Verde River near Clarkdale, Arizona

Verde River Economic Development Study

Final Report

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by

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Executive Summary

"I think the more people use and enjoy the river the better the future health of the river will be."

"Drive up and down the Verde Valley and find out how many places go 'River opportunity—fun, fun, fun.' It doesn't exist. It's almost like it's been completely ignored."

"How can you not love the Verde Valley? It's one place that you can still come and sit outside and watch geese fly over, birds of all kind coming into the area, and just know that you're still in a setting that is natural and beautiful. If we lose that, our economy will go down the drain…down the river."

These three quotes, taken from the nearly 100 stakeholder interviews conducted by the Verde River Economic Development Study (VREDS), sum up the challenge facing the Verde River if we are to have a healthy, sustainable, free-flowing perennial river in our future. The Verde Valley is blessed with a singular asset, the Verde River, and today it is an under-performing asset. The river is threatened by groundwater depletion from its headwaters and throughout the Verde Valley, by invasive species which are outcompeting natives, by pollutants from septic systems and stormwater runoff and by neglect. But perhaps the biggest problem the Verde River faces today is the lack of engagement of the people who live near it and whose livelihoods depend to some extent on it.

To identify ways of increasing the public's engagement in the health of the river, the VREDS study explores the connection between sustainable economic development in the study area and a healthy Verde River. It also suggests ways to strengthen that connection and therefore increase the value of a perennial river to the Verde Valley's residents. A third goal of this report is to examine whether an organization whose mission is to educate the public about water, the river and river-based economies might increase the likelihood of conserving the Verde River as a healthy perennial stream in the Verde Valley. Finally, VREDS was tasked to determine where additional investment in the Verde River could be applied most effectively and efficiently.

To inform the study, the VREDS team interviewed approximately100 stakeholders, including public officials, businesspeople, educators and "men on the street." Their answers to eight standard and three optional questions helped our team understand the current state of economic development related to the river, the barriers to establishing a stronger connection to the river and how an organization like the Walton Family Foundation might make practicable and effective investment into this system.

VREDS also conducted an extensive review of documents related to economic development and its tie to healthy river systems. These included previous studies in our study area, studies of systems in the United States outside our area and statistical analyses of such things as park visitation, the value of recreational wildlife viewing, and the impact of fishing and hunting on similar river systems.

What VREDS uncovered was at times surprising and sometimes almost intuitive. The lack of safe, pleasant, well-maintained access to the Verde River in the Verde Valley emerged as one of the most glaring deficiencies. This lack of public access seemed to permeate almost all other findings, as it impacts the public's understanding of and connection to the river so severely. Perhaps second only to poor access we heard time and again that for all practical purposes, the river did not play a role in the identity of the people, the municipalities or the businesses in the Verde Valley. In short, it is ignored in its own home. The good thing about these two results is that they can be effectively addressed and the effort to correct them can pay handsome rewards in the preservation and valuation of this rare and beautiful river.

Another interesting finding is that currently very little economic activity in the Verde Valley has a close tie or dependency on a healthy, flowing Verde River. In fact, most respondents in our interviews could name only one business activity that is related to the river, a kayaking tour company. Some agriculture in the study area depends on the river for the water it provides in irrigation ditches, but these activities, while popular and important to local food enthusiasts, make very little or no profit.

Opportunities to increase the river's importance to the local economy are many and varied. They include recreational pursuits, such as canoeing and kayaking, fishing, birding and aesthetic and "lifestyle' activities that can tie the area strongly top the Verde River. Also, small, local-consumption agriculture can be promoted and probably made profitable. Tourism has been almost completely untapped as a source of area income, and this, too, can be corrected using the proper promotion and infrastructure improvements. The identification of the Verde Valley with the Verde River will need to be promoted if we want to maximize the public's valuation of a healthy river. This can be done with a coordinated branding and promotional campaign.

Interestingly, the literature review turned up some very good work that had been done in the past. Many of these projects made solid and practical recommendations for action – but most were "put on the shelf" without implementation. This finding alone is one of the most instructive in the report. One 2-year study done in the late 1990's, the "Verde River Corridor Project" brought stakeholders together with professional facilitators and produced a very high-quality report replete with recommendations on how to improve the fate of the Verde River. That report is difficult to find today, and no planning department in the Verde Valley could put their hands on it when asked! It and others like it are a cautionary tale of failure to implement after an excellent study is done. We do not want this report to suffer that same fate, and the report suggests ways to avoid "on the shelf" syndrome.

An analysis of the current organizations that advocate for the Verde River or which are involved in water resource management and planning, revealed none that are currently capable of taking on the task of Verde River education, promotion, and conservation. While there are several well-attended organizations that work one way or another for the health of the Verde River, none is staffed or funded adequately for the task. Over the years, each has earned a reputation for advocacy that may hinder its ability to do what we believe needs to be done. The lack of funding and professional, accountable and responsible staff also makes their missions very difficult to perform. This means that a new, impartial, well-staffed and funded professional organization may be more effective.

This new institute could have several responsibilities, including education of the public and decision makers, decision support for any organization whose activities may impact or be impacted by the river, growing the connection between sustainable economic development and a healthy Verde River, acting as a document repository, and even implementing the recommendations of other studies.

Additional areas to apply additional investment in the Verde River's future can be summed up in a few broad areas: access, promotion, and preservation of flows. These three categories of investment can be targeted to produce the maximum benefit in the minimum time.

Access is minimal now, and any injection of capital can be extremely effective. Signage directing people to the current access points, almost entirely missing now, could improve river use immediately. Improving current public recreational areas by adding adequate facilities and providing active management, has a high potential for increasing use and value. There are also several opportunities to increase public recreational areas. Some of these areas are privately owned, but currently unused, and some are already owned by various public agencies, such as municipalities, Forest Service, The State of Arizona and Yavapai County.

One of the principal findings of this study is that, by and large, the Verde Valley's residents do not identify with the Verde River. Businesses, municipalities and organizations seldom link their identities to the Verde River, even though the river is one of the primary reasons most of them are in the Verde Valley. One solution to this "identity crisis" is a branding campaign that strengthens the linkage of the residents' day-to-day lives with a flowing, healthy Verde River. This will build loyalty and interest in the river and can increase people's desire to see that no harm comes to the object of their identity.

Promoting best management practices and preservation of agricultural acreage for small farming along the Verde River greenbelt could reward investment by increasing the agricultural use, decreasing conversion of farmland to residential development, and nurturing a culture of locally grown food and other related economic development opportunities in the Verde Valley. This alone could greatly increase the perceived value of the river in the area. A program of encouraging and even purchasing agricultural

easements on existing irrigated land would help protect that land from conversion to other uses. The success and efficacy of such a program would depend to a great extent upon maximizing the efficiency of surface water irrigation, better fertilizing and pest control practices and education of small farming families in appropriate business models aimed at improving yields and profits.

Finally, the VREDS team suggests funding a feasibility study which will identify the specific programs, costs, timeframes, responsible organizations, and odds of success of several alternatives to improve the chances of sustaining the Verde River. Such a study would conduct a cost/benefit analysis to rank several possible courses of action by the estimated cost, the amount of time needed to produce substantive results, and the probability of achieving the desired result.

The VREDS team is extremely optimistic that the Verde River will have a better future because of the work being funded by the Walton Family Foundation, and we are proud to be a part of the team that will help ensure success.

The goal of economic development is to improve the economic well-being of a community through job creation, job retention, tax base enhancement and quality of life. There is no single strategy, policy, or program for achieving successful economic development. Communities differ in their geographic and political strengths and weaknesses. Therefore, each Verde Valley community will have a unique set of challenges and opportunities for sustainable economic development.

Introduction and Purpose

The Verde River Economic Development Study (VREDS) is supported and funded by the Walton Family Foundation (WFF) to determine whether a clear and convincing nexus between sustainable economic development and a healthy Verde River system exists today and what might be done in the future to strengthen that link. This research identifies current conditions, stimulates critical thinking and identifies mechanisms that will help accomplish those goals.

While this report was commissioned by the Walton Family Foundation, its recommendations have not yet been examined for feasibility. Which of these recommendations will be implemented, as well as when and how they will be adopted, is a matter of further study.

It is important to understand that this report deals primarily with the link between a sustainable economy in the Verde Valley and the long-term health of the Verde River. Its conclusions and recommendations primarily address those opportunities, and should not be taken to indicate that other conditions related to the health of the river are less important or do not exist. For instance, many experts believe that the greatest long-term threat to the health of the Verde River may be the slow, but inexorable dewatering of the river due to groundwater depletion. This challenge is beyond the scope of this study, and is treated very well by several other excellent recent publications on this topic. One goal of the VREDS report is to stimulate a larger discussion based upon the connection between public welfare and the Verde River that may compel and enable the public and its policymakers to address this larger issue and others.

The objectives of the VREDS research are to identify existing scientific data and social research, ecosystem services and management practices and current conditions that inform us about and identify the nexus between a healthy river and sustainable economic development strategies and practices. This investigation focused on:

- Determining the feasibility of establishing the economic value of the Verde River in the study area;
- Determining whether an investment of additional resources in the Verde Valley might positively impact sustainable economic development and, thereby, lead to and sustain a healthy Verde River;
- Determining the most efficient and effective methods to educate the public and its policy makers about the value of the river and its relationship to sustainable economic development of the Verde Valley; and

- Assessing the practicality of creating and supporting an organization whose mission would be to implement recommendations of this and other WFF-funded studies.

Central Arizona's Verde River is one of the last free-flowing perennial desert rivers remaining in the Southwestern United States. The river is threatened from many quarters, but none of the threats is yet insurmountable. The preservation of this unique waterway lies in demonstrating and promoting the river's value to the population. The river's values are often subjective and sometimes ill-defined. While attempts are made at measuring such things as recreational, cultural or "quality of life" values in dollars and cents, the true value of the river and the full range of services it provides are not easily calculated. This study addresses that gap in existing information in the study area as described below. The VREDS research examines some of the subjective and intrinsic values residents of the Verde Valley assign to the Verde River.

The VREDS purpose is to evaluate the current connection between the Verde River and the economy in the study area and the possibility of strengthening that connection to support a healthy river system, as well as to identify opportunities to invest resources in the study area that will result in a healthier, more sustainable Verde River ecosystem. Further, it will inform whether or not this work could potentially be done by existing entities and/or if, in the opinion of the VREDS team, other options warrant exploration including the formation of a new organization dedicated to the purpose of this study.

Study Area

The study area (Appendix 2) encompasses approximately 200,000 acres in eastern Yavapai County, Arizona, with its western limit being west of the Town of Jerome, the eastern boundary east of the City of Sedona, and the southern limit south of the Town of Camp Verde. The area contains the incorporated municipalities of Camp Verde, Clarkdale, Cottonwood, Jerome and Sedona, and the unincorporated populated areas including Big Park, Cornville, Lake Montezuma, Page Springs, Rimrock, Verde Village, and Village of Oak Creek. It lies entirely within the Upper Verde River watershed and the Middle Verde Groundwater Sub-basin.

The Verde River enters the study area north of Clarkdale and flows toward the southeast, exiting the area south of Camp Verde. Two perennial tributaries are included in the study area. The largest is Oak Creek, which flows southwesterly from Oak Creek Canyon north of Sedona, through Sedona and Cornville, and reaches its confluence with the Verde River approximately five miles southeast of Cottonwood. Beaver Creek enters the study area east of Rimrock, flows southwest, and joins the Verde River at the northern boundary of Camp Verde. (see Appendix 2)

The Central Yavapai Highlands Water Resource Management Study (CYHWRMS), conducted by the Bureau of Reclamation in 2010, reports the total population of the study area to be approximately 65,000. Camp Verde, Cottonwood, and Sedona, have the largest populations, with approximately 14,000 residents each. About one-third of the population is located in unincorporated areas of Yavapai County. The study area includes two national monuments (Tuzigoot National Monument and Montezuma Castle National Monument) and four Arizona state parks (Red Rock State Park, Fort Verde State Historical Park, Jerome State Historical Park, and Dead Horse Ranch State Park). Slide Rock State Park is located immediately outside the

area. Major public landowners include Prescott National Forest, Coconino National Forest, Bureau of Land Management, and Arizona State Land Department.

Elevations in the study area range from 3,000 feet (915 meters) near Camp Verde, to above 5,000 feet (1,785 meters) near Jerome and Sedona. Adjacent to the area are higher mountains ranging from 7,800 feet (2,380 meters) at Mingus Mountain to 6,000 feet (1,829 meters) east of Sedona on the Mogollon Rim, and 6,000 feet (1,829 meters) southwest of Camp Verde.

Vegetation types in the area are highly variable. The valley floor above the river is dominated by desert scrub (e.g., mesquite, catclaw, saltbush, creosote) and grasslands. Riparian zones along the Verde River and tributaries are predominately Fremont cottonwood/Goodding willow complex, and the higher slopes are taken over by pinyon/juniper mix, and even higher by Ponderosa Pine. Native and non-native species are mixed in all vegetation types.

Study Design and Methods

The research methods used in this study are primarily qualitative and include personal interviews and the review and content analysis of documents pertinent to the study's purpose.

Expert Design and Review Team

A first step in the study process was to create an independent skilled and knowledgeable panel to evaluate and provide feedback on the overall design, methodology, and execution of this project. The VREDS team identified individuals with expertise in various fields applicable to the VREDS mission. The resulting Expert Design and Review Team includes representatives from academia, non-profit organizations, and the public sector with expertise in study design. Appendix 3 lists the members of this support team.

Literature Review

The VREDS team reviewed research literature to provide information relevant to the nexus between the health of the Verde River and economic development in the study area. This review and analysis included archival records, scientific studies and other documents and associated literature that showed inter-relationships between such things as population growth, river habitat, pollution, geohydrology, and public policies pertaining to the river and economic development or absence thereof. Many publications include studies of venues similar to the Verde River, especially concentrating on economic development efforts associated with rivers and riparian ecosystems.

Document sources included, but were not limited to, published and unpublished studies and reports generated by:

- Educational and government agencies such as Northern Arizona University, Prescott College, Yavapai College, United States Geological Services (USGS), and Arizona Department of Water Resources;
- Private research institutions ;

- Media organizations;
- Interest groups and non-governmental organizations; and
- Comparative scholarly studies linking sustainable economies and healthy river systems.

Appendix 4 provides a list of the pertinent literature.

This initial phase of the research provided understanding and information about what questions remain to be answered about the nexus between economic development and the health of the Verde River and how this study might address and/or answer some of these questions. A secondary purpose of the literature review was to determine if additional studies might be needed to help refine the conclusions, or if sufficient data were already available. In addition to the literature review, the study team interviewed select individuals to help assure the currency, as well as completeness, of the archival information.

Interview Process

The VREDS team identified and interviewed five categories of individuals: 1) decision makers; 2) opinion leaders/community leaders; 3) representatives of various interests in the Verde Valley (e.g., ranchers, developers, tourist industry, retirees, entrepreneurs, manufacturers, etc.); 4) individuals and/or organizations from other communities where similar goals have been successfully implemented; and 5) citizens-at-large. A list of individuals interviewed is included in Appendix 5.

Headwaters of the Verde River Downstream from Paulden, AZ

Because the target population appropriate for this study is relatively homogenous with groups of varying sizes, a convenience sampling method was used to select participants in categories (1), (2), and (4). Category (3) used a stratified sample method. When respondents identified others appropriate for further interviewing, the team added these individuals to the cadre, providing a snowball sampling. The citizens-at-large category evolved randomly and serendipitously throughout the interview process. The study team regularly addressed the question of the sample adequacy and representativeness.

An additional interview group that did not fall in the established categories resulted when members of the study team spent an afternoon talking to river users between Tuzigoot Bridge and Dead Horse Ranch State Park. These informal interviews of five different groups recreating on the river resulted in anecdotal information that is assimilated into one response.

Preliminary domains on which study interview questions were derived include:

- Significant factors influencing the health of the river system;
- Factors and data about the Verde River that need to be better understood;
- Current efforts to connect effectively the Verde River system with sustainable economic development;
- Potential economic development opportunities that are associated with the Verde River system in the Verde Valley;
- Existing data that can be used to promote and advance the connection between the Verde River and the design and development of a sustainable economy in the Verde Valley;
- Potential allies in advancing the connection between a healthy river and sustainable economic development;
- Barriers to advancing sustainable economic development in connection with a healthy river (e.g., laws and regulations, property rights, institutions such as ditch companies, water companies, historic uses, and cultural intransigence);
- Potential collaborators/outside experts who might be valuable in productively using the findings of this study; and
- Assessment of need and focus of potential additional investment to achieve the goals of sustaining and conserving the Verde.

The study team used a set protocol in the interviews of the study sample. (see Appendix 6) While the interview questions were carefully structured, interviewees were invited to provide supplemental information about closely allied topics. The interview questions were somewhat open-ended in order to avoid unduly constrained responses. Before interviews began, the interviewers gave the respondents an opportunity to remain anonymous if desired and to review and furnish consent for any attribution(s) that might be selected for inclusion in the final study report. The interviewers also completed a written record and checklist to ensure that consent information was received and recorded. (see Appendix 7) Before each interview appointment, interviewees were sent a document that introduced and summarized the Verde River Economic Development Study. (see Appendix 8) Interviewees also had a copy of the interview questions for referral during the interview.

Some interview questions probed different perceptions/values about the river and sustainable economic development. For example, a rancher or owner of property along a stream or river may have been asked to rate the importance of specific items such as aesthetics, property values, etc. Alternatively, a business owner may have responded to what economic or other relationships, if any, the river has on his/her business. Optionally, the interviewer prompted interviewees for their ideas about how a link between economic development and a healthy Verde River could be advanced by promoting economic development and communicating the link between them. The respondents also provided suggestions about whom or what organization(s) might be able to do this work.

The study team interviewed 98 people in 90 separate interviews. There was one formal group interview session and five informal anecdotal group interviews. All but three of the interviews were recorded digitally. Members of the study team transcribed verbatim all recorded question responses. When interviews were not digitally recorded, the interviewers took detailed notes during the process and compiled a written report of those subjects' responses. The respondents

were asked eight standard questions and one or more discretionary questions as the interviewer deemed relevant and/or appropriate. Interviewers encouraged the respondents to expand on themes needing more explanation or exposition. These standard and optional questions are included in Appendix 9. Each VREDS team member reviewed all interviews either by listening to the interview recordings or reading the transcriptions.

To better analyze the transcribed interviews, all responses to each question were assimilated into one summary response. This process resulted in a collective response for each of the eight major questions as well as the add-on questions. These combined responses appear in Appendix 10.

Keywording

To check the validity of the written interview summaries and other report content, VREDS conducted a keyword and coding analysis. Key words and concepts explicitly stated in the transcribed responses provided six major codable categories. The frequency with which a word or concept occurs indicated its relative significance in the responses to interview questions. The categories, along with their sub-categories, describe common topical areas across all interview responses. Finally, the team developed the codable categories and a single team member conducted and recorded the counts, with one retest by another member.

