supplemented, by instituting methods for obtaining data on categories of bicycling activity that are not readily obtainable. For example, during the course of this study the research team became aware of the fact that Arizona is a popular location for organized "corporate level" competitive training, product testing and promotion, and similar activities which would not necessarily be made public. Another example is the out-of-state bicycle-using tourist, who might be drawn to the state primarily for the mountain biking trails, for example, but whose presence is not tracked because that person is not involved in a specific event or guided tour. This latter case might only be illuminated by incorporating focused questions, special sampling methods, etc. into regularly administered surveys of visitors such as those sponsored by the Arizona Office of Tourism.

Methods of reaching out to corporate sponsors of bicycling activities might require some trial-and-error experimentation. One approach might be to target a sample of corporate prospects (who might or might not have been identified as having previously come to the state for such purposes) with special promotional literature about the advantages of hosting bicycling activities in the state. The literature could encourage them to "check in" when they come to Arizona and receive some token reward.

While all of the data management concepts mentioned above are described here in reference to the advantages they offer for updating the economic impacts report, putting any or all of these methods into effect would provide additional benefits:

- They would expedite efforts to market Arizona to bicyclists nationally and internationally.
- The databases alone could be used to help inform ADOT and other public policy.

### *Updating options*

The approach to updating the report, and costs associated with any updating concept, will be heavily influenced by the existence, and effectiveness, of any bicycle-related business and bicycle event database-compilation systems that are implemented.

### Benchmarking with secondary data:

If the database-coordinating bodies recommended above are put in place, updating of inventories would be a fairly straightforward task. To use these updated inventories for benchmarking purposes, the following considerations would apply:

- For bicycle shops: Growth rate of bicycle shops (and/or sales, corrected for inflationary effects, if such data were available) could be compared to the rate of change in other growth measures such as population, and this could be done by region.
- For events/tours: Additional activities would have to be categorized in keeping with the system established for the database update as described above, that is, it would be necessary to categorize events in terms of their likelihood of having out-of-state participants. (This type of categorization was undertaken for this report, but only informally and to help target follow-up inquiries to event organizations.) The growth rate of events that had meaningful levels of out-of-state participants could then be compared to other growth measures, by region, similarly to the methods applied to bicycle shops. These inventory-based indicators could be used to proportionately increase/decrease (inflation-adjusted) economic effects according to the values of

the indicators. The most interesting component of this research however would be the extent to which the indicators show that bicycling activity, in sales or in events, is changing at a different rate than overall growth in the state or any particular region.

## Replicating the original report

The implications of replicating this report are discussed below under two alternative conditions:

1. The database-coordinating bodies recommended above are put in place, and
2. Data-gathering challenges experienced in the preparation of this initial report remain unchanged.

Under either condition, the preparation of an updated report would be considerably simplified, based on the following:

- Survey forms and related materials could be largely reused, even if some modification in the data sought, structuring of questions, etc. was desired. For example, the inventory of bicycling events revealed that some bicycle shops are either prime sponsors of or otherwise heavily involved in certain events. For other shops, the survey of bicycle shops indicated that proprietors were generally aware of significant levels of purchases by tourists. It would be interesting to learn in future studies the extent to which shops advertise, sponsor riders, offer specials, increase inventories, etc. targeting specific events.
- The computational models established to process survey-based information could be reused in a subsequent report, assuming that the survey materials are reasonably comparable.

Under the second scenario, with no database coordinating entities in existence, data gathering would still be simplified to some degree because the various sources used in the original report will have been documented, and the inventories will provide some measure of the usefulness of various data sources. If updated databases have been maintained, administering a new round of surveys will be greatly facilitated.

Although there is no particular reason to believe that new or improved secondary data sources will be available in the near future, due diligence requires that a review of potential sources be conducted as part of the update process. This activity would consist primarily of revisiting original sources from trade organizations, government, and bicycling organizations.

# 4 Conclusions and Recommendations

Table 30 shows the combined total for all benefit categories for which the I-O model was used to generate multiplier effects from expenditures by out-of-state visitors/consumers:

- Event participant spending
- Retail sales to out-of-state customers combined with manufacturing/wholesaling exports

The table shows the four measures used to gauge the economic effects, including industry output (sales), income, employment, and disposable income.