The "Find" function in Microsoft® Word 2010 tallied the number of times keywords (or their roots/extensions) were used by respondents. The intensity of use was not measured and multiple uses by single respondents were not considered. However, further qualitative review of the question summaries indicated that in a number of instances, the intensity (emotional strength) of interviewees' statements warranted inclusion of these findings in the final report, despite a relatively low number of occurrences. For example, "water quantity" was specifically mentioned only 18 times, but several respondents made strong and convincing statements regarding the importance of this topic.

Study Area Site Inspections

During the interview process, frequent references to the difficulty of accessing the Verde River and the ditch systems in the study area prompted the VREDS team to inspect these two elements. A study group member identified possible river access points by conducting a web search, reviewing information obtained in the document review process, and through personal knowledge. He visited and photographed all publicly-owned river access points surveying available facilities, quality of river frontage, and ease with which the site could be located and used.

Team members also physically inspected several of the existing irrigation systems in the study area. This examination involved following a primary ditch diversion and its lateral lines and observing its location and environs. To approximate of the amount of agricultural land along the Verde River system, the team member used the Yavapai County Parcel Viewer website. This tool provides an aerial view of land parcels from which one can visually assess the possibility of agricultural versus residential usage. He then cross-referenced the properties to determine if they

are classified as "agricultural use" in the county tax rolls. Personal interviews with three ditch bosses and a representative from Salt River Project (SRP) further informed the irrigation systems examination.

Findings and Conclusions

The literature review, stakeholder interviews and physical inspections of existing systems impacting the study area resulted in an abundance of informative and useful data. Excluding the anecdotal sessions, the interviews totaled more than 52 hours and averaged 38.25 minutes in length. Interviewees who had particular expertise in the subject were informative, engaged and enthusiastic about sharing their thoughts and knowledge. However, the more casual, lay people often provided the "out of the box" perspectives that helped to inform the study.

Common Themes

These findings revealed recurring themes and common threads that connected many of the seemingly unrelated ideas. The topics focus on:

- Branding of the Verde Valley;
- Public river access;
- Irrigation systems;
- Literature review and scientific studies;
- Public engagement and education; and
- Cooperation among government entities.

Branding of the Verde Valley

During the interview process, among the more common themes was an observation that the Verde Valley has not identified itself sufficiently with the river—that it has not branded itself with the Verde River.

Verde River near Tuzigoot National Monument

The study team frequently heard comments like "the public doesn't even know the river exists" or "access to the river is limited, poorly understood, unsafe and unattended."

Interviewees often reported that improving access to the river is essential if the public is to become more involved with, and have a vested interest in, the health of the Verde River.

Public Access to the River

The physical inspection of the publicly-owned river access points in the study area included for each site a survey of available facilities, quality of river frontage, and ease with which it could be found.

The examination of access availability in the study area revealed that only eight publicly-owned areas exist where people can easily get to the river. Of these, all have parking areas and six have some additional facilities. The most developed access point is in Dead Horse Ranch State Park, which is a fee area, a factor that may limit local users. The other points are generally parking areas with minimally improved or unimproved trails and facilities. Appendix 11 describes each public access point and its facilities.

With the exception of Dead Horse Ranch State Park and Riverfront Park, no site has any way finding or directional signage on major arteries leading the public users to it. Also, none of these access points has signage on the smaller approaching roads that indicates that river access is available.

Most of the bridges spanning the Verde River in the study area completely block any view of the river itself. While safe and flood-proof, they do not offer users easy visibility of the river. Thus, the thousands of travelers who cross the river each day seldom actually see it. At best, they can see the tops of the riparian forest trees. Of the five major bridges crossing the Verde River (Tuzigoot Bridge in Clarkdale; Dead Horse Ranch State Park , Mingus Avenue Bridge and State Route 89A Bridge in Cottonwood; Black Bridge at I-17 in Camp Verde; and White Bridge on State Route 260 in Camp Verde), the river is easily visible only from the Tuzigoot Bridge. Even the bridge leading to Deadhorse Ranch State Park, whose focus is the Verde River, provides motoring travelers no visibility of the river. It is conceivable that a resident or visitor to the Verde Valley could travel all main roads in the study area and never be casually exposed to the Verde River.

Bridge over Verde River at Dead Horse Ranch State Park

Irrigation Systems

While it was not possible to determine the exact acreage being irrigated, visual examination of aerial photography and physical inspection of some representative areas indicate that less than 25% of the irrigated acreage is used in for-profit agriculture. The rest of the irrigated lands are primarily residential. A personal interview with a Salt River Project representative revealed that land converted from agricultural to residential use, which retains irrigation rights, generally consumes more water per acre than the agriculture it replaced. An overview of the major irrigation ditch systems is in Appendix 12.

Literature Review and Scientific Studies

The records, studies, documents and publications compiled and reviewed by the VREDS team include information about other cities and towns that have focused on connecting their respective rivers with local economic efforts. A list of these documents appears in Appendix 4. Several studies included in the literature review involve similar economic analyses of a river's direct or indirect impact on economic development efforts. Other documents provide specific data that could potentially be adapted and implemented in the Verde Valley

Findings of particular interest include economic data from National Park Service and Arizona State Parks that focus on visitation.

The two-year **Verde River Corridor Project** (VRCP), identified during the research and interview process of the VREDS project, warrants more attention. In the fall of 1989, a steering committee consisting of 26 public officials, businesspeople and other stakeholders in the Verde Valley was formed was to "develop a workable strategy for the use, management, and protection of the river that incorporates the views of its many users, residents, agencies, and elected officials." (Verde River Corridor Project, June 1991). It was facilitated by two representatives each from Arizona State Parks and Arizona Department of Commerce. The final report was completed in 1991.

This project is a good example of public engagement, scientific diligence, relevance and thoughtfulness, but few, if any, of its outcomes and recommendations have been implemented. Identifying possible reasons for this lack of implementation is valuable to the VREDS project and deserves additional discussion because it informs a number of the VREDS recommendations.

After the VRCP study was completed and the final report prepared, including findings and recommendations to implement them, no core group of staff or other qualified professionals was charged with and/or funded to complete the implementation. Although one of the recommendations proposes that some body of "others" in the community could/would/should continue the necessary work set out in the VRCP study, it was, in fact, only a recommendation. With no accountability, no staff, no funding mechanism, and no procedure in place to continue the planning and implementation efforts, this well-funded and facilitated multi-year project became one of the many studies that fills shelves and collects dust in the Verde Valley's and the State's planning departments. It is notable that no local municipal or county planning department

in the Verde Valley could easily locate and provide the VREDS team with a copy of the report. In fact, several reported never having heard of it.

The conclusions and recommendations of the VRCP are as applicable today as they were in 1991, when the population of the Verde Valley was half what it is today. Many of the VREDS findings, conclusions and recommendations mirror and/or are very similar to those made in 1991 by the VRCP. The VCRP called for branding, community engagement, more economic development associated with a healthy river, and improved access and signage to the existing access points. There is little or no evidence that any of these was ever begun or completed.

The value of the VRCP is not lost, for it helped create awareness of river issues and started the public engagement and thought processes that may have led to an improved Verde River Greenway development and helped unite a core group of passionate river advocates, many of whom are still active today. Of those who participated in the VRCP process and are still in the area and available to the VREDS team, four were interviewed about the successes and failures of the VRCP. The responses range from statements that it was a "sham" to vague feelings that the project increased awareness incrementally and that this raised awareness is its primary legacy.

Public Engagement and Education

Several local and regional events that focus on the river or riparian habitat, such as Verde River Days and the Verde Valley Birding and Nature Festival (VVBNF), provide annual opportunities for the public to share and celebrate the Verde River. However, as interviewees often expressed, few other events or Verde River venues invite visitors or members of the community to visit and enjoy the river.

Interviewees often cited their poor understanding of the issues that threaten the health of the Verde River. Threats like invasive species, groundwater withdrawals (both in the study area and upstream), water quality impacts, and such were often mentioned, but generally not well understood.

Many of the respondents voiced frustration over the number of studies that have been done at considerable expense with little or no implementation of their recommendations and no further exploration of their conclusions Many interviewees also expressed little patience with the number of organizations, both governmental and non-governmental, devoted to various river and water issues that can show few tangible results.

"Verde River" on Facebook®

Web-based social networking is leading the way as a cultural marketing tool. Users can share with others who participate on this social network site ("friends") ideas, activities, events, and interests easily and extensively.

On February 22, 2011, the "Verde River" appeared as an individual on the social networking site Facebook®. Within three weeks, "Verde River" had more than 600 friends. By July 30, 2011, friends of "Verde River" totaled more than 2,650. Its base was growing at over 130 new friends

per week, and a new, lively and engaged community of Verde River devotees was thriving. Friends have "tagged (contributed) more than 900 pictures of their own experiences with the river. "Verde River" steadfastly refuses to acknowledge any human intervention in its posts. It refers to itself in the first person, thus personifying itself for its ever-expanding group of friends.

The "Verde River" typically posts a photograph with an explanation of that picture from the river's perspective. The following is a post about Woodhouse's Toads that appeared June 5, 2011:

This grumpy-looking fellow is the most common toad in and around me. He's a Woodhouse's Toad, and you can see his kids swimming around in my shallows on any summer day. They're those little black tadpoles. About this time of year in the evenings the male toads sing their lonely song - a kind of WAAAAAAAAA! that attracts females. Who wouldn't fall for a warty, bug-eyed guy singing WAAAAAAA!? I would.

Other posts have highlighted native fishes, basic hydrology, watershed properties, threats, successes, diversions, plants, lizards, snakes, history, and so forth. All are positive, and each has a gentle educational component. The discussions of each posted topic are robust and lively. More than 2,500 entries of one sort or another have been made in the last three months by "Verde River" and its friends.

The reason the VREDS team believes this effort is significant and important to the future of the Verde River is that it addresses the river in a way that is familiar to those people who will be responsible for and to it in the future—the "Millennial Generation." Millennials are comfortable getting information and interacting in the virtual realm of Facebook®, Twitter®, blogs and other social media. To reach this demographic cohort and influence their valuation of the Verde River, these media will play a pivotal role.

The success of the "Verde River" on Facebook® is a clear indication that an unmet need has been addressed and that the river can play an important and topical role in people's lives. In the future, it will likely be social media that delivers our news, establishes our social context, and serves as the "town square" forum for discussion of a broad range of subjects. The friends of the "Verde River" on Facebook® will form the basis for an educated, passionate cohort who values the river as a flowing, perennial, vital stream and is engaged in ongoing efforts to maintain and preserve its health well into the future.

Cooperation among Government Entities

Interviewees commonly stated that the various governmental jurisdictions in the Verde Valley and statewide needed to be more aware of the condition of and threats to the Verde River. They expressed a belief that there is insufficient regional cooperation and coordination among government agencies, local and regional jurisdictions and river-related, non-profit organizations.

Several respondents specifically suggested the need for an umbrella organization that would provide assistance to and coordinate the efforts of local, regional, and state governments on issues concerning water and the Verde River. This entity could also serve as a central repository for additional research and study that addresses river-related and sustainable economic development in the Verde Valley. The repository would provide a portal available to elected officials and the general public for accessing information.

Interview Keyword Analysis

Words, terms, and concepts consistently heard in the interviews provided a keyword index that then formed the six codable categories from which the VREDS team could check the validity of the interview summaries. The results of the VREDS keyword analysis of the transcribed interviews are in Appendix 13. As mentioned previously, the intensity of use was not measured and multiple uses by single respondents were not considered.

Economic Value of the River

The monetary value and economic significance of the Verde River to the businesses and residents of the study area is exceedingly difficult to determine. Several key values identified by the VREDS team help approximate the river's impact. Other research attempts to establish clear economic impacts of the river have not resulted in confidence or action. For this reason, the VREDS team addresses some of these key principles anecdotally and in general terms. They appear in no particular order.

Direct Economic Benefits of a Flowing Verde River

The Gross Regional Product (GRP) is the market value of the goods and services produced or derived from a specific region (see Appendix 14). The portion of GRP of interest in this report is derived from the goods and services that are dependent upon the perennial and continuous flow of the Verde River.

Direct economic benefits attributable to a flowing Verde River include local agriculture irrigated with surface water from the river, recreational float trip operations, and businesses serving and supplying river and riparian area enthusiasts.

Annual events, such as the Verde Valley Birding and Nature Festival (VVBNF), with more than 400 attendees each year, have a direct economic benefit to the area. The Verde River provides the habitat used by a large portion of the birds and animals showcased by the VVBNF. It is unlikely, however, that this festival could continue to attract nature enthusiasts without the riparian habitat surrounding the river and its tributaries. Further, economic benefits from regional events such as Verde River Days and the Verde River Canoe Challenge are primarily reliant upon the river flow.

Verde River at U.S. Forest Service Bignotti Beach Recreation Area

Another example of direct economic benefits in the Verde Valley is Sedona Adventure Tours, a company that, according to its owner/operator, derives about 80% of its income directly as a result of a healthy and flowing Verde River. This commercial venture provides guided and equipped kayak tours of the river and has a specialty tour called "Water to Wine" taking kayakers to one of the wineries near the river and where they are invited to enjoy some wine and a brief tour of the vineyard if they choose. Other tour companies, mostly based in Sedona, bring tours to the river as part of their nature agenda or archaeological tours.

The direct economic impact of the flowing river is a relatively small percentage of the approximately $1-1.5 billion GRP of the study area. (Limbrunner, et al., 2011) Surface-water irrigated agriculture exists, but all indications are that only a few of these operations are profitable. While a few commercial irrigated enterprises thrive, such as corn and vegetable crops and cattle ranching, the majority of irrigated agricultural operations in the study area are small private farms that are maintained without expectation of being a primary source of income. Some are irrigated to provide recreation for the owner, such as pasturing a few horses. Others are managed as working farms for sideline income, or are even operated at an ongoing financial loss as a lifestyle choice. The vast majority of surface-water irrigation is used to water personal yards or is only indirectly associated with for-profit agriculture.

Many interviewees linked the growing wine industry in the Verde Valley directly to the Verde River. Some of the local wineries experience an enhanced ambiance in their tasting rooms and decks due to the proximity of the Verde River or Oak Creek. However, the study team was able to confirm only a small direct connection to wine production.

Indirect Economic Benefits of a Flowing River

Indirect economic benefits to the GRP include activities that are more profitable because of, but are not strictly dependent upon, a healthy, flowing Verde River.

Among these indirect economic advantages in the study areas are the premium prices paid for real estate located near the river; visitorship to national and state parks; wineries situated near or along the river, but not necessarily using surface water irrigation; and sales of sporting goods,

food, gas, lodging, and other visitor amenities that are to some extent associated with the health of the river.

The Verde Canyon Railroad, a local tourist-based excursion train, also fits in this category. The railroad carries passengers from Clarkdale, up the Verde River Canyon to Perkinsville and back six days a week. It employs 25 people full-time and another 25-30 part-time. Operating since 1990, it is generally fully booked and currently serves about 90,000 riders each year, according to correspondence with the railway's marketing and sales department. However, it is unclear whether the train would continue to be as profitable without a flowing river and its associated healthy riparian ecosystem.

According to real estate professionals interviewed for this study, property in the riparian zone near the river is generally valued at approximately 30% more than comparable property outside the riparian area. A secondary effect of this differential is the increase in revenues generated from residential property tax collections for Yavapai County, local school districts, other special taxing districts, and the Town of Clarkdale. The Town of Camp Verde and the City of Cottonwood do not levy property taxes.

Visitorship to national, state, and community parks in the study area is due to or facilitated, at least in part, by the Verde River's riparian habitat and rich history and culture. The contribution of these parks to the local economy can be estimated, but teasing out the portion of that impact that is directly attributable to a healthy Verde River is at best inexact. Dead Horse Ranch State Park and the state parks near Sedona (Slide Rock State Park and Red Rock State Park) are more dependent on flowing water than the national parks (Tuzigoot National Monument, Montezuma Castle National Monument and Montezuma's Well National Monument), which are all adjacent to streams, but would still have their historic and archeological significance without flowing waters.

Sporting goods, especially fishing supplies, are indirectly related to a flowing river since this equipment and apparel are used in the Verde River or its tributaries. No data are available that reveal with certainty what percentage of that market is directly related to a flowing Verde River.

These examples of indirect economic benefits as a result of a healthy, flowing river are not necessarily dependent on the Verde River as a perennial and continually flowing stream. However, these activities may not continue to be as profitable without a flowing river and an associated healthy riparian ecosystem.

Ecosystem Services and Ecological/Environmental Values Related to the River

Ecosystem services and ecological/environmental values of the Verde River are economic and social benefits that are not captured as sales or profits of an economic activity, but which do have an impact on the cost of living for people near the river and/or supply a service at no charge. One example of this function is the cooling effect of the riparian corridor for homes in and near the river. Others include the supply of "free" foods (e.g., fish, crayfish, watercress, etc.), and the relative fire and wind protection afforded homes and structures situated near or along the riparian corridor.

While there are clearly some economic advantages offered by the river and the riparian corridor, these values are not all positive. Proximity to the river also brings flood hazards and the need to purchase flood insurance, mosquitoes and potential exposure to insect-borne disease, and summertime humidity, which limits the usefulness of less expensive evaporative cooling. Ecological or environmental values are generally benefits to one's lifestyle and peace of mind. These personal values are difficult to quantify, but are nonetheless important.

Possibly the single greatest economic impact, and the one most sensitive to degradation of flows among the ecosystem services, is the delivery of surface water to ditch users. There are 10 major ditch systems in the Verde Valley, serving 1,531 accounts. They irrigate 4,339 acres, extending a total of 61.1 miles (see Appendix 12). These ditches have combined peak withdrawals of 230 CFS, more than twice the base flow of the river during the primary irrigating season. As previously stated, the majority of the irrigated acres are private homes that use the water for residential landscaping and not-for-profit agricultural.

To give perspective to the issue, one large Verde Valley ditch diverts about 50 cubic feet per second (CFS) from the river during its peak use period (Appendix 12), and averages, conservatively, 25 CFS over the year, it diverts enough water to serve 50,300 homes. This is enough water to supply to about 125,700 people for a year at an average household consumption of 128 gallons per capita per day (GPCD), which is the average GPCD of Clarkdale and Cottonwood according to the Central Yavapai Highlands Water Resource Management Study (CYHWRMS). Even if its consumptive use is two-thirds of that total and the other third finds its way back to the river, it would still serve 84,000 people, which is greater than the current population of the Verde Valley.

The Verde River provides riparian habitat for a wide variety of plants, insects, fish, reptiles and amphibians, birds, and mammals. Some species that do not occur anywhere else in Arizona are attracted to the rare resources that the Verde provides. The first Audubon Society/Bird Life International Important Bird Area (IBA) in the state was established along the Verde River from Dead Horse Ranch State Park to the old power plant site at Tapco, approximately two miles upstream from Clarkdale. Page Springs, also in the study area, was one of the next established IBAs. These two designations demonstrate the extraordinary habitat and species diversity that typifies the Verde River corridor. These areas attract recreational nature lovers, birding enthusiasts, fishermen, and hunters to the Verde Valley, and along with events such as the Verde Valley Birding and Nature Festival and Verde River Days, have established the Verde River and its associated ecosystem as one of the premier birding and wildlife viewing areas in Arizona.

The Nature Conservancy's recent report entitled "Policy Options for Water Management in the Verde Valley" attempts to define the economic impact of the Verde River, but the authors state that they were unable to separate the economic impact of a flowing river from the impact of groundwater. The results presented in their report cite a few examples of impacts (e.g., Verde Canyon Railroad, Sedona Adventure Tours) and make an educated approximation that the value of the river is approximately 10% of the GRP of the Verde Valley.

Water Resource Allocation and Its Implications to a Healthy Verde River

Without water, there is no Verde River and the conclusions and recommendations of the VREDS project are rendered moot. This statement seems intuitive and simple, but is highly nuanced and complex. Rivers do not just stop flowing overnight. As a river is dewatered, a variable period of riparian maintenance occurs due to sub-flow and occasional flooding. As the sub-flow declines, a succession of plant life overtakes the former riparian corridor. Phreatophytes, like cottonwoods and willows, are slowly replaced by a succession of upland species, such as mesquite, creosote and cacti. This succession can take hundreds of years or it can happen much faster, depending upon the maintenance of sub-flow.

Verde River near the Foot of Tuzigoot National Monument

Even dead rivers flow occasionally. Intermittent and ephemeral streams flow during seasons of high runoff or groundwater discharge. Their ecosystems are variable, but they are not as diverse or vibrant as those of perennial streams. The VREDS area has several examples of these, including Dry Beaver Creek, Sycamore Creek, Dry Creek, and others.

The Verde River is at risk of becoming one of these intermittent streams. If that were to happen, biological diversity would plummet. Floods would continue to occur with some regularity, but the impact of those floods would be very different from what we experience today. As a stream's riparian zone retracts and eventually disappears, the riverbed's resistance to erosion generally decreases. Severe channelization, bank down-cutting and lateral erosion occur as flood flows increase in velocity due to lack of vegetation in the stream channel. This change in streambed topography continues to worsen with time, until there is a steep, narrow gorge left, instead of a greenbelt of cottonwoods and willows. At this point the Verde River would likely become more of a liability to the Verde Valley than an asset. This is one reason it is essential that the river continue to flow.

Threats to a perennial stream like the Verde River are many and varied. These threats vary in probability, timing, severity and impact on the surrounding ecosystem and economy. In the case of the Verde River, the potential for dewatering as a result of excessive groundwater withdrawals is probably the most likely and immediate threat of all, and could have the greatest impact on surrounding ecosystems and economies.

The recently released USGS "Northern Arizona Regional Groundwater Flow Model" reveals that virtually all groundwater in the Verde Valley is slowly flowing toward and discharging into the Verde River and its tributaries. This finding implies that all groundwater pumped and consumed is river flow lost, gallon-for-gallon. Historical records of Verde River stream-flow indicate that the flow is decreasing with time. The decline could have several causes, including draught, climate change and changes in riparian cover, but the speed with which the change is occurring seems to indicate that the largest single impact on river flow is groundwater depletion. All potable water used in the Verde Valley originates as groundwater, and according to the preliminary results of the Bureau of Reclamation's Central Yavapai Highlands Water Resource Management Study (CYHWRMS), Phase 1, the demand for potable water in the Verde Valley will nearly triple from 2006 to 2050. The source of this additional water is a matter of policy and economy, but clearly a large portion will continue to come from groundwater withdrawals. As groundwater is pumped in increasing quantities, Verde River flows will decrease correspondingly.

Considering the magnitude of these challenges and threats, water resource allocation and use needs to be a major focus of any effort to conserve and maintain the health of the Verde River, its ecosystems and the economies that depend upon it. Water consumption, especially groundwater use, must be stabilized or reduced if the region is to continue to benefit from a flowing, perennial Verde River.

Groundwater consumption can be reduced in a number of ways, with the most obvious being greater conservation of the resource. More effective and well-planned recharge of treated effluent is another of the most important methods for reducing the net demand for groundwater. Relying less on groundwater by gathering storm water, harvesting rainwater on a conscientious and sufficient scale, diverting flood waters to off-channel storage, and other similar techniques can provide some relief, but in the end, if the residents of the Verde Valley and upstream communities do not reduce net groundwater withdrawals, the river will pay the price.

Several early-stage projects are currently underway which will help reduce groundwater consumption in the study area. The Town of Clarkdale and the City of Cottonwood are each planning new wastewater treatment plants which will facilitate more efficient recharge and reuse of treated effluent. However, these two communities represent only about one-quarter of the groundwater use in the Verde Valley. Upgrades to the City of Sedona's wastewater plant are also being considered, but to date, they have not proposed a final recharge or reuse plan. The more than 6,000 private wells in the study area account for a large portion of unregulated groundwater use, and almost all of them use septic systems for wastewater disposal. Since septic systems have very low recharge potential, averaging about 33% according to the CYHWRMS, they represent an opportunity for positive change. Wastewater in the Town of Camp Verde is largely handled by private septic systems. A lesser amount is treated in the local sewer district facility, but not recharged. Improving the recharge potential, both in quantity and quality of all untapped wastewater resources in the Verde Valley would have a positive impact on the consumptive use of groundwater.

Opportunities for Expansion of Economic Relevance to a Flowing River

The idea that the river and its economic potential are virtually untapped and even ignored is almost universal among the VREDS interviewees. Many respondents say that opportunities to increase the relationship between a healthy Verde River and the study area's economy do exist and that they vary in feasibility, difficulty, initial costs, timing and potential impact. Some of the most frequently heard ideas are:

- the potential for increased tourism and eco-tourism is high;
- for-profit educational opportunities may exist;
- local food production will play a larger role in the Verde Valley's economy in the future; and
- recreational opportunities related to the river have only been lightly explored.

Currently, only one kayaking company, Sedona Adventure Tours, has made a substantial investment in guiding trips along the Verde River. This operation, while successful, is hampered by a poor flow regime, dangerous obstacles and the limited access points for put-in and take-out. Interviews and the VREDS team's inspection of the river access points suggest that only when access to the river is improved, obstacles in the river are mitigated or removed, and flow regimes are addressed will the opportunity for significant additional recreational use exist on the river.

Tourism and eco-tourism potential are dependent upon the high level of species diversity and scenic beauty in and around the Verde River. According to the Checklist of Birds in the Tuzigoot Important Bird Area (Radd and Von Gausig, 2001), more than 170 bird species migrate through, breed or are resident in the riparian zone of the Verde River in the VREDS area. This avian diversity drives the success of the Verde Valley Birding and Nature Festival (VVBNF) and attracts birders and naturalists to the Verde River corridor. According to the director of the VVBNF, increased registration is limited only by logistics, such as the number of vans and drivers to transport participants, tent space, and so forth. This indicates that there is likely additional demand that could be served by increasing capacity. The VVBNF organization is considering adding days to the festival, or even adding additional festivals, such as during the fall migration.

Hauser's Corn stand in Camp Verde

Many other opportunities exist to increase tourism in the study area. Increased safe, convenient river access that is publicized, should increase recreational tourism significantly. Better pedestrian, equestrian and bicycle trails as well as improved canoeing/kayaking stretches will attract recreational users and will increase the public's perception of the river's value.

The Verde Valley is a very fertile and profitable area to grow vegetables, according to two farming interviewees. This is due to its flood plain soil and the mild climate. Currently most farms, even small, family-owned farms, are watered using flood irrigation from the irrigation ditches. This is an inefficient way to water. Water consumption can be significantly decreased using drip irrigation and an organic approach to growing. One small family farm in the VREDS area is supplying about 20 restaurants and grocers in northern Arizona, including their own restaurant, with produce. An interviewee states that gross revenues from small (5-7 acre) farms are averaging around $12,000 per acre.

According to several of the interviewees, the demand for local small-scale food production is increasing and will continue to grow in the future. Driving this growth is the rising expense of transportation of foods, increased demand for the organic/slow food market, and a general desire to return, at least to some extent, to sustainable agriculture practices. In the study area, there is some production farming of vegetables (carrots, root vegetables, corn) and alfalfa, along with smaller farms growing tomatoes, peppers, chiles, and other crops for local consumption. Four interviewees familiar with food-crop production reported that currently less than 10% of irrigated acreage is devoted to food crops in the Verde Valley, and less than 25% is used for commercial agriculture. However, a few areas exist where the majority of ditch usage is for food and for-profit agriculture. The Diamond S Ditch in Camp Verde, according to a conversation with a long-term farmer in the study area, is one such system.

According to the same farmer, a major threat to the future of farming in the Verde Valley is the conversion of farm lands to housing developments. While a large percentage of the land taken out of production has already been converted to housing, a significant amount is still available that could be rehabilitated to allow farming. One way to ensure that both the current agricultural land and the land that has been taken out of production retain their agricultural potential is the use of title restrictions similar to conservation easements. Instruments such as title restrictions typically pay the owner of the land for placing an agricultural easement or restriction on the land, thereby preserving its agricultural status and potential in perpetuity. The cost of such easements and the number of acres that potentially could be conserved this way will need further study.

Recreational uses of the Verde River, such as swimming, fishing, wildlife viewing, birding, canoeing and kayaking, hiking, cycling, equestrian uses, picnicking, and outdoor sports, have been relatively untapped in the study area. Due to development along the Verde River corridor, there was more hunting in the past than there is today.

The river is home to a variety of native and non-native sport fish and provides excellent fishing opportunities. Fishermen enjoy catching largemouth and smallmouth bass, sunfish, channel catfish, flathead catfish and three species of bullheads. In the winter, when the water is cool enough, the Arizona Game and Fish Department stocks the river with rainbow trout. Some fishing enthusiasts catch the large carp that are common in the river. The only native sport fish remaining in catchable numbers is the roundtail chub (*Gila robusta*), also known locally as "Verde trout" and "bonytail." The primary barrier to additional sport fishing opportunity in the study area is the small number of convenient access points.

In fact, the limited number of safe, convenient access point in the study area is the primary barrier to expanding all river-related recreational opportunities. Trails along the river are infrequent and broken by stretches of private property. Cycling paths suffer from this same limitation, as do equestrian trail and hiking opportunities. Swimming and picnicking sites are few and far between, and are generally limited to public sites, such as the Verde River Greenway, Dead Horse Ranch State Park, and the U.S. Forest Service sites (see Appendix 11). Improving and adding to the current access points would significantly improve the opportunities to recreate on and near the river. There are ways to improve access and signage, and to enhance the desirability of the current access points as well as opportunities to add new access to the river in the study area.

The potential for educational pursuits is great. The Verde River and its associated ecosystems are among the few remaining natural desert rivers left in the United States. This rarity makes it a prime candidate for studies centering on preservation of threatened ecosystems, the function of flowing streams in the desert southwest, and many other relevant topics. It is a real and practical model of how the hydrology of the area works. The richness of its habitat and the attendant species diversity provide opportunities to learn about birds, fish, aquatic macrofauna, plants and so forth. Literally hundreds of ancient archeological sites exist throughout the study area, and these are concentrated along the Verde River's greenbelt. National Parks Service sites, such as Montezuma Castle, Montezuma's Well and Tuzigoot, currently draw more than 600,000 visitors to the area each year. (National Park Service, 2010) However, the majority of archeological sites are not currently protected by public ownership and management.

Programs such as Elderhostel could provide an important educational component related to the health of the Verde River and sustainable economic development that depends upon it. Regularly scheduled educational seminars for adults on birding, nature photography, archeology, plein air painting, hydrology and a host of other topics could be offered by various private and public entities.

Allies in Linking Economic Development to a Healthy Verde River

The VREDS interviewees were nearly unanimous in their assessment that "everyone" is potentially an ally in linking a healthy Verde River to a healthy and sustainable economy. While several of the interviewees specifically mentioned policymakers, municipal leadership, chambers of commerce, business organizations and state and national government agencies as allies, their response to this question ultimately came back to "everyone."

Linking a healthy Verde River to a healthy local economy is a winning proposition for everyone. Even stakeholders who may initially view their interests as being compromised by the changes needed to advance the river-economy connection (e.g., ditch companies, private well owners and users, cattlemen, etc.) must eventually recognize that their economic well-being is dependent on the river's health. Stakeholders must be brought into the discussions early and earnestly. Opportunities to link the river and the area's economy should be seriously pursued and honestly evaluated to be accepted by the maximum number of stakeholders.

Creativity, civility, honesty and respect for the perspectives of all will be a major key to successfully making the changes necessary to improve the connections between the river and the economy. Most changes will need to be incremental and gradual. The use of pilot programs might help reduce resistance to transformative ideas. For instance, if the goal is to change the way ditch diversions work, the current management of the systems will need to be involved in the change from the beginning. A clear indication that the ditch will be better after a change must be a driving theme for that change to be embraced. Changing this entrenched paradigm will not be as simple as explaining the benefit to ditch users. Institutional changes will have a greater chance of success if the impetus for change comes from the stakeholders themselves.

Barriers to Success

The VREDS interviews provide insight into the challenges and even barriers that might be met when moving the study area toward a symbiotic relationship between economic development and a healthy Verde River. According to the respondents, state and federal laws and regulations are among the other major barriers to achieving this goal. Obstacles that make substantive and necessary changes more difficult and expensive include: the Endangered Species Act (ESA); the Army Corps of Engineers' administration of Section 404 of the Clean Water Act; the Arizona Department of Water Resources, particularly now that it is severely underfunded; the U.S. Forest Service's administration of their lands along the Verde; and other zoning and environmental regulations.

Arizona's bifurcated water law, which generally denies the connection between groundwater and surface water, was repeatedly mentioned as a barrier. Although surface water rights are regulated by the legal concept of prior appropriation, groundwater is, for all practical purposes, unregulated in the study area. This bifurcation means that a well user can pump virtually unlimited amounts of groundwater, regardless of its impact on the surface water in the Verde River and its tributaries. Currently no legal way to regulate the groundwater used by the more than 6,000 private wells in the Verde Valley exists. Since all related studies by the USGS have clearly demonstrated the connection between groundwater and the flow of the Verde River, this conflict represents a barrier when the goal is to regulate groundwater withdrawals in order to improve and preserve river flows.

Peregrine Falcon

Enforcement of the ESA could lead to situations where the solution to preserving base flows may impact an endangered species or alter its habitat. Although the overall goal may be to improve the general health of the ecosystem and improve habitat for the species in question, the ESA may prevent, delay, or render economically

infeasible the necessary changes in preference to one species. An overarching Habitat Conservation Plan (HCP) for the study area along the Verde River may provide a solution to this problem. The U.S. Fish and Wildlife Service website describes HCPs as "planning documents required as part of an application for an incidental take permit. They describe the anticipated effects of the proposed taking; how those impacts will be minimized, or mitigated; and how the HCP is to be funded." (U.S. Fish and Wildlife Service, 2011) In short, an HCP predicts what "incidental take" may occur and agrees with all parties in advance that no enforcement action will be taken as long as they comply with the terms of the HCP. In order to produce an effective HCP, all stakeholders need to be at the table from the beginning of the process, and the HCP written to satisfy each of them to the maximum extent possible.

Cultural and institutional inertia and intransigence are always potential barriers to the success of any project. It is easier to do nothing than to make changes in a system, and the Verde River system is no exception.

There is considerable inertia in the status quo of the Verde River's relationship with the people it impacts. Overcoming that inertia will be an important part of any successful plan. Public and stakeholder engagement, early and often, can help overcome intransigence. By involving interested parties in the decisions that affect their lives, resistance to change can be reduced. Any substantive changes will find better acceptance if a campaign of public engagement and cooperation is among the first steps.

The current economy is a real barrier to success. Government funding, either by direct project funding or grants, has been severely curtailed since 2007. Funding for Arizona's state parks is currently at an all-time low. State legislation has largely defunded the Heritage Fund which was established by public referendum to improve parks and public lands and promote conservation efforts. Municipalities are no longer funding non-profit organizations to the extent they were able to before 2007. Business and private donations are declining for most charitable organizations. Future projects to enhance the ecosystem of the Verde River will likely need to rely on non-traditional funding sources and creative solutions in order to effect necessary change.

Several interviewees cited the lack of coordination and cooperation among governmental jurisdictions in the study area as a potential barrier. The Verde Valley is typical of many rural areas, as it is host to a large number of governmental jurisdictions and interests. Federal jurisdictions and departments with a stakeholder role in the Verde Valley include the U.S. Fish and Wildlife Service, Army Corps of Engineers, U.S. Forest Service, National Park Service and others. State agencies, such as the Arizona State Lands Department, Arizona State Parks, Arizona Department of Environmental Quality, Arizona Department of Water Resources, and Arizona Department of Transportation also play key roles in local decisions. Yavapai County, the largest jurisdiction in the Verde Valley, has several departments involved in local planning, flood control, public health, parks, and transportation. The Cities of Cottonwood and Sedona and the Towns of Camp Verde, Clarkdale and Jerome all have an interest in Verde River outcomes, as do several special improvement districts, school districts, and non-governmental organizations in the Verde Valley. Bringing all these into concert on transformative projects will be essential to any successful plan.

Interviewees frequently referred to the number of organizations concerned with water and river issues in the study area. While the passion and devotion of the volunteers in these organizations is unquestioned, their successes are limited. The lack of a paid, accountable staff to implement the necessary changes in the system is a real barrier to successful change.

Data Gaps

Several gaps in the public's understanding of the Verde River system and its impact on the people in the study area were revealed in the VREDS research. Some of these are truly unknowns that require additional study, and many are gaps in the public's education and understanding of the available information.

Surface water rights and water ownership under Arizona State law seem poorly understood by most of the interviewed stakeholders. While most of these rights have long been established, some for more than 100 years, they have never been settled or defined in a court of law. The Gila River Adjudication has been ongoing since 1974. When finalized, it will define rights on the Gila, Salt, Verde, Agua Fria, Upper Santa Cruz and San Pedro watersheds. Until the court has issued final decrees in this adjudication, little substantive management work can be done to realign water rights ownership in the study area.

The lack of clarity and certitude in the adjudication provides an example of how the public is left guessing about who owns what and just how much water each is allowed to divert, use and/or consume. It also means that rights holders are reticent to take any action that may hamper their ability to exercise their right to use water in the future. This situation, although not strictly a data gap, is a gap in the public's and rights holders' information that is destructive to meaningful management of the resource.

Interviewees often cited their poor understanding of water quality issues. The impact of septic systems, storm water runoff and discharge, and wastewater recharge projects needs to be better understood if efforts to mitigate or reduce those impacts are to be successful. Whether the Verde River system is degraded by water quality issues and to what extent needs further study.