**Table 30. Total annual economic effects generated by out-of-state customers/participants**

| | Bicycle Tourism | Retail sales and manuf./wholesaling | Total |
|---|---|---|---|
| **Jobs** | | | |
| North Central | 26 | 16 | 42 |
| Northern | 14 | 13 | 27 |
| Phoenix & Central | 134 | 221 | 355 |
| Tucson & Southern | 214 | 54 | 268 |
| West Coast | 16 | 13 | 29 |
| **Arizona Statewide Total** | **404** | **317** | **721** |
| **Output in $2013** | | | |
| North Central | $1,428,000 | $1,401,000 | $2,829,000 |
| Northern | $889,000 | $1,117,000 | $2,006,000 |
| Phoenix & Central | $13,774,000 | $47,152,000 | $60,926,000 |
| Tucson & Southern | $13,550,000 | $6,726,000 | $20,276,000 |
| West Coast | $909,000 | $1,221,000 | $2,130,000 |
| **Arizona Statewide Total** | $30,552,000 | $57,618,000 | **$88,170,000** |
| **Disposable income in $2013** | | | |
| North Central | $812,000 | $834,000 | $1,646,000 |
| Northern | $404,000 | $505,000 | $909,000 |
| Phoenix & Central | $5,723,000 | $13,456,000 | $19,179,000 |
| Tucson & Southern | $6,532,000 | $2,830,000 | $9,362,000 |
| West Coast | $378,000 | $528,000 | $906,000 |
| **Arizona Statewide Total** | $13,850,000 | $18,152,000 | **$32,002,000** |
| **Labor income in $2013** | | | |
| North Central | $631,000 | $610,000 | $1,241,000 |
| Northern | $394,000 | $490,000 | $884,000 |
| Phoenix & Central | $5,822,000 | $13,730,000 | $19,552,000 |
| Tucson & Southern | $6,005,000 | $2,577,000 | $8,582,000 |
| West Coast | $389,000 | $543,000 | $932,000 |
| **Arizona Statewide Total** | $13,241,000 | $17,949,000 | **$31,190,000** |

Source: Authors; Redyn model

In comparison to results of studies of the economic impact of bicycling in other states, reviewers of this report might ask why these economic effects of bicycling activities in Arizona

are rather modest. First, an economic impact assessment typically focuses on export activity—product/service sales to customers located outside of the region. Such export activity introduces new spending into the regional economy. This new injection of money into the economy causes a ripple (or "multiplier") effect throughout the rest of the economy. Through the use of an input-output model, we can track and measure this economic impact. Second, the dominant market niche of Arizona in bicycling activities is hosting various events—bicycle road races, "ironman" triathlons, extreme (e.g., 24 hours) mountain bike events, elite training camps, and unique operated bicycle tours. All of these events draw thousands of participants to the roads, trails, and scenic vistas of Arizona, but only for a brief period of time—for instance, a competitive event with an additional two to three vacation days in Arizona with the participants' families.

Conclusions within this study address two different types of issues: 1) interpretation of the findings, and 2) observations regarding the experience of working with the bicycle industry in Arizona to accomplish the objectives of this study. The findings of the study that are perhaps the most illuminating to readers with minimal or no involvement in bicycling have to do with the extensive inventory of bicycling events, both in general and those that have some level of out-of-state participation. As noted above, the study estimated that approximately 14,000 out-of-state participants are involved annually in about 250 events held throughout the state. With its mild winter in the desert areas and numerous scenic attractions, Arizona is well positioned to increase this kind of activity, regardless of national trends in bicycle usage, and could market itself as a destination for bicycle tourism. A velodrome could be an important complementary asset for bicycle tourism in Arizona.

From an economic development standpoint, it is a logical to conclude that the popularity of the state with bicyclists should provide one platform by which to leverage the capture of other aspects of the bicycling industry, primarily manufacturing. It is also likely that other states that have a much larger established base of bicycle manufacturing, such as California, have an advantage over Arizona. This would particularly apply for those types of bicycles that are mass-produced in large volumes (however this is the type of production most likely to be occurring offshore). In any case, manufacturing of bicycles is likely to continue to be a highly dynamic, global activity, and may perhaps become even more fragmented in terms of specialized vehicles, the materials used, and the specific purposes for which bicycles can be designed and built.

Arizona bicycle shops that responded to the survey for this study indicated high levels of sales to out-of-state customers, although any conclusions in this regard are hampered by the small sample size of respondents. To the extent these findings can be verified, for example in

subsequent updates in this study, additional efforts could be justified to assess how this kind of activity could be supported/encouraged, as it constitutes "export" activity relative to the state.

As noted elsewhere in this report, research efforts were constrained by widespread unwillingness on the part of representatives within all categories of the state's bicycling industry, including both shop owners and event sponsors, to share information. A proactive approach to involving businesses and the entire bicycling community in an ongoing data-gathering process could greatly expedite preparing subsequent updates to this report. Any such actions however must take into account what appear to be high levels of "competition anxiety" among all categories of bicycle business owners.

## 4.1 Policy implications of findings

**Integration of bicycling activity with overall tourism at both the state and region level.** Two aspects of policy related to this concept are: 1) To maximize the Arizona Office of Tourism's (AOT's) engagement in bicycle-related tourism, including defining, quantifying, and promoting Arizona's position, nationally, as a center for bicycling. There is also a broad economic development component of this, as in all forms of tourism, which involves the exposure of the state to people who subsequently relocate here; and 2) For policymakers generally to recognize that, while this report focuses on statewide impacts as discussed above, bicycling events in areas outside the major cities can be important to that locality, as components of the redistribution of tourism dollars within the state, irrespective of the fact that some participants are Arizonans and the statewide effects are neutral. These local effects, where potentially significant, could be documented separately and taken into consideration in the course of ADOT's integration of agency plans with local planning.

**Public land management coordination.** Federal and state land-management agencies can play pivotal roles in encouraging or discouraging off-road bicycle use, and there are "mixed reviews" by informants to this report regarding the federal role in such matters in Arizona. These kinds of issues are complex and part of a whole set of "multiple use" issues faced by federal land management agencies, in which evolving planning processes are an increasingly important component of resolving these issues.