The effects of bank cutting and channelization and its resultant increased turbidity are inadequately understood. While cattle grazing in the riparian zone is considered by most experts to be detrimental to the health of the river, the effects of cattle in the river bottom is not as well understood as it could be. Some respondents said that cattle actually have a beneficial impact on the river's ecosystem, citing the reduction of thickets and mitigation of cut banks. The flow regime and its seasonal variations are well documented, but poorly understood at this time. The Verde Valley's water budget, river seepage, evapo-transpiration, effects of diversions, and groundwater withdrawals are all currently being studied. All need further clarification in order to provide decision support to policy makers, regulators and others with authority over water issues. The recently completed USGS "Northern Arizona Regional Groundwater Flow Model" will provide some clarity regarding groundwater withdrawals and their impact and timing on the flows of the Verde River. However, the model has been created using a 1 km. resolution, which is very coarse. Nested models will more precisely define impacts in a local area and will need to be financed and run before water managers will have a high degree of confidence in well-siting decisions, recharge projects, and so forth.

Many policymakers tend to put off projects and planning decisions until the latest study is completed. However, the base of knowledge about the interaction of groundwater and surface flows in the Verde Valley is currently sufficient to support most of the decisions that need to be made today. This tendency to await better data delays implementation of important projects and gives political cover to policy makers who find it easier to take no action. The public and their representatives may need to be better educated about the groundwater/surface water connections to break the impasse.

The source water for the Verde River is another subject that is sufficiently understood by professionals and others passionate about water issues, but it is very poorly understood by the general public, according to the interviews. Again, a public education campaign could answer many of the public's questions about how much of the Verde River's water comes from where, goes where, and is impacted by what.

The very subject of this study, the economic impact of having a flowing Verde River, remains poorly understood. While VREDS clarified that there is an impact, as explored above, the public's understanding of it is low and uncertain. The general public, as represented by the interview cohort, knows very little about the economic benefits of having a river running through their town.

Tree of Heaven, *Ailanthus altissima*

Invasive species and how they degrade the quality and diversity of the river's ecosystem were mentioned frequently by the interviewees, and yet are seldom well understood. The problem of invasive species—including fish, plants, invertebrates and amphibians—is acknowledged, but generally is not receiving the attention it might. Solutions are expensive, time-consuming and difficult, resulting in this problem receiving only peripheral attention. While a few projects attempt removal of invasives such as tree of heaven (*Ailanthus altissima*), salt cedar (*Tamarix spp.*), and giant reed (*Arundo donax*) in a few local areas, the overall eradication of these species from the watershed may be too large a task to undertake, due to ongoing funding challenges. In addition to these species, a plethora of invasive grasses, herbaceous plants, fish, and invertebrates arguably impact the native ecosystem far more than the three species that are receiving the focus of both financial and human resources. Crayfish, bullfrogs, Asian clams and many other invasive species get little attention and practically no resource allocation, simply because the problem is too big to tackle and too difficult to guarantee success. An additional complication of *Tamarix* removal is that the Southwest Willow Flycatcher, another endangered species, has adapted in Arizona to use *Tamarix* as breeding habitat.

Recommendations

The VREDS project results show that the application of additional resources can significantly advance the connection between a healthy Verde River and a healthy, sustainable economy in the study area. An investment of additional funding could create more value in a healthy Verde River and incentivize the public and their elected representatives to make decisions based in part on the health of the river and its ecosystem. In order to have effective and efficient resource allocation, the study team has identified several approaches.

The following recommendations are offered in no order of priority, with the understanding that a feasibility study will be needed to establish the cost-benefit analysis of various projects. This can then help prioritize proposed actions based on economic efficiency, time needed to implement and produce meaningful results, and expected effectiveness in producing the desired outcome. These recommendations include:

- Improving and increasing access and visibility of the river;
- Enhancing and creating additional signage;
- Expanding pedestrian and bicyclist use of bridges;
- Improving irrigation ditch system efficiency;
- Reducing groundwater use;
- Branding the Verde Valley with a Verde River identity;
- Maintaining and expanding the use of social media; and
- Establishing a Verde River institute.

Improved and Increased Access to the River

Enhancing access to and visibility of the Verde River for the people who live, work and recreate in the Verde Valley would likely increase the value the river plays in their lives. The VREDS team recommends that additional financial resources be devoted to improving access and visibility of the Verde River in the study area. While full linear park access to the entire river corridor was a goal mentioned by many of the interviewees, it may not currently be feasible, due to fiscal constraints. Such an expansive project can and should remain the ultimate goal, but implementation will be best accomplished incrementally.

It is possible to improve the current access points to make them more usable and desirable attractions. Improvements to these existing sites may vary, depending upon the current facilities at each. Some areas need a simple clean up, such as weed and tree limb removal, riverside beach improvements, and trail maintenance. Others require more expansive improvements, including restrooms, improved parking areas, picnic facilities, and canoe/kayak launch and takeout areas. Poor security limits the utility of some sites. Simply improving site safety by removing obstacles in the water and assessing each site for personal safety of the users is in order. Signage cautioning users to lock their cars, watch for snakes, dispose of their trash appropriately, and so forth would be beneficial. Creating a culture of safety, as any business must do, could go a long way to improving site utility.

Opportunities may exist to create new access to the river and its natural resources. Several publicly held lands adjacent to the Verde River currently have no access at all. One of these is at the Mingus Avenue Bridge site in Cottonwood where, between Yavapai County and Arizona State Parks, six acres of public land are inaccessible except by boat. Also large private holdings along the river may provide opportunities for parks, trails and other recreational access. The three municipalities on the river—Camp Verde, Clarkdale, and Cottonwood—as well as Yavapai County, all have parks departments that could cooperate on a regional basis to identify new access opportunities. Such cooperation could eventually produce a Verde River corridor that is easily and safely kayaked for the entire 37 river miles in the study area. If that were to happen, the Verde River could become a world-class attraction.

Enhanced Signage

Consistent signage indicating the presence of and access to the river is essential. Even with the existing public access points, way finding signage on main highways and feeder roads that lead to these sites is almost non-existent. New signage might be directional and also inform the public about exactly what facilities (wildlife viewing, fishing, picnic facilities, restrooms, etc.) are available at that site. Universal sign coding use on major highway markers would make it clear that a waterway and its riparian corridor are available. Signage is critical to improving awareness for visitors and enhancing value in the public's mind. Signs will be more effective if they are consistent in style, colors, branding logos, etc.

Expanded Bridge Use by Pedestrians and Bicyclists

One way to expose a large number of people to the beauty and values of the Verde River would be to improve its visibility to pedestrians and motorists from the major bridges. As noted in the findings, motorists crossing the river at most of its major crossings (State Route 89A, Mingus Avenue and Dead Horse Ranch State Park in Cottonwood; Black Bridge and White Bridge in Camp Verde; and Interstate 17 at Camp Verde) cannot see the river from their vehicles. Pedestrian access is usually on only one side of the bridge and is dangerous. The responsible organizations should give consideration to improving visibility and walkability by installing see-through barriers along the sides, rather than the solid concrete barriers that exist today. Pedestrian and bicycle traffic could be encouraged and supported with the expansion of the bridge sidewalks to include both sides and by creating safer bike lanes over the bridges.

Improved Irrigation Ditch System

New ways to divert surface water effectively and deliver it to irrigators could improve recreational use by boaters, swimmers and other enthusiasts. The culture of ditch management and use in the Verde Valley is an entrenched and highly invested one. Changes to delivery systems will need to engage the stakeholders from the beginning and will need to benefit not only the river and its flows, but also the ditch users.

Cottonwood Ditch Diversion, Diverting 100% of Flow

Since many diversions dewater the river for a mile or more before serving the first customer, it may be possible to change many diversions from the "push-up" dams now being used to "lay-down" diversions, farmer's screens, solar-powered pumps, or other technologies that would improve the flows in the river. If water were withdrawn closer to the point of use by the irrigators, dewatering long stretches simply to get the needed head would no longer be necessary. This new system of diversion would improve floatability, convenience and safety, and encourage more recreational use of the river. Improving the usability of the Verde River will then increase interest in conserving the river and its flows.

Reduction of Groundwater Use

Water consumption, especially groundwater use, must be reduced if the region is to continue to benefit from a flowing, perennial Verde River. Improving the recharge potential, both in quantity and quality of all untapped wastewater resources, could have a beneficial impact on the consumptive use of groundwater.

A VREDS recommendation is that this potential be examined carefully to determine its feasibility—logistically, legally, economically and environmentally—and to identify the best ways to convert this unused wastewater to beneficial uses, and thereby reduce groundwater demand and improve flows in the Verde River.

The public needs better education about the impact of groundwater use and ways consumption can be minimized. This can be done in a number of ways, and may best fall under the responsibilities of a local institute (see below).

Branding the Verde Valley

Branding is a technique commonly and successfully used by schools, municipalities, businesses and projects that gives identity to those organizations. A strong identity helps create value, enthusiasm, focus, and serves as a marketing tool. Study area businesses, chambers of commerce, cities and towns, schools, and public groups in the Verde Valley have typically linked little of their own identity with the Verde River. Interviewees frequently mentioned this lack of "river town" identity.

The VREDS team recommends an investment in a branding campaign that could reach out to governments, businesses and other stakeholders to identify themselves with the Verde River. A well-coordinated branding effort that identifies the area as one in which a river runs and involves the three river municipalities (Camp Verde, Clarkdale, and Cottonwood) as well as Yavapai County, could help create and sustain value in the river.

Signs at each community or county boundary could identify or link that city or town to the Verde River. Businesses might also then begin identifying themselves as connected to the Verde River by using that theme in logos and names. This relatively small investment could reap large benefits in promoting conservation and caretaking of the Verde River as the mascot of the Verde Valley. A successful branding campaign could compel its audience to protect and preserve the health of the river.

One idea for promoting this collective identity is to place flat screen monitors at key locations, such as restaurants, hospital waiting rooms, chambers of commerce visitor centers, motel lobbies, banks, and large retail stores, which display an idyllic video of the Verde River. The movie might simply show a series of peaceful scenes of the river, its ecosystem and public recreation on a rotating basis, changing seasonally. This relatively inexpensive, passive system could increase awareness and interest in the river. Soliciting ideas from the general public and business owners could produce many other suggestions that would raise awareness of the Verde River. One example is a newly opened fast food restaurant in Cottonwood that displays a mural of the Verde Valley on a glass partition that separates the counter from the main dining area. It includes the river, riparian area, Tuzigoot, some indigenous birds and animals and a family holding hands and enjoying their Verde Valley experience.

Support the Use of Social Media

The Verde River's Facebook® presence has demonstrated that social networking can enhance public engagement in a way that is difficult to match with any other medium. To date, a single volunteer has maintained the Verde River's persona, but with over 2,600 friends sharing experiences, photos, questions, and ideas, the maintenance of the presence becomes increasingly time consuming and demanding. The VREDS team recommends that this presence be continued and supported. Exactly what type of support will be needed can be assessed in a feasibility phase.

Establish a Verde River Institute

It is unlikely that any organization currently in place in the area can meet all the needs identified in this report. As the findings of the study indicate, there is no central repository for information about the Verde River and no organization dedicated to educating the public about the river and/or fostering the connection between the river and sustainable economic development. Further, no organization is currently in place and charged with the responsibility and accountability necessary to oversee the general health of the river. The creation of a new institute to deliver and coordinate these services would have comprehensive, long term implications for the Verde River. Although contracting services from an existing institution like the Sonoran Institute or developing collaborative partnerships with state universities are worth further study, the VREDS team believes an umbrella organization is needed to identify, develop and oversee these affiliations.

The new Verde River institute would be non-political, fact-based and pay scrupulous attention to providing clear, accurate, unbiased information to its stakeholders. This organization must be unconditionally trusted and accountable. One of its missions would be to ensure that the hydrological, environmental, ecological, and economic sciences of the Verde River are continually infused into the consciousness of the public, the policy makers and the stakeholders. A new, professionally-staffed, well-funded, responsible and accountable organization would likely be more successful than any one existing entity. It would alleviate the historic political or social stigma that surrounds this issue.

The role of a Verde River/Valley institute might provide services that include, but are not limited to, the following:

- Growing the connection between the river and economic development;
- Stimulating, coordinating and facilitating river-related studies;
- Educating about the river;
- Providing decision support;
- Data warehousing;
- Maintaining information technology;
- Coordinating future projects with existing organizations when appropriate; and
- Conducting studies and projects that will improve the health and sustainability of the Verde River when appropriate.

Growing the Connection

Concentrating future resources on improving and growing the connection between a flowing river and economic development in the study area would be more efficient and effective than attempting to refine today's data on that connection. The institute could initiate and coordinate a campaign to improve that connection, using relationships with the area's chambers of commerce, municipalities, and businesses to promote and help publicize the importance of the river to the area's economy.

Stimulating, Coordinating and Facilitating Studies

The institute could act as a facilitator or coordinator of additional studies that will be needed to better define resources and assess management alternatives for water, economic pursuits, recreational opportunities, etc. As a non-profit, it could receive and administer grant funding for other organizations.

Educating

Educating the public, stakeholders and elected officials historically has fallen to a handful of volunteer organizations. Among these are the Verde River Basin Partnership (VRBP), Verde Watershed Association (VWA), Verde River Citizens Alliance (VRCA), Friends of the Verde River Greenway (FVRG), and the Yavapai County Water Advisory Committee (WAC). While these organizations are doing beneficial work and some are funding important studies by USGS and others, the meetings are typically attended by "the choir" and the information they generate is either not reaching the public or is very short-lived in the public consciousness.

Field Trip at the Head of Tavasci Marsh

Elected officials and others responsible for planning and policy in the Verde Valley change frequently. With these constant changes, institutional knowledge diminishes and requires rebuilding with each election or staff change. A Verde River/Valley institute could serve to sustain this knowledge and awareness quickly and completely as required. Annual training for newly elected officials would help ensure policy makers are equipped with complete, current and accurate information with which to make decisions.

This organization could help elected officials and decision makers gain a more complete understanding of the connection between the groundwater in the study area and the Verde River's flow. Some threats are exaggerated and other, more important ones are virtually ignored. While many studies have established a high degree of confidence in the understanding of the hydrology, ecology and resource allocation of the Verde River in the study area, the message is simply not reaching the people who can make a difference.

The Verde River and its associated ecosystem are prime candidates for studies centering on preservation of threatened ecosystems and species, the function of flowing streams in the desert southwest, and many other relevant topics. Taking the lead in stimulating and coordinating educational opportunities, the institute could work with school districts, colleges, universities,

and life enrichment programs like Elderhostel to keep the public engaged in learning about the richness of river and its habitat. It could provide curriculum design and delivery support to K-12 schools and the community college on classes and programs specifically related to the Verde River. With a major educational role, this institute might do regular public outreach, such as publishing a weekly Verde River spot in the local media or coordinating presentations in the K-12 schools.

Supporting Decision-making

Support for the decision-making process is an essential tool for governmental and non-governmental planners and others seeking to make effective and sustainable changes in their particular system. Municipalities, counties, businesses and non-governmental groups of all sorts need unbiased, objective answers to questions of hydrology, ecology, economy and general impacts of proposed local changes. The institute could serve as a single source of objective and reliable advice, analysis and support. Since the institute would be at least partially publicly funded, the data and analysis they provide would become public record. This in itself might strengthen the perceived and actual objectivity of the organization. Since the institute would seek a wide range of funding sources, costs to the client would be kept minimal in exchange for the contribution of their studies to the common good.

Data Warehousing/Information Clearinghouse

While many groups are independently studying some facet of the Verde River, its impacts and its challenges, no one group, agency, or governmental entity is coordinating the studies or warehousing the information generated. The institute could be a central repository for all research, data, education and so forth related to the Verde River. Serving as the data bank, the institute could potentially inform the works of other volunteer and government entities as well as receive and catalogue their resulting reports and data. Many governmental entities have studies scattered throughout their organizations with little cataloguing, indexing, or random access control in place. The institute could function as the master library for all of the governments and non-governmental organizations in the Verde Valley, and could maintain a master index to all pertinent documents. This function could help avoid duplication of efforts and keep costs down for everyone.

A side benefit of the repository function would be to foster and promote cooperation among the many diverse governmental jurisdictions in the study area on matters concerning the health of the Verde River. With assistance from and facilitation by a clearinghouse, collaborative efforts of research would be easier to define and develop.

Maintaining Social Networking, Web Presence, and Information Technology

The recommended institute is the logical organization to maintain social networking and other internet presence for the Verde River. This will require expertise in river and local resource issues as well as the ability to maintain public engagement and interest. The institute could also provide the strong information technology foundation required to manage the document repository, scheduling, communications, and general networking among users.

Next Steps

The goal of this study is to advise the WFF on the best and most effective and efficient ways to demonstrate and advance the link between sustainable economic development in the study area and a healthy, sustainable Verde River. The VREDS research focused on determining: 1) the feasibility of establishing the economic value of the Verde River in the study area; 2) whether an investment of additional resources in the Verde Valley might positively impact sustainable economic development, and thereby, lead to and sustain a healthy Verde River; and 3) the most efficient and effective methods to educate the public and its policy makers about the value of the river and its relationship to the economic development of the Verde Valley. The study findings indeed support the conclusions and recommendations presented in this document. Since these proposed actions to continue the work identified and initiated by this study need coordination and further investigation, the study team offers the following as next steps in the action sequence of this initiative.

Feasibility Study

The VREDS project reveals that the connection between sustainable economic development in the Verde Valley and a healthy Verde River system is tenuous. This study is an appraisal level study of the historical and current economic status of the project area and its relationship to the Verde River. A proposed next step, which would further this initial work and develop its conclusions and recommendations, is to conduct a feasibility-level study. This investigation will evaluate the recommendations in this and other WFF-funded studies, according to their respective economic, legal, political, environmental and social practicability and efficacy. The VREDS team believes that this subsequent phase of the VREDS research is essential to developing and implementing the recommendations identified in these reports. The feasibility study would assess, rank, and prioritize the various actions based on their relative expense, sustainable funding sources, time to implement, efficiency and effectiveness.

The need to evaluate the formation of the recommended Verde River institute is particularly important. Twenty years have passed since the release of the Verde River Corridor Project (VRCP), and the call for action on behalf of the Verde River is even more pressing today. The VRCP represents diligent and thorough work by a large public/private partnership and produced a valuable report. So that the VREDS and other WFF area studies are not also shelved without action, an important next step would be to determine the feasibility of a Verde River institute. This umbrella organization that will connect the community to the Verde River through education, decision support, data warehousing, continued studies and use of to social networking warrants thoughtful consideration. The VREDS team recommends completing this feasibility study as expeditiously as practical.

The feasibility study can identify organizational and physical structure, users and their needs, and perpetuation mechanisms. A feasibility investigation can also examine sustainable financial support opportunities and ways to transition funding to the stakeholders it serves.

Walton Family Foundation Grantees Forums

In December, 2010, and July, 2011, the VREDS team organized three half-day forums to bring together all the Walton Family Foundation grantees in the Verde Valley. These meetings proved to be valuable in coordinating the efforts of all the grantees. They also helped identify and avoid duplications of efforts, provided a network of information and resource materials, and significantly improved the efficiency of all the grant projects. This study team suggests that these forums continue to share ideas and expertise, as well as assist in the assessment and implementation of each of the projects' recommendations.

Dissemination of Study Results and Recommendations

This VREDS report is the property of the Walton Family Foundation (WFF). The full report will be distributed at their direction and with their authorization.

In Closing

The VREDS team has been privileged to conduct this study and is confident that, with the appropriate application of resources, the recommendations contained in this report will provide a practical, efficient, and effective path to a healthy, sustainable Verde River. With the right support and energy, this report will not suffer the fate of so many others that remain "on the shelf."

The VREDS team is optimistic about the future of the Verde River and the possibility it provides for sustainable economic development in the Verde Valley, and will continue to work on behalf of the river.

Reflections on the Verde River near Tuzigoot Bridge

APPENDIX 1

Members of the VREDS Team

The Verde River Economic Development Study (VREDS) team members are Doug Von Gausig, Jane Whitmire, Casey Rooney, and Becky O'Banion.

Doug Von Gausig

Doug Von Gausig, as project manager, conducted the day-to-day administrative logistics and planning for the VREDS team. This role included determining the schedule, coordinating periodic and final reporting, and communicating with the team on behalf of the study. He was responsible for financial management of grant funds and coordination with the fiduciary, Yavapai College. Doug provided information technology (IT) services for the VREDS website, web-conferencing and other electronic media. He also conducted some of the interviews.

Douglas C. Von Gausig is currently the Mayor of Clarkdale, Arizona, and is in his seventh year as such. Among the many committees and boards upon which he sits are the Yavapai County Water Committee (one of two co-chairs). Doug is also the Vice-President of the League of Arizona Cities and Towns, an organization of all incorporated municipalities in the state. Other groups in which he also serves include the Bureau of Reclamation's Technical Working Group for the Central Yavapai Highlands Water Resource Management Study, the Verde River Basin Partnership (Chair, 2006-09), and the Northern Arizona Municipal Water Users Association which represents municipal water utilities in Northern Arizona. He is a member of the Arizona State Heritage Fund Advisory Committee, which advises the State on best ways to apply its Heritage Funds. He has participated in countless water committees and studies in Northern Arizona for the last 10 years. He spends much of his time on water issues in Yavapai County and on preservation of the Verde River.

In his 35 years in the Verde Valley, Doug has worked on many environmental and conservation-oriented projects, including the Nature Conservancy's study of the Economic Value of a Healthy Verde River as a Steering Committee member and their Verde River Watershed Conservation Plan in 2009. He has also been a member of the National Park Service's Tavasci Marsh Wetland/Wildlife Workshop Committee, and is on the Arizona State Parks "Verde River Greenway Brain Trust" team.

In early 2010, Doug was honored as the Verde Valley Citizen of the Year by the local newspaper *The Verde Independent* and the Cottonwood Chamber of Commerce, and in 2006, for "Outstanding Service to the Public with Regard to Water Issues" by receiving the Annual Civic Award from the Verde River Citizen's Alliance.

Doug is a professional photographer and sound recordist. He provides natural sound recordings to museums, films, reference libraries, and many conservation organizations and state and national parks throughout the country.

Jane Whitmire

Jane Whitmire, as principal researcher, designed the VREDS study, including the research protocol, with input from an independent Expert Design and Review Team and the VREDS Team. She oversaw the gathering and compilation of research data and monitored the progress and performance related to the conduct of the study. Finally, Jane directed the preparation of the *Summary of Interview Responses by Question* shown in Appendix 10 of this report.
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Jane Whitmire is completing her Ph.D. in public administration and natural resource/environmental policy at Northern Arizona University (NAU) in Flagstaff. She was inducted into The Honor Society of Phi Kappa Phi in 2007. Jane holds a BS in Business Management (with honors) from Arizona State University West and an MA in Sustainable Communities (with distinction) from NAU. In addition, she is a graduate of the Center for Rural Leadership, a two-year program funded by the Kellogg and Marley Foundations and administered by the University of Arizona. While Jane's master's thesis focused on open space protection, her current primary research interest is the role of civic engagement in community planning and natural resource sustainability. Her professional experience includes organization and management consulting, research and marketing.

Jane has served on numerous local and regional non-profit boards. She is a co-founder of the Verde Valley Land Preservation Institute, an organization whose mission is to develop and implement strategies to preserve and enhance the natural open space of the Verde Valley. She has received state-level awards for her work in historic preservation and community service. As a community advocate and volunteer in civic engagement and public participation processes, Jane has served as a Planning and Zoning Commission Member and Chair in her community. She was appointed to represent the Natural Conservation Board on the Verde Valley Regional Plan Team and was appointed by the Town of Camp Verde to serve as a member of the Verde Valley Open Space Steering Committee. She has lived and worked in the Verde Valley of Arizona for over fifteen years.

Rebecca (Becky) O'Banion

Becky O'Banion, as communications coordinator, documented the course and progress of the study, meetings and decisions. She also conducted and transcribed some of the interviews. She collated, extrapolated, edited and formatted the final report with input from the team.

Becky O'Banion has lived and worked in Sedona and the Verde Valley for 22 years. She is the owner/operator of a retail gift shop serving the tourist industry since 1990 and, as a result, has been involved in economic development, non-

profit organization and operations, leadership training and public relations. She has been a board member/representative of many City of Sedona, Town of Clarkdale and Yavapai County focus teams, community panels, non-profit organizations, and think tanks dealing with economic development including Focus Future and community plans. As a founder of the Sedona Main Street Program in 1994, Becky returned to the board of directors and currently serves as president. She became involved in education leadership, both locally and statewide, while raising her four children, served two terms on the Sedona-Oak Creek Unified School District Governing Board, and is a current board member of the Clarkdale-Jerome Elementary School District.

Becky holds a BBA degree (*cum laude*) in Computer Systems Management (minor-English) from the University of North Texas, and has provided services as an independent operational and data systems consultant with education, non-profit, and municipality clientele. She currently provides public relations and leadership consulting to private and political clientele.

Casey Rooney

Casey Rooney, as economic development coordinator, provided economic development expertise and assisted in the design and execution of the study. He also conducted some of the interviews.

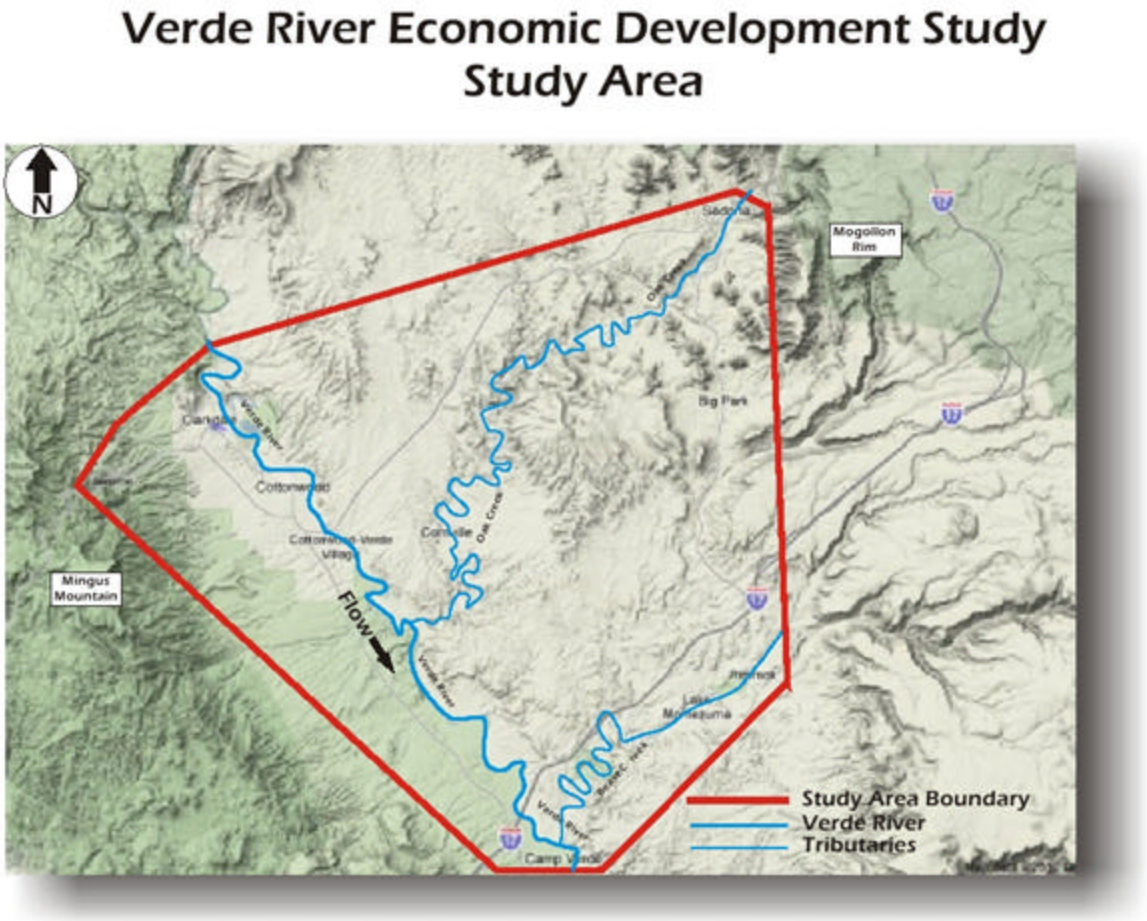
Casey Rooney is the Economic Development Director for the City of Cottonwood and the President and CEO of the Cottonwood Economic Development Council. He is the Chair of the Northern Arizona Council of Governments Economic Development Committee. He is a board member and officer of the Verde Valley Regional Economic Organization and the Verde Valley Wine Consortium. In addition, he has recently accepted the challenge as co-chair of the Yavapai County United Way Campaign Cabinet. In his spare time, he teaches an SBDC entrepreneurship class at Yavapai College.

Before arriving in Cottonwood four years ago, he served as the Economic Development Director for Champaign County Regional Planning Commission in Illinois working closely with the University of Illinois' research park and incubator (Enterprise Works). Prior positions included the startup of the Center for Manufacturing Excellence, a business incubator and industrial training center, Chamber of Commerce Director and a long career working in industry as a manufacturing manager for notable companies such as United Technologies Carrier Corp and Sundstrand Aviation. He proudly started his career working in his family business in Findlay, Ohio, Rooney Builders, in business continually for over 60 years.

Casey has a Bachelor of Science Degree from Bowling Green State University in Ohio, a Master of Business Administration from the University of La Verne in California, and is also a recent graduate of the Economic Development Institute at the University of Oklahoma.

APPENDIX 2

Map of Study Area



APPENDIX 3

Members of the VREDS Expert Design and Review Team

Sherry Bailey
Community Development Director
Town of Clarkdale, AZ

Russ Martin
Town Manager
Town of Camp Verde, AZ

Dr. Dean Smith
Professor, Economics and Applied Indigenous Studies
W. A. Franke College of Business
Northern Arizona University

Dr. Marshall Whitmire
President and Managing Director
RCI Surveys, Inc.

APPENDIX 4

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APPENDIX 5

VREDS Interviewees

Name	Community	Affiliation	Special Interests--Education, Rancher,Tourism,Real Estate,Manufacturers	Citizen-at-large	Decision-makers/ Government	Opinion/Community Leaders	Other--Water Interest, Similar Experience/
Adams, Rob	SE	Sedona Mayor			x		
Addis, Tamara	CO	MUHS Principal	x				
Allen, Jodie and Dexter	CV	Residents		x			
Ayers, Steve	CO	Verde Independent reporter/ditch president				x	x
Bagley, Tom	CV	AZ Game and Fish	x		x		
Bartosh, Doug	CO	Cottonwood City Manager			x		
Beach, Margie	CO	Resident/former Chamber president	x	x			
Bishop, Jim	SE	Writer/river advocate		x			
Bitz, Brent	SE	Resident/Sedona WAC rep			x		x
Block, Stephen	CO	Tour operator	x				
Bob Bear	YAN	Yavapai Apache Nation			x		
Buchanan, Linda	CV	Yavapai College	x				
Bullard, Stanley	CV	Camp Verde water co.					x
Burnside, Bob	CV	Camp Verde Mayor			x		
Campbell, Dan	PR	Nature Conservancy	x				x
Canning, Cody	CV	Teacher in Flagstaff	x				
Castillo, Max	AZ	State Parks			x		
Casuga, Evelyn	AZ	APS community programs	x				x
Cathcart, Kelly	CV	Farmer/insurance broker	x				
Coder, Chris	YAN	YAN Archaeologist			x		
Davis, Chip	YC	Yavapai County Supervisor			x		
Davis, Kathy	US	U.S. National Park Service			x		
Dehnert, Richard	CL	Clarkdale Council/Verde Valley Guidance Clinic	x		x		
Emmanuelle, Deborah	SE	Verde Food Council	x				
Everett, Ann	CV	Retired		x			
Filardo, Jodie	CL	Econ developer/VVREO	x		x		
Geminden. Frank	CV	Farmer/economist	x	x			
Gioia, Tony	CV	Former Camp Verde Mayor		x		x	
Goetting, Steve	CV	Resident		x			
Grace, Dr. Susan	CL	Resident/physical therapist		x			

Name	Community	Affiliation	Special Interests--Education, Rancher,Tourism,Real Estate,Manufacturers	Citizen-at-large	Decision-makers/ Government	Opinion/Community Leaders	Other--Water Interest, Similar Experience/
Groseta, Andy	CO	Rancher/ditch association	x			x	x
Harrington, Norela	CL	Bent River Machine/SLIM	x				
Hart, Barbie	CO	VVBNF	x				
Hauser, Brenda	CV	Retired farmer	x	x			
Jenkins, Dee	CV	Resident business owner		x			
Joens, Diane	CO	Cottonwood Mayor			x		
Kim, Steve	VV	Tao Fellowship Mago	x				
Kornrumph, Greg	AZ	SRP senior analyst			x		x
Lamer, Marv	CO	VACTE superintendent	x				
Levy, Virginia	CV	Resident		x			
Lillie, Lonnie	SE	Sedona Lodging Council	x				
Lynch, Richard	CO	Rafting/kayaking services	x				
Mabery, Dan	CO	Real estate broker/Blazin' M	x				
Mabery, Gayle	CL	Clarkdale Town Manager			x		
Martin, Russ	CV	Camp Verde Town Manager			x		
McDonald, Van	CO	Retired--developer/planner	x	x			
Moyer, Phil	CO	Real estate	x				
Neville, John	SE	Sustainable AZ, SEDI	x				
O'Neill, Lisa	CL	Verde Canyon RR	x				
Parsons, John	VV	Resident, river advocate		x			x
Pitts, Tom	JE	Jerome Chamber, Verde Valley Wine Consortium	x			x	
Randall, Vince	YAN	Former tribal chair			x		
Rasmussen, John	YC	Yavapai WAC Coordinator			x		
Reinhold, Karen	CV	Insurance broker	x				
Rothrock, Bob	CO	VV Land Preservation Inst.	x				
Sawyer, Brian	CO	Butler-Leavitt Insurance	x				
Schalau, Jeff	YC	Yavapai Cty ext. service	x				
Schimikowski, Tracie	CV	Camp Verde Chamber dir.	x				
Schloeman, Pastor Karl	CO	Lutheran Church pastor	x	x			
Schumacher, Tom	CL	Yavapai College	x				
Seiverd, Charles	CL	Media				x	
Self, Keith	SE	Arizona Water Company	x				x
Selna, Ray	CL	Real estate/developer	x				
Seronde, Jacques	VV	Sedona Energy Lab dir.	x				
Simmons, Lori	CO	Bank manager	x				
Slaback, Tom	PR	Sierra Club	x				
Smith, Brenda	US	U.S. Fish and Wildlife			x		
South Verde H.S Students	CV	Students	x	x			
Springer, Carol	YC	Yavapai County Supervisor			x		

Name	Community	Affiliation	Special Interests--Education, Rancher,Tourism,Real Estate,Manufacturers	Citizen-at-large	Decision-makers/ Government	Opinion/Community Leaders	Other--Water Interest, Similar Experience/
Statler, Cristie	AZ	AZ St Parks foundation boarc	x				
Taylor, Mary	CV	Financial planner	x				
Thurman, Tom	YC	Yavapai County Supervisor			x		
Tolleson, Lana	CO	Cottonwood Chamber dir.	x				
Tufte, Mark	CO	Bank manager	x				
U'Ren, Barbara	CO	COCUSD Superintendent	x				
Watkins, Larry	CV	Retired farmer		x			
Wesselhoff, Jennifer	SE	Sedona Chamber director	x				
Whitmire, Marshall	CV	SEDI exec. Director	x				
Wingate, Mike	CV	Resident/former CV Fire bd.		x			
*****	VV	Winery	x				
*****	SE	Citizen/retired	x				
*****	AZ	Utility company	x				x
*****	YAN	YAN			x		
*****	CV	Resident		x			
*****	CO	Real estate appraisers	x				

***** indicates interviewees who completed interview but requested to remain anonymous

APPENDIX 6

VREDS Interview Protocol

One of the primary roles of the interviewer is to motivate respondents. Therefore, asking the right questions in the right way makes the interview data more valid and reliable..
Members of the *expert design review team* will be asked to review the interview question structure and format and provide feedback to help ensure we ask the 'right' questions the 'right' way to secure the information we need to meet identified VREDS project goals and objectives.
The purpose of our research is exploratory. As such, we, as interviewers, will be learning as we conduct the interviews. When specific topical information from select interviewees is desired, that request should be communicated at the onset of the interview. Asking topical questions, however, should not preclude the prepared questions agreed upon by the VREDS team. Responses to topical questions will constitute supplemental and/or supportive information.
Our research questions are somewhat open-ended in order to allow respondents to state what they know and think about an issue or concept. As such, some interviewees may respond at greater or lesser length than others. The interviewer must be sure to facilitate responses in such a way as to gain useful information by probing when necessary. Care should be taken to remain within the scheduled time allotted for the interview.
The research questions will be logically sequenced in order to build on information which may have been provided in previous questions. The order of the questions will also facilitate a "branching or filter" follow-up question as the interviewer may see fit. If/when an interview question has already been answered in a previous response(s), it should be so noted. However, the "already answered" question should still be read to the interviewee and he/she should be asked if there is anything comment he/she would like to add. None of the interviews should last more than an hour and only two or three interviews should be conducted during any given day.
The substantial professional experience and expertise of many public officials/administrators and some other interviewees, may cause us to reword and/or re-sequence some of the questions. Therefore, I recommend that we interview such people early in the process.
The following recommendations and interview protocol applies to all interviews:

1) Contact the interviewee by email or by phone to request an interview at a mutually convenient day and location.

   Provide some potential dates and times. Tell the interviewee how much time will be required to complete the interview (45-60 minutes). Contact the interviewee one day prior to the interview to confirm the scheduled date and time. Ask whether or not he/she gives permission for the interview to be recorded.
2) Establish a good rapport and/or conversational approach prior to beginning the formal portion of the interview.

Introduce yourself, describe the purpose of the project and explain why the person has been invited to be interviewed and how the interview responses will be used.

3) Provide a copy of the project description *and* interview questions to the interviewee for his/her reference during the interview.

   This is a matter of convenience and courtesy to the interviewee as it allows him/her to more thoroughly consider and directly refer to the interview question(s) while answering.

4) Determine whether confidentiality and/or anonymity are desired.

   When the interview is requested, and again prior to beginning the interview, it is important to ask whether confidentiality and/or anonymity is desired. If promised confidentiality or anonymity, care should be taken *not* to reveal the person's identity through written descriptions so that others may "guess" or establish his/her identity. The promise of confidentiality may result in a more candid interview and more useful information.

5) Determine whether the interviewee wishes to review and approve anything subsequently written, based on the interview, that could be, or is, attributed to him/her.

   The interviewee has complete and final say regarding attribution of his/her statements.

6) Confirm whether taping the interview is acceptable to the interviewee.

   Some people are uncomfortable being interviewed when a recorder is used and may not be candid even though promised confidentiality. It is important to be sure to ask *permission* for the interview to be taped.

7) Begin the taped portion of the interview by stating the name of the person being interviewed, the date and place of the interview, and the name of the person conducting the interview.

   When using a tape recorder, the interviewer should be fully familiar with the equipment in order to avoid appearing awkward and unprepared. Be sure to test the machine immediately before the interview to ensure it is functioning properly and that there is sufficient recording capacity and battery power available for the entire interview.

8) Be prepared to take notes during the interview.

   Advise the interviewee that any notes taken during a taped interview are primarily for the purpose of potential clarification and/or follow-up during the interview.

9) Keep track of time.

Out of respect for the interviewee's schedule, keep track of the time. If it appears that the interview is not going to be completed within the scheduled 45-60 minutes, ask the interviewee's permission to continue beyond, schedule a follow-up (phone call or email) to complete the interview.

10) Conclude the interview by thanking the interviewee.

Ask permission to contact him/her for clarification if necessary.

11) Be certain to follow-up with a written 'thank you' within 48 hours of the interview. Include the following statement: "Now that you have had time to consider the interview questions and your responses to them, is there anything else you'd like to add?"

Documenting the interview:

- Transcribe all handwritten or recoded interview data onto the interview question template as soon as possible, especially if the interview was not recorded.

- While not all of the interview data may be useful, a*ll* of it should be transcribed for future review and consideration. All tapes and handwritten notes will be retained for VREDS files.

Suggested practices to increase quality of interview data:

- Clarify or confirm statements as may be necessary to ensure understanding.
- Ask the interviewee for an example(s) to help explain concepts and ideas.
- Don't talk too much; leave the talking primarily to the interviewee.
- Stay on point with the focus of the interview.

APPENDIX 7

Verde River Economic Development Study
P.O. Box 885 Clarkdale, AZ 86324 (928) 300-6603
vreds@esedona.net

Interview Record and Checklist

1/25/2011

Date: _____/_____/_____ Time: _____ am pm

Interviewer:_____

Interviewee Name: _____

e-Mail: _____@_____

Phone: (_____)_____-_____

Checklist

1. Gave interviewee a copy of the study description and questions? YES NO
2. Does interviewee agree to having the interview recorded? YES NO
3. Does interviewee wish to remain anonymous? YES NO
4. Does interviewee wish to approve anything that may be attributed to him/her? YES NO
5. Informed the intervieweee that the interview will take approximately 30-45 minutes? YES NO
6. Checked batteries in recorder? YES NO
7. Place the recorder with the mics pointed at the interviewee, and tilted up slightly.
8. State Interviewee's name, date, place of interview and your name at the beginning of the recording.
9. Followed up with written thank you note? YES NO

Interview Notes

APPENDIX 8

Verde River Economic Development Study
P.O. Box 885 Clarkdale, AZ 86324 (928) 300-6603
vreds@esedona.net

What is "VREDS?

VREDS is the Verde River Economic Development Study. The study will identify several importiant factors about the Verde River and its relationship to the economy and economic dvelopment of the Verde Valley. The study area includes the area commonly known as the Verde Valley in Yavapai County, Arizona, and includes the municipalities of Jerome, Clarkdale, Cottonwood, Sedona nd Camp Verde as well as several unicorporated areas of the county. The study is scheduled to begin in November 2010, and will take approximately six months to conclude.

What is the VREDS Mission?

This study will develop, implement and communicate a research and assessment plan that aids in establishing a clear and convincing nexus between sustainable economic development and a healthy Verde River system. The conduct of this research will provide opportunity to identify current conditions, stimulate critical thinking and identify mechanisms to educate and inform the general public and public officials about potential opportunities for establishing economic development and water management practices and policies designed to protect and maintain the health of the Verde River.

This study will use existing information in order to do two primary things:

a. Establish the means to determine the economic value of the Verde River in the study area; and
b. Determine the feasibility of investing additional resources in the Verde Valley that will positively impact sustainable economic development, and thereby lead to and sustain a healthy Verde River.

How will the VREDS Results be Used?

The VREDS study will answer critical questions about the link between economic development and a healthy Verde River and will inform organizations, governments and others about how to most effectively and efficiently apply resources to produce positive outcomes for the future health of the Verde River. VREDS will demonstrate whether the Verde River has a demonstrable and measureable economic value to the Verde Valley, how to determine that value, and how we might best enhance the value and the economy of the study area.

How is VREDS Funded?

VREDS has been funded by the Walton Family Foundation as part of their Freshwater Initiative Strategy (see http://www.waltonfamilyfoundation.org/environment/Freshwater-Strategy.pdf). This initiative is currently studying how to improve the health of several river systems in the U.S., including the Gunnison and Dolores Rivers in Colorado, the Escalante River in Utah, and the Verde, San Pedro and Colorado Rivers in Arizona.

Who is on the VREDS Team?

Doug Von Gausig is the VREDS Study manager, and is currently the Mayor of Clarkdale, Arizona, and is in his seventh year as such. Among the many committees and boards upon which he serves are the Yavapai County Water Committee, of which he is one of the two co-chairs. Doug is also the Vice President of the League of Arizona Cities and Towns, which is the organization of all incorporated municipalities in the state. He is also a member of the Bureau of Reclamation's Technical Working Group for the Central Yavapai Highlands Water Resource Management Study, the Verde River Basin Partnership (Chair from 2006-2009), and the Northern Arizona Municipal Water Users Association, which represents municipal water utilities in Northern Arizona. He has participated in countless water committees and studies in Northern Arizona for the last 10 years. He spends much of his time on water issues in Yavapai County and on preservation of the Verde River.

In his 35 years in the Verde Valley Doug has worked on many environmental and conservation-oriented projects, including the Nature Conservancy's study of the Economic Value of a Healthy Verde River as a Steering Committee member and their Verde River Watershed Conservation Plan in 2009. He has also been a member of the National Park Service's Tavasci Marsh Wetland/Wildlife Workshop Committee, and is on the Arizona State Parks "Verde River Greenway Braintrust" team.

Jane Whitmire is currently completing work for a Ph.D. in political science with focus on public administration and natural resource/environmental policy at Northern Arizona University (NAU) in Flagstaff. She was inducted into The Honor Society of Phi Kappa Phi in 2007. Jane holds a BS in Business Management (with honors) from Arizona State University West and an MA in Sustainable Communities (with distinction) from NAU. In addition, she is a graduate of the Center for Rural Leadership, a two-year program funded by the Kellogg and Marley Foundations and administered by the University of Arizona. While Jane's master's thesis focused on open space protection, her current primary research interest is the role of civic engagement in community planning and natural resource sustainability. Her professional experience includes organization and management consulting, research and marketing.
Jane has served on numerous local and regional non-profit boards. She is a co-founder of the Verde Valley Land Preservation Institute, an organization whose mission is to develop and implement strategies to preserve and enhance the natural open space of the Verde Valley. She has received state-level awards for her work in historic preservation and community service. As a community advocate and volunteer in civic engagement and public participation processes, Jane has served as a Planning and Zoning Commission Member and Chair in her community. She was appointed to represent the Natural Conservation Board on the Verde Valley Regional Plan Team and was appointed by the Town of Camp Verde to serve as a member of the Verde Valley Open Space Steering Committee. She has lived and worked in the Verde Valley of Arizona for over fifteen years.

Becky O'Banion has lived and worked in Sedona and the Verde Valley for 21 years. She has been the owner/operator of a retail gift shop serving the tourist industry since 1990 and, as a result, has been involved in economic development, non-profit organization and operations, leadership training and public relations. She has been a board member/representative of many City of Sedona, Town of Clarkdale and Yavapai County focus teams, community panels, non-profit organizations, and think tanks dealing with economic development including Focus Future and community plans. As a founder of the Sedona Main Street Program in 1994, Becky returned to the board of directors and currently serves as president. She became involved in education leadership, both locally and

statewide, while raising her four children and is the current board president of the Clarkdale-Jerome Elementary School District.

Having a BBA degree in Computer Systems Management (minor-English), Becky has provided services as an independent operational and data systems consultant with education, non-profit, and municipality clientele, as well as public relations and leadership consulting with private and political clientele.

Casey Rooney is the Economic Development Director for the City of Cottonwood and the President and CEO of the Cottonwood Economic Development Council. He is the Chair of the Northern Arizona Council of Governments Economic Development Committee. He is a board member and officer of the Verde Valley Regional Economic Organization and the Verde Valley Wine Consortium. In addition he has recently accepted the challenge as co-chair of the Yavapai County United Way Campaign Cabinet. In his spare time he teaches an SBDC entrepreneurship class at Yavapai College.

Before arriving in Cottonwood 4 years ago he served as the Economic Development Director for Champaign County Regional Planning Commission in Illinois working closely with the University of Illinois' research park and incubator (Enterprise Works). Prior positions included the startup of the Center for Manufacturing Excellence, a business incubator and industrial training center, Chamber of Commerce Director and a long career working in industry as a manufacturing manager for notable companies such as United Technologies Carrier Corp and Sundstrand Aviation. He proudly started his career working in his family business in Findlay Ohio, Rooney Builders, in business continually for over 60 years.

Casey has a Bachelor of Science Degree from Bowling Green State University in Ohio, a Master of Business Administration from the University of La Verne in California and he is also a recent graduate of the Economic Development Institute at the University of Oklahoma.

Thank You

Thank you for your interest and help in this vital study! We believe that with your help we will unequivocally demonstrate that the health of the Verde River has more than cultural or environmental importance to the residents of the Verde Valley. At the study's conclusion, we believe it will be apparent just how important this river is to the economy and future economic growth of every person and business in the Verde Valley.

The Verde River is a treasure with an uncertain future, and the threats to its continued health are increasing daily. We are confident that when the policy makers and residents of Arizona understand the link between a healthy economy and a healthy Verde River, the future will be much brighter for our Valley and our river!

November 18, 2010

APPENDIX 9

Interview Domains and Related Questions

Domain: Significant factors influencing the health of the river system
☐ Q 1: What do you think are the most significant factors influencing the health of the Verde River system?

Domain: Factors and data about the Verde River that need to be better understood
☐ Q2: Do you feel there are things about the Verde River that we need to understand better? If so, what are they?

Domain: Current efforts to connect effectively the Verde River system with sustainable economic development
☐ Q 3: To your knowledge what, if any, economic development activities have recently been, or are currently being, conducted that directly relate to the Verde River? Who is involved in these activities?

Domain: Potential economic development opportunities that are associated with the Verde River system in the Verde Valley
☐ Q 4: What potential economic development opportunities exist which are associated with the Verde River system in the Verde Valley?

Domain: Existing data that can be used to promote and advance the connection between the Verde River and the design and development of a sustainable economy in the Verde Valley
☐ Q 5: In your opinion, what information and facts are there that could be used to promote and advance the connection between the Verde River and potential sustainable economic development in the Verde Valley?

Domain: Potential allies in advancing the connection between a healthy river and sustainable economic development
☐ Q 6: Who are important potential supporters in advancing the connection between a healthy Verde River and sustainable economic development?

Domain: Barriers to advancing sustainable economic development in connection with a healthy river (e.g., laws and regulations, property rights, institutions such as ditch companies, water companies, historic uses, and cultural intransigence)
☐ Q 7: What or who do you see as current or potential barriers to advancing sustainable economic development in connection with a healthy river(for example, laws and regulations, property rights, institutional like ditch companies, water companies, historic uses, etc.), changing cultural values? (If response is that "there are too many," ask for top 3-5…interviewer's discretion)

Domain: Potential collaborators/outside experts who might be valuable in productively using the findings of this study

☐ Q 8: Who do you think might be interested in using the findings of this Verde River Economic Development Study, including the results of interviews such as this one?

Domain: Assessment of need and focus of potential additional investment to achieve the goals of sustaining and conserving the Verde

☐ Q9: A final and especially complex question to be asked *depending* on the conceptual sophistication of the interviewee's responses to questions 1-8 above:
What ideas do you have about what can be done to make the Verde River a focal point for regional economic development?

In closing, each interviewee *may* be asked (at the discretion of the interviewer):

- How long have you resided in the Verde Valley?
- In what ways do you interact with the Verde River?
- If you were given $5 million to spend on behalf of the Verde River, how might you spend it?
- Who else should be interviewed?
- Where, in your opinion, could/should money be spent to strengthen the link between the river and sustainable economic development?
- Is there anything about this study that concerns you? If so, what and why?

If appropriate, state the interviewee's position, insofar as it relates to this subject,

Additional questions may emerge as a function of initial interviews and document analysis.

APPENDIX 10

Summaries of Interview Responses by Question

Question 1: What do you think are the most significant factors influencing the health of the Verde River system?

> *"It seems that the most significant factors are those we can't impact – just the patterns of the world and then those we can impact – development and recreation."*
> *"I think people don't understand why they should care about the Verde River…not only the general public…, but also our elected officials largely don't understand either."*

This question invited interviewees to begin thinking about the Verde River as a living system referring to and allowing them to define and respond to the word "health." The responses fall primarily into four inter-related categories:

- biological characteristics and conditions
- public policy and water law
- human impact related to water use, population growth and related economic development
- public education and understanding

Maintaining the source and flow of the river is a major concern associated with the potential drawdown of water at the head of the Verde River in the Big Chino. This concern is exacerbated by the possibility of extended drought in addition to projected population growth, development and associated increased demand for water in Verde Valley communities located along the river. Similarly, maintaining the quality of the water is considered to be a significant factor influencing the health of the Verde. Pollution of the river from agricultural and storm run-off, turbidity, aging and/or faulty septic systems and trash in and along the river, including construction debris and other contaminants such as micro-contaminants from medications and from other nonpoint sources is seen as a major problem.

Many of the interviewees cite the need for increased understanding of the Verde River. They specifically identify a general lack of awareness and knowledge about the physical and geographical issues that impact the health of the river, including tributaries and streams that feed it. There is an increasing awareness of the negative impacts brought about by invasive species due to their impact on aquatic, migratory and various endemic species that depend upon the native flora, fauna.

There is a common awareness that a number of Verde River related scientific studies have been, and currently are being, conducted by multiple organizations. However, most people interviewed cite a lack of understanding and confusion between what seems to be studies written by and for 'experts' that, in large part, require interpretation and are otherwise inaccessible to the general public. Further, they are frustrated by the number of studies that often present conflicting information that apparently contribute to continued contentious political debate and inaction. A general lack of understanding about the river, numerous scientific studies and absence of ongoing outreach efforts to inform and seek input from the general public make it

difficult, if not impossible, for the general public to stay engaged with the process of becoming more knowledgeable about the factors influencing the health of the Verde River. All of this is complicated by existing cultural intransigency and continued in-migration to the Verde Valley by people who may, or may not, be aware of the Verde River, its vulnerability and fragility, as well as its overall impact on the quality of life.

Several interviewees identify Arizona water law, including the Groundwater Management Act, as a very real factor influencing the health of the river. Specifically, the law treats ground water and surface water as two separate and unrelated elements. Therefore, the 'rights' of well owners are legally addressed and managed separate and apart from surface right owners at the expense of effective management of water resources and the overall, long-term health of the river. This statement is particularly relevant as it pertains to water rights held by ditch companies in the Verde Valley whose historic practices are largely seen by the majority of interviewees as being in need of more efficient delivery and management practices. Further, whereas canals and ditches historically served ranches and other agricultural production, much of the water is now used to satisfy the thirst of one or more acres of Bermuda grass.

Many of the interviewees expressed a general appreciation for events like the Verde Birding and Nature Festival and Verde River Days that bring people into direct contact with the river and contribute to the local economy. As one interviewee stated, "The value of the river is the health of the river."

Question 2: Do you feel there are things about the Verde River that we need to understand better? If so, what are they?

> *"You can study this river forever but if your studies are strictly for the cognoscente or academic or professional peers and if they're not put into terms that are usable by the public, frankly they don't do a lot of good."*
>
> *"We keep studying and studying and eventually we say we've got to make this information available to the public."*
>
> *"…a hydrological survey takes four years to say anything. So by that time you're brain dead and you don't even care or remember what the answer or questions were that these things were answering."*

This question was designed to prompt interviewees to identify what data gaps exist in our knowledge and understanding of the health and value of the Verde River system. Responses vary widely likely depending on the respondent's familiarity with the river system.

While some interviewees were unable to answer the question, others readily discussed the research and studies that have, to date, helped define the resource, river system geohydrology and other water quality and quantity issues. While they recognize the critical importance of these studies and the probable need for more in order to more fully address remaining gaps in data, they are generally frustrated that none of the available data is currently being used by

decision makers. Several respondents cite the need for action based on current understanding. They express concern about what they consider to be excessive time and resources committed to more and more study that generates no, or little, perceived action or substantive results. There is a commonly expressed need among interviewees to coordinate existing river studies and make them accessible to the general public. While there is general acknowledgement that a lot of information about the Verde River system exists, several interviewees expressed a desire for that information to be translated into language and terms that make it meaningful and useful to the non-scientist and/or average person.

Some respondents note the lack of discussion and civic engagement about water issues in the Verde Valley and most people interviewed register concern about the prevailing lack of understanding that exists with regard to how the health of the river impacts economic sustainability. There is a commonly expressed need to educate the public, adults and children, about the unique characteristics and importance of the Verde River. Several interviewees note the importance of educating the public so that they, the public, can substantively support public policy that contributes to the health and value of the Verde River. Several interviewees suggest the use of an already established economic driver, i.e., tourism, as an opportunity to educate some people and re-educate others. One interviewee specifically notes the importance of the VREDS research and its potential to directly link the health and value of the river with sustainable economic development.

There is a common awareness among interviewees of the need to better understand the hydrology of the river and the ecosystem it supports. They believe a better understanding may serve an important function in potentially and positively altering human behavior that influences the health of the river. This is especially meaningful to several respondents who express concern about irrigation with surface water. They suggest the need to engage residents who live along the river, especially those who use the irrigation systems, so those people can become partners and collaborators in developing solutions to water management problems. However, several interviewees note that culturally embedded reluctance to change and/or the unwillingness to acknowledge water and the river as a limited resource is a barrier to greater understanding of the relationship between water and the economy in the Verde Valley.

The legal framework that surrounds ownership and water rights on the Verde River is a concern to many interviewees. While some claim not to fully understand it, others specifically identify Salt River Project's asserted rights to the river water and the lengthy, and ongoing, Gila and Salt River general adjudication process that exacerbates the issue.

Several interviewees express concern that while water *quantity* issues are being addressed, water *quality* issues are *not* receiving similar or adequate attention. They specifically identify concern about the impacts of water pollution from septics and storm water runoff. While many respondents acknowledge that water quality and/or quantity problems are looming for the Verde River, they often express frustration that they have no idea what possible solutions may exist.

Many interviewees note that the political and economic drivers behind the Big Chino pipeline are confusing and/or poorly understood. They express concern about the connection between withdrawals from the aquifer in the Big Chino Basin and the flow of the Verde River and how

well, or even if, that connection is understood. Some respondents also note the impact of wells—whether domestic, municipal or industrial—on the flow of the river.

While some respondents are concerned about the sustainable capacity of local aquifers, others suggest the consumption of groundwater does not significantly impact either the Verde River or Oak Creek. A few respondents are confident that an untapped and essentially unlimited aquifer commonly referred to as "Big Mama" runs beneath the Verde Valley at great depth (1,000 feet or more) and will satisfy water demands for many years to come.

Interviewees commonly express an appreciation for the river as it relates to the historical development of the Verde Valley. They note reliance of mining, agriculture and tourism on the continued availability of water and identify the need to better understand and communicate the hydrogeology of the river system, especially as it pertains to the effects of flow and water temperature that impact habitat and wildlife, including fish. Finally, they point out the need for regional planning that takes hydrogeology and riparian systems fully into account.

Question 3: To your knowledge what, if any, economic development activities have recently been, or are currently being, conducted that directly relate to the Verde River? Who is involved in these activities?

> *"There is not a single business that is not related to the Verde River in the Verde Valley. Without the Verde River, nobody lives here. Our economy is that of water. End of story. Without the river, we're gone."*
>
> *"...encouraging people to get out along the river is an important part of economic development because it brings tourism but it also brings the local people to those local riparian areas."*
>
> *"The first people who came and settled here wouldn't have settled here if there wasn't water."*

This question asks interviewees to identify who, if anyone, is currently working effectively to connect the Verde River system with sustainable economic development. Some interviewees asked for a definition of "economic development" prior to answering the question. They were advised to respond to the question based on their own definition of the term. The responses fall primarily into three categories:

- Agriculture and small farms
- Tourism, recreation and river-related public events
- Real estate development

The history and culture of the Verde Valley is frequently cited by interviewees as they consider the connection between the Verde River system and sustainable economic development. They recall the settlements of prehistoric cultures, American Indians and early pioneers, many of

whom were farmers, and all of whom depended on the river and the riparian system and water it provided for their livelihoods.

There is a common awareness and appreciation for an increase in small farm operations in the Verde Valley that produce such things as eggs, cheese, chickens, goats, beef, lamb, honey pecans, a wide assortment of specialty crops, including organic, vegetables and seasonal orchard fruits in addition to alfalfa, corn crops grown as feed for livestock and nursery stock. Nearly all of the respondents identify the significance of grapes and the wine industry as part of an increasing agriculture and farming economic sector. They readily acknowledge how the wine industry, as a recognized low-water user, will increasingly benefit the overall local economy, especially as it relates to tourism. Some interviewees, however, also voice concern about the inefficiencies of traditional irrigation systems and the need for more efficient water delivery methods and practices. While some respondents are notably aware of the river and its impact(s) on life in the Verde Valley, others describe a perceived lack of awareness and/or general appreciation for the river by the general public claiming the many residents do not know how the river impacts their lives on a daily basis -- not to mention its value and relationship to economic development.

As one interviewee noted, people come here because "It's the Verde Valley. People aren't coming here because it's the Desert Valley." Nearly all the respondents identify recreation and tourism as significant economic development sectors. They repeatedly identify such things as rafting, canoeing, kayaking, hiking, birding, fishing and the Water to Wine tour that floats people down the river to local wineries. Interviewees hold this particular tour and business enterprise in high regard because it simultaneously educates the public about the river and its connection with the wine industry and provides locals and visitors alike with a new experience and connection with the river.

Several respondents identify the significant relationship and larger impact between tourism and river-related activities. They recognize that when people visit the Verde Valley for one or more days, they support local businesses such as general retail, grocery and convenience stores, gas stations, restaurants and bars, art galleries, boutiques and a range of specialty hunting and fishing shops. Tours and experiences such as Verde Canyon Railroad, Sedona Adventure Tours (especially Water to Wine tour), Out of Africa and the Blazin' M Ranch provide locals and visitors alike with a multi-day agenda. However, several interviewees cite the need for greater marketing of the Verde River and the Verde Valley region as a tourist destination so that greater overall economic advantage can be achieved and the importance of the unique characteristics of the Verde River as a perennial stream can be more fully recognized and appreciated. River-related events and venues such as The Verde Valley Birding and Nature Festival, Verde River Days, Dead Horse Ranch State Park and the Verde River Greenway are highly regarded by many respondents because they offer education about the value of the river and the natural and built environments that surround it.

While sand and gravel operations were identified by some respondents as historically significant economic development entities, most are not sure whether or not any of these companies remain in business. One respondent cited Yavapai College as an economic development entity due to its direct relationship with the agriculture/viticulture industry.

Several respondents identify the desirability of real estate located in and around the river. They specifically note how the river contributes to the overall quality of life and how real estate agents use the river and riparian area as a marketing strategy to sell commercial and residential property. As one person states, "Everybody likes to sell a little paradise; a little green paradise, where you can have shade in the desert with water flowing by, and otters and you can go fishing…" Another respondent recalls a marketing presentation for a new subdivision in the Verde Valley. "…they did a show on the subdivision showing red tile roofs and a guy fly fishing." Others identify land "development" that includes the purchase of large tracts of land for conservation along the river noting that such development "would be famous" and a notable draw for tourists from around the world. They cite the important and increasing work of The Nature Conservancy and Arizona State Parks to conserve historic ranches and preserve open open space.

Interviewees generally acknowledge the ongoing economic development efforts of several Verde Valley nonprofit organizations and local, county and state government agencies. These include:

- Verde Valley Regional Economic Organization (VVREO)
- Cottonwood Economic Development Council (CEDC)
- Verde Agricultural Coalition
- Verde Food Council
- Verde Valley Wine Consortium
- The Nature Conservancy
- Arizona State Parks
- Arizona Game and Fish
- Chambers of Commerce

While many respondents identify some of the direct economic benefits associated with the Verde River, others point out that some things related to the value of the river cannot be easily quantified. "…I love to look at the trees from a distance and the feeling of peace it brings to my heart…" As the respondent notes, "You can't quantify that. You can't attempt to assign a dollar value to how someone's spirit is affected by the fact that this great river exists."

Question 4: What potential economic development opportunities exist which are associated with the Verde River system in the Verde Valley?

"I think from a commercial prospective, the Verde River is completely under-utilized."

"Drive up and down the Verde Valley and find out how many places go 'River opportunity – fun, fun, fun.' It doesn't exist. It's almost like it's been completely ignored."

"…I think tourism and maintaining that ambience – it's one of the last rivers in the state and we need to protect it."

"There has to be some education around water 'foot-printing'…I think the entire Verde Valley needs to be 'branded' so everybody who participates in new economies that depend in any way on water need to be able to borrow and not tarnish the reputation of the 'label' of the Verde Valley."

This question prompts interviewees to consider economic development opportunities associated with the Verde River that have not yet been identified *or* that might be more fully pursued and expanded in the future. Without exception, all of the respondents acknowledge the Verde River as a valuable asset whose full potential remains relatively unexplored and undeveloped. As one interviewee notes, "How can you not love the Verde Valley? It's one place that you can still come and sit outside and watch geese fly over, birds of all kind coming into the area, and just know that you're still in a setting that is natural and beautiful. If we lose that, our economy will go down the drain…down the river."

There is a common perception among respondents that the Verde River is 'invisible' to many who live here and others who come to visit the Verde Valley. "You can drive through and not even know that we've got a river." There is also commonly shared agreement regarding the need for promotion, marketing and/or 'branding' of the river and the Verde Valley as a region. Some of the interviewees acknowledge there are likely difficult decisions to be made when considering economic development and maintaining the health of the Verde River. "How do we keep the river while considering the needs of people, wildlife and the whole pie?"

Tourism is widely recognized by the interviewees as an economic development opportunity whose full potential has not been recognized primarily due to a lack of coordinated marketing efforts and/or 'branding' of the Verde Valley and the Verde River as a destination for domestic and international visitors. Similarly, ecotourism, with a focus on wildlife watching along the river, birding and education, is a commonly cited opportunity not yet fully explored. "The Verde River could be the only place in Arizona where you could go and do real serious watchable wildlife and riparian hiking." Others, however, are mildly cautious about expanding ecotourism. "…I always am leery about the idea of ecotourism because it usually leads to an exploitation of that resource…when you turn an environmental place into a place of business, then that place exists for the paying customers and not for the people who live there already and that's problematic."

Several interviewees note that tourism and ecotourism related opportunities, including guided nature and archaeology tours, provide immediate opportunity for economic development through interpretation, teaching and learning about the socio-cultural history of the region and the river that supports it. "I think sometimes we forget our history…how we were dependent upon the river for our economy…how we should still be tying our community with the river for our economic health."

Many of the interviewees readily identify outdoor recreation as a potential economic development opportunity. They relate their own interactions with the river, e.g., fishing, boating, swimming, and suggest these activities, if marketed and well managed, could provide the economic impetus for related businesses. These businesses could provide complementary amenities such as boat rentals, fishing bait and tackle, picnic supplies, including grill rental, food and beverages. "Maybe somebody could give tours of the Verde River by canoe or kayak…you can get a paddle boat going down [and then find]…shade cover for Grandma and some tuna sandwiches." Further, respondents acknowledge that maintaining the health of the river, i.e., water quality and flow rate, is critical to the continued operation of such businesses, especially those associated with various types of boating.

There is a general awareness, and support among several interviewees, for increasing local food production and sustainable agriculture activities, including viticulture. These activities are recognized as having favorable impacts on local economies because they provide jobs, circulate money locally, attract tourists and offer potential opportunities to export locally grown products.

"What I am seeing personally, and from a business standpoint, is the Verde Valley, primarily Camp Verde, becoming the Mecca of local foods for Arizona…people are now aware of where their food is coming from and they want to eat local from an economic point [of view]." One interviewee suggests that tourism is simultaneously the best import *and* export of all because people come to the Verde Valley to enjoy what is here and then they return home well satisfied and eager to return for another experience. Another suggests the development of a greenhouse industry – a 'growing nursery.'

Many respondents note the economic benefits Dead Horse Ranch State Park and the Verde River Greenway provide, especially to the City of Cottonwood. They suggest continued expansion of the Greenway and development of other similar greenway belts with trails along the river that can be developed and used as interpretive, teaching and learning sites for children and adults. Similarly, some interviewees suggest the development of additional park facilities as an economic development opportunity. Others suggest the development of a trail system along irrigation ditches that provide the water to support local agriculture and food production.

Limited access to the river is cited as a significant barrier to economic development by several interviewees. While limiting public access to the river contributes to the maintenance of several pristine wilderness areas, many recommend increasing accessibility for the benefit and health of the river. "I think access is a key issue on the river. I think that access brings awareness." "People can't understand the importance of the river if they can't ever get to it." Many interviewees agree that if/when more people gain access to the river, they are more likely to support public policies that protect and enhance it. "Whatever you do to help get people connected to the river, whether it's by encouraging them to look at it, or to ride on it, or to fish in it, or whatever else, those people become constituents of the river. They are more likely to favor conservation and protection of those sort[s] of things."

Similarly, interviewees frequently identify limited access as a possible barrier to economic development, especially of riverside businesses that could be located along the river and provide a convenient view of it. Further, land ownership and property rights are cited as possible reasons for limits to public access. Several interviewees suggest the use of conservation easements and other mechanisms that protect property rights yet allow the development of more public access points along the river. Other respondents recognize the need for management and control of access points. "I think the river also belongs to the creatures…so I think I would want to see it [access] regulated somehow."

A few of the interviewees suggest the construction of dams and reservoirs off the main 'stem' of the river as a way to expand and enhance tourism and recreational use. The dams and reservoirs, could also serve as a water flow management tool by maintaining flow in the river during times of drought.

Many respondents note that the Verde River and the Verde Valley, as a region, is a yet 'untapped' economic development opportunity. While they do not consider heavy industry appropriate for the area, there is potential for some light industry that is sensitive to existing environmental conditions and priorities. Others suggest opportunities to develop amenities that attract people and complement local history and culture, e.g., an underground kiva, wine tasting room and restaurant. Several interviewees note that young people need to become more involved. "It's the young, vibrant people, the entrepreneurs, the people with ideas, and the people who can create capacity for ideas, that then become a job, that is at the foundation of genuine economic development. This area has everything that should be attractive to an

aggressive younger person seeking a place to lay down their future and prosper...We should be marketing to them."

Nearly all of the interviewees identify a critical need for continued education about the river, especially its unique contribution to regional quality of life and the environment we enjoy. One interviewee described an aborted economic development project directly associated with the river. An 'enviroseum' was envisioned as a scientific museum offering technology and interactive exhibits that educated people about the rich socio-cultural and natural environment of the Verde Valley and River. Another interviewee suggested an environmental center, or repository, that provides space for classrooms, education, research, facts and information about the river. "I think it would be partly educational and then partly a space where we could bring researchers in to do research on the river and have their research available for people to see and read…develop it into a true riparian study area."

Finally, several of the respondents identify the need for a regional strategic economic development plan that complements the needs of the river and the communities in the area. "How do you enjoy the river and enjoy a good economy? …I think you attract the businesses that are the kind of businesses you want." Most agree that protecting the river is critical to the economic health and vibrancy of the regional economy. "What we need to insist on is that new operations [businesses] also have some kind of a water footprint that is less than what its predecessors were using."

Question 5: In your opinion, what information and facts are there that could be used to promote and advance the connection between the Verde River and potential sustainable economic development in the Verde Valley?

> *"That's a good question. If I had a clear picture of how we were going to be promoting economic development via the Verde River, I could better answer that question…I don't know how to answer that questions…I don't have a clear picture of what we are aiming for… economic development vis à vis the Verde River."*
>
> *"If you don't have the river, you're going to have a hard time sustaining the economy of the community. You'll have a community, but it won't be as attractive to people to come to, to stay in, and to relocate in."*
>
> *"I'm not aware of a whole lot of information and facts."*

This question invites interviewees to identify what data exist that can be used to promote and advance the connection between the Verde River and the design and development of a sustainable economy in the Verde Valley. A range of responses, many of which begin with "I don't know" and "That's a hard question to answer," clearly indicates a general lack of knowledge about that "connection" and the availability of data sources that can inform it. Many of the interviewees responded by providing their own ideas about sustainable economic development related to the river. Others exhibited frustration over the lack of information and/or the disaggregation of existing information and absence of a central repository or similar mechanism that might offer accessibility to it. A small number suggested a null hypothesis to derive the economic value of the Verde River., with respect to economic development, by establishing a "null hypothesis." "If you talk about these measurements and you're going to put some figure on them, the figure that is missing is the 'x' factor which says, what's it [Verde River] worth when it's gone?"

There is a common awareness among interviewees that scientific studies of the Verde River have been and/or are being conducted by various organizations and groups, e.g., Verde River Basin Partnership and the Water Advisory Council. While several suggested *possible* sources of information and facts that *might* link the Verde River to economic development specific to tourism, e.g., Arizona State Parks and other state and federal agencies, Northern Arizona University, The Nature Conservancy, The Verde Valley Birding and Nature Festival, few are aware of other data sources.

A small number of respondents are aware of United States Geological Service (USSGS) studies that provide geological and hydrological facts related to the river. Also, there is some awareness of studies conducted by the Audubon Society and The Nature Conservancy. However, these studies are specific to bird and other animal life and the people who come to enjoy and participate in organization-sponsored activities. Several noted the need for additional and/or expanded opportunities such as Project WET and the Verde Valley Birding and Nature Festival that "connect" more people to the river and, at the same time, educate them about the river and how it impacts quality of life and economic development in the Verde Valley.

While interviewees are generally aware of many studies that have been, or are being, conducted about the Verde River by various groups and organizations, they express frustration at the disaggregation of information contained in these studies. In addition, some are frustrated by the lack of consensus by political leaders about findings. "Part of the challenge of all the information from all the water groups is that only the people who belong to those groups are getting the information. So, how do you communicate to the broader public about the value of the river…in terms of the facts and information about the health of the river, I don't know what's out there."

Many of the respondents identify a need for interpretation, dissemination and communication of information and facts that make study findings accessible to the general public, especially as they relate to the connection between the health of the Verde River and sustainable economic development. "The more these studies become very tangible as they relate to dollars coming into the community, the more that the business community will support the need to sustain the river. Right now, quite frankly, most of the business community ignores the river…They need to understand the value of the river being there and the impact it has on their business. How do you do that? I don't know. Education? Money?"

In summary, there is general consensus among interviewees about the need for more public education and information and facts that could potentially be used to promote and advance the connection between the Verde River and potential sustainable economic development in the Verde Valley. "…Frankly, reading the study [VREDS] information that you gave me ahead of time, that's [information and facts about the river and sustainable economic development] what I'm going to be most interested in. I can't wait to find out what this study comes back with as the answer to Question #5."

Question 6: Who are important potential supporters in advancing the connection between a healthy Verde River and sustainable economic development?

> *"Guess the question would be, 'who isn't?'"*

> *"…the municipalities…I don't want to bring them along. I want to have them along side-by-side as partners."*

"The people themselves are the only ones that can ever really do that and part of the reason for that is that they vote."

"Everybody. If you can make the case to anybody, they can become a partner—and I mean everybody and anybody. Potential partners are everybody who lives here."

Respondents were asked to identify key players and potential allies that might play an important role in advancing the connection between the Verde River and sustainable economic development. A majority of interviewees immediately stated that "everyone" should be involved as a partner/supporter. Further, they noted that this study is an important tool that can and should be used to help establish a meaningful connection between a healthy river and a healthy local/regional economy.

In addition to current full-time residents of the Verde Valley, many of the interviewees note that seasonal and part-time residents, i.e., "snow birds" and second-home owners could potentially be important and valuable allies because they come to the Verde Valley by choice to enjoy the environment. Both residential and commercial property owners, regardless of acreage or lot size along the Verde and its creeks, are also frequently identified by respondents because, as water-front property owners, these people already have an obvious vested interest in the river, at least where it borders their own private property, and likely utilize the ditch systems or use the water in other types of irrigation for lawns and gardens. This may include small farm operators and people associated with agricultural interests, including grapes.

Most interviewees frequently referred to various agencies—government, quasi-government, and private—as potential collaborators and supporters because of their respective mission and objectives related to land and water management. Those most frequently identified by respondents are: Arizona State Parks Department, National Park Service, United States Forest Service (Prescott and Coconino), Arizona Game and Fish Department, United States Fish and Wildlife, Bureau of Land Management, United States Geological Services, Arizona Department of Water Resources, Arizona Commerce Authority and the Arizona State Land Department. Salt River Project is also considered, by some interviewees, to be a strong potential ally that could provide leadership and community investment through education and support for research and studies related to water management. One interviewee suggests the United States Department of Agriculture is also a potential supporter because of the rural development grant programs it does/could sponsor in the Verde Valley.

Many of the respondents are familiar with a number of water-related organizations in the Verde Valley. As one interviewee notes, "…All 17 groups," would likely be strong supporters of efforts to advance the connection between a healthy Verde River and sustainable economic development. Among those specifically named are the Verde River Basin Partnership, Verde Watershed Association, and Verde River Citizens' Alliance. Other valuable potential supporters identified by interviewees are service clubs such as Rotary, Kiwanis, Lions, Elks and Moose. In many cases, these same interviewees belong to and support the community-related activities these organizations sponsor on an ongoing basis. Land management organizations and

government agencies such as the Natural Resource Conservation District, Verde Valley Land Preservation Institute, Central Arizona Land Trust, Clarkdale Sustainability Park, Oak Creek Watershed Task Force, Izaak Walton League, Verde National Resource Conservation District, Dead Horse Ranch State Park, Cottonwood Parks and Recreation are also frequently identified by interviewees as strong supporters of the river and sustainable economic development.

Direct reference to sustainable economic development in this question prompted many interviewees to name local and regional economic groups or businesses with which they are familiar. Included are: Chambers of Commerce (Sedona, Cottonwood, Jerome, and Camp Verde), Sedona-Verde Valley Tourism Council, Cottonwood Economic Development Council, Verde Valley Regional Economic Organization (VVREO), the Wine Consortium, Specialty and Light Manufacturers Association (SLIM), Green and Gold Networks, Institute of Ecotourism (now defunct), and various lodging, food and farm/ag-related organizations. While several respondents identified the Verde Valley Chambers of Commerce as potential strong supporters, one interviewee expressed an especially poignant concern. "They [Chambers of Commerce] need to understand that this study is about s*ustainable* economic development and not their normal modus operandi of doing something for a quick profit."

Nearly all of the respondents recognize educators and educational institutions as very strong supporters of the Verde River and sustainable economic development efforts. The importance of educating children about the relevance of the Verde River is noted by many interviewees. They specifically identify Project WET (offered to 4th graders in public schools throughout the Verde Valley), Northern Arizona University, Arizona State University, University of Arizona and Yavapai College. As one educator/interviewee states, "Educators [are important supporters] because they can give you the perspective on things both ways…[for example] if you go this way, this can happen; if you go that way, this can happen…we teach people critical thinking."

As several respondents note, a lot of information is available about the Verde River, but it is often difficult to access and understand. They cite a need for this type of information to be available to elected officials who must critically consider the consequences of policies related to the Verde River and economic development, especially sustainable economic development.

Several respondents suggest that volunteers who currently work on river-related projects, whether as individuals or as part of an organized effort, are also likely supporters because they have already taken the initiative to enhance and protect the river in various ways. They point out that committed volunteers may also serve as important resources in helping to establish a connection between a healthy river and sustainable economic development in the minds of Verde Valley youth and senior citizens. According to several interviewees, local residents and tourists pursuing recreational interests such as birding, kayaking, duck hunting and fishing are also potential supporters.

The development of a connection between tourism and conservation is considered by many interviewees to be a viable potential asset in achieving a healthy Verde River while developing a complementary and supportive regional economy. According to one respondent, land developers, builders and realtors need to recognize that the future is not in *more* homes, but, instead, in a higher quality of life experience that depends upon, and values, a green viewshed.

The "quality of life theme" is expressed by other interviewees as they identify other potential supporters such as churches, medical care providers and other health-related organizations such as the National Diabetes Association, National Lung Association and the Heart Association. While some respondents answered this question in very general terms, others directly referred to many businesses and business-related organizations as potential partners in supporting the health of the river and developing a strong and sustainable economy. Those directly related to tourism, i.e., lodging, B&Bs, outfitters and guided tour operators are among those most frequently identified. One interviewee notes that several of the lodging establishments are actively involved in "greening" the local lodging industry in the Verde Valley by instituting various sustainable practices in their daily operations. They include Enchantment Resort, L'Auberge Resort, Sedona Rouge and Wyndam Resorts.

Several interviewees note the importance of support from various Verde Valley municipalities and communities, Yavapai County, Coconino County, the Yavapai Apache Nation and a number of state and federal agencies. Other respondents identify the important potential support by sanitary districts, private water companies, and the Arizona Department of Transportation, because of its relationship to tourism. One interviewee made an interesting observation noting that the residents of Maricopa County could also be strong supporters because they frequent the Verde Valley as tourists and recreationists. He suggests that Maricopa County could potentially be an influential partner because of this relationship in addition to its own interests in water resources but it is currently not at the policy making table.

Some interviewees cautioned that most of the elected officials, especially city or town councilors, will say that they are supporters of a healthy river as it relates to a strong economy, but they often do not see the regional connection. Instead they have a micro view of how their own community or jurisdiction is influenced and/or affected by the Verde River. As at least one respondent notes, the government, at any level, can be a positive collaborator and/or a barrier, especially as it relates to water policy changes that are needed at nearly all levels of government.

Similarly, several other interviewees maintain that it is citizens who must directly address the issue of a healthy Verde River and sustainable economic development in the Verde Valley. They note that the citizens are the ones who vote and they are, ultimately, the ones who make things happen. However, as these same interviewees point out, it is a challenge to get citizens to understand and act on this premise in a way that effectively influences elected officials. As another respondent poignantly notes, citizens who have a particular economic interest and those who vote are "going to have to get smart locally and take this issue into our own hands and…own this problem."

Question 7: What or who do you see as current or potential barriers to advancing sustainable economic development in connection with a healthy river(for example, laws and regulations, property rights, institutional like ditch companies, water companies, historic uses, etc.), changing cultural values?

> *"State laws dealing with surface water appropriation are based on conditions and realities of the early 1900's. These need to change to allow better stewardship of the Verde River."*

"The frustrating thing about science playing a role is it takes an awful long time and an awful lot of money. "
"If people were informed about the dire consequences of a dry river or seasonally flowing river, they might act more rationally and not as much in their self-interest."

"The first hitch is that I don't think we have a political view of regional planning. The second one is that we do have all these public agencies that don't coordinate or cooperate. Therefore, it's going to be very difficult to get the kind of regional planning that we really need to get done."

Question 7 invited interviewees to explore all possible barriers to advancing the connection between sustainable economic development and the Verde River. A primary barrier identified was land ownership.

The ownership of the river corridor itself is considered a barrier by many interviewees. Some feel that private ownership and private property rights issues are major barriers to increasing the economic development potential of the river. Others note that public land owners, i.e. lands managed by the Arizona State Parks Department, U.S. Forest Service and local municipalities also constitute a barrier because of the restrictions imposed on land use along the corridor and in the river itself as a result of the various, and mainly independent, missions and objectives of these respective entities. In addition, the lack of public access to the river and/or signing that indicates access points constitutes a barrier for many respondents. They attribute this barrier to land ownership as well citing private ownership and reticence of some land owners to allow the public on their land.

Lack of governmental cooperation and collaboration on water issues, especially at local and regional levels, is mentioned frequently. Many of the interviewees express frustration that some communities located along the Verde River are not cooperating with each other in such a way as to benefit the river. A general lack of cooperation and coordination among federal agencies was also cited. The U. S. Bureau of Reclamation, Corps of Engineers, U. S. Fish and Wildlife Service and the Environmental Protection Agency are considered by many of the respondents to be acting at cross purposes or even antagonistically with each other and is resulting in inaction and/or inappropriate action(s) by these agencies.

Prescott-area communities that look to the headwaters of the Verde River as a potential new water supply are mentioned by several respondents. They note that these communities have a vested interest in *damaging* the river. Big and Little Chino Basin water withdrawals are a common source of pessimism among several respondents. They wonder whether or not any work done in the Verde Valley will add significant value to the overall health of the river considering pumping activity at the headwaters.

Many interviewees comment on the need for education and the general lack of knowledge about the river and its potential and describe these things as barriers to advancing the connection between the river and sustainable economic development efforts. Many feel that if the public were better educated about all aspects of the river, they would be more inclined to want to

preserve it through, among other things, better and sustainable economic development efforts. Others comment that many residents are simply not as aware of the river and what economic development opportunities it might provide and this constitutes a significant barrier as well. Associated with the need for education, interviewees note the bifurcated water laws and subsequent disconnects between groundwater and surface water that constitute a significant barrier. They observe that this disconnection leads to depletion of groundwater resources which, in turn leads to reduction of the river's flow. Some respondents point to well owners as an example of the disconnect and observe that these owners can pump unlimited amounts of water from the ground seemingly without regard for and/or consideration of the impact on the river.

Current legal and regulatory frameworks and systems are identified as barriers by several respondents. They specifically identify national environmental protection laws and agencies such as the National Environmental Protection Act, the Endangered Species Act, the U.S. Fish and Wildlife Service, Bureau of Reclamation, Army Corps of Engineers, and various other state agencies and local laws that restrict how the river can be altered or, in their opinion, improved. Some respondents refer to Arizona's restrictive zoning legislation that generally does not allow a local government to base planning decisions on the availability of water or the possible impact of development on surface water.

Some interviewees describe the inertia that results from a resistance to change in water use as another major barrier to success in almost any effort, including economic development associated with the Verde River. They identify the "good ol' boys" and other long-term residents as examples of people who do not want to see any change in/along the river or, for that matter, in the Verde Valley. They observe this inertia is often most evidenced by riverfront property owners who often have lived in the area a long time rather than those who have moved here more recently. Many respondents observed that it is just easier to do nothing than to embark on a new, and possibly radical, project that may result in positive change.

Current and continued economic conditions are cited by several interviewees as a barrier. Many predict that the current economic decline may not last much longer and some express confidence that when the general economy does improve, the river will/could receive a targeted share of dollars from various sources that could be used to solve some of the sustainability issues currently observed. The lack of funding for and from state agencies such as the Department of Water Resources, Arizona Commerce Authority and the Department of Environmental Quality, is cited by some respondents as a singular impediment to creating a healthy and sustainable river.

Finally, a general fatigue with the number and perceived lack of substantive performance by river-related organizations, both governmental (WAC, NAMWUA, etc.) and non-governmental (VRCA, VWA, CWAG, VRBP, etc.) is noted by many interviewees. They are concerned about the relative absence of quantifiable actions and results from these organizations; they remain skeptic about the possibility of any substantive action being taken to ensure the river will remain healthy and vital. They go on to note with frustration the considerable number of studies that are initiated and completed at considerable expense and time but are then "put on the shelf" with the findings never used and/or implemented in any perceivable way. Some of these same interviewees wonder if this is, in fact, the case or if their observation is simply due to a lack of public awareness and education about actions taken by any of these groups or organizations.

Question 8: Who do you think might be interested in using the findings of this Verde River Economic Development Study (VREDS), including the results of interviews such as this one?

> *"The miracle of what is occurring as the current effort to preserve the Verde is as a result of people who have moved here."*
>
> *"The answer is always everybody. But, then trying to be specific about how you would approach that, the idea that I would assume the governmental entities, including the national and local entities, should and would."*
>
> *"…those that are economically tied to it and know it…will find this important to them in trying to understand it and see if they can increase their understanding to have that coffee table talk or that grocery store talk."*

This question asks respondents to identify potential collaborators/outside experts who will be interested in the results of this study. Nearly all of the interviewees specifically say, "everyone." Others suggest that this study will be of interest to the general population of the Verde Valley and go on to explain that the residents of the Verde Valley are most apt, at some point in the future, to assimilate the findings into an action plan.

Local service organizations, e.g., Kiwanis, Rotary and Lions Club, homeowners' associations, senior homes and centers are identified by some interviewees as potential venues where the study results can be communicated. Several respondents note that water companies, private and public, ditch company bosses and users, and river-related organizations, such as the Verde River Basin Partnership and the Verde Watershed Association, might use the findings of the VREDS to further their respective goals and objectives.

Many interviewees advise that government entities, including local cities and towns, Yavapai and Coconino Counties, the Yavapai Apache Nation, and various state and federal agencies located in the Verde Valley, *need* to receive and use the study findings. Others specifically identified are the Yavapai County Water Advisory Committee (WAC), Cottonwood Economic Development Council (CEDC), Sustainable Economic Development Initiative (SEDI), Clarkdale Sustainability Park (CSP), Arizona Department of Water Resources, Arizona Department of Environmental Quality, National Park Service, Arizona State Parks Department and Arizona Game and Fish Department. These interviewees optimistically suggest that these entities will find the information interesting and useful in future community development planning efforts. However, other respondents are more pessimistic in their perception of whether or not any of the entities names would, in fact, put the study findings to good and positive use stating that although the findings *should* be used, they probably will *not* be used. There is general consensus among interviewees that public officials in local municipalities, Yavapai County, and the State of Arizona can benefit from any and all additional knowledge, including the VREDS study, on an ongoing basis. As one respondent notes, "Verde River 101 needs to be taught to all newly elected officials in the county, state, cities, towns and tribes."

The need for more education about the Verde River is commonly expressed by the majority of interviewees. They specifically identify the critical importance of involving school children and young adults in learning and talking about the river that runs through their communities and/or contributes to the quality of life they commonly experience. Because they are the next generation of residents and policy makers, it is important to inform them about the value of the river and its direct relationship to their current lives and possible future livelihoods. According to many of the respondents, this will potentially require the development and/or enhancement of river and water related study/research classes and programs specific to the health of the Verde River that include relevant sustainable economic development components at all educational levels – grade school through college/university. As such, schools, colleges and universities serving the Verde Valley should be interested in the results of the VREDS. While Yavapai College is most frequently mentioned, Northern Arizona University, Arizona State University, University of Arizona and Prescott College are also cited by several interviewees.

Many respondents suggest that agriculturalists, food coalitions and commercial growers in the Verde Valley will find value in the VREDS findings. These include farmers, ranchers, viticulturists, community food banks, and commercial cattle growers. Many interviewees directly link the existence and growth of the wine industry to the presence of a healthy river system. One interviewee notes that by linking agriculture and tourism in the Verde Valley (agri-tourism) and appropriately marketing it, an additional economic benefit can be realized.

A majority of interviewees note that all businesses and organizations related to revenues derived from visitors or tourists will be interested in the VREDS findings. These include area chambers of commerce, travel agents, the Sedona Lodging Council, and other hospitality industry groups. Many interviewees frequently point out that the health of the river and the ecosystem derived from it is what makes fishing, birding, hiking, rafting and kayaking trips possible and pleasurable in the Verde Valley. When visitors come to enjoy this natural amenity, they often spend additional money in local lodging establishments such as restaurants, gas stations, sporting goods stores, general retail, grocery and convenience stores.

Several respondents also suggest that real estate related entities will be interested in the study findings because it provides a source of information, although limited, about local perceptions and observations relative to land use, construction and development, and economic development past, present and future. Others, while often not providing specific reasons why, suggest that the following businesses and organizations will be interested in the VREDS findings: mining companies (especially sand and gravel mining), the Salt River Materials Group, APS, local historical societies, Girl Scouts and Boy Scouts, the Audubon Society. A few respondents note that the local media should be interested in the VREDS results because, in addition to informing the public about the findings, they have a vested interest -- their own sustainability depends on the economic success of the businesses who advertise in their publications.

Extra Question: If you were given X ($5-10 million) dollars to spend on behalf of the Verde River, how might you spend it?

> *"I think the more people use and enjoy the river the better the future health of the river is going to be."*

"Could you imagine that? A big riverfront park the whole length of it?"

"The more accessible you make it, the more buy in you get from the entire community about the importance of it."

This optional question was added to the standard VREDS interview questions as a result of a statement made by one of the first people interviewed. The interviewee mused about the fact that there are large grants being awarded for remediation of the Salt River near Phoenix. "I think it was $80,000,000 that they spent on restoration for the Salt River…if they'd only give *us* $80,000,000 for the Verde River. What could be done with that? And it's (the Verde) a live river. We don't even have to restore it. We could just help it." This additional question provided respondents with an opportunity to "dream" about, without the obvious strictures of severely limited funding, what might be done to substantively link a healthy river system with sustainable economic development in the Verde Valley. Many of the responses to this question are creative, revelatory and confirming of previous responses to other questions asked in this study.

River access points are consistently mentioned by most all interviewees who responded to this question. They cite the need to creating additional access points and also to improve those that currently exist. This includes making them more visible through signage so that people can physically see them. It also includes development of a marketing and/or branding campaign that speaks to what recreational resources are available in and around the Verde River. Many respondents note that improving access and availability of the river to more people will increase and improve people's perception of the river and significantly inform how they assign value to it, including the need to maintain its health.

Another commonly stated notion was the need for more and better trails along the banks of the river. Many interviewees suggest that the need for acquisition of easements along the river and/or fee simple acquisition of land in the greenway corridor. They specifically point out the need for funding dedicated to the maintenance of current and future trails in perpetuity.

Several respondents consider conservation/preservation of lands along the Verde River as a priority over other possible expenditures. Some suggest that purchasing the property outright, or using one of the more creative approaches like Purchase of Development Rights (PDRs), Conservation Easements or other binding, non-ownership schemes, might work as well, if not better, than direct and outright ownership. However, transferring ownership from private to public entities, such as Arizona State Parks, Yavapai County or local municipalities is mentioned by other respondents. Several interviewees often linked land conservation efforts along the river with the possible development of a "strip park" located in a contiguous stretch of publicly owned land along the river – an expanded Verde River Greenway concept.

A few other respondents propose that money be used to purchase land or conservation easements in the Verde watershed, specifically the Big Chino sub-basin and the state trust land located immediately east of Cottonwood. This would, in their opinions, help to ensure that no additional groundwater pumping occurs there.

Several interviewees indicate the need for a general river cleanup. They note specific dangers and general unsightliness that old cars, steel rails, sheet metal, and other items in and along the river present to recreationists and others who come to enjoy the river. Many respondents advise that the river experience would be much more inviting and user-friendly if there was an ongoing maintenance plan put into place.

While some interviewees note the need for habitat improvement along the river, i.e. re-vegetation of some areas with native trees and plants, others express concern about invasive and exotic plant species and cite the need to remove them. They indicate, however, that sufficient funding would have to be dedicated to this purpose in order to support ongoing and continued work as most all of these plants regenerate quickly. One interviewee suggests the need for a large chipper and other equipment so that the biomass created by the removal of plants could be either used or disposed of more efficiently and effectively.

A majority of interviewees express concern about inefficient irrigation ditch systems and practices. They observe that ditches in the Verde Valley generally operate in ways that cause an excess of water diversion and resultant dewatering of the river. Several respondents suggest specific ways to solve the problem. Their suggestions include: leveling of irrigated acreage so that water flows more efficiently; lining irrigation ditches to decrease percolation; pumping water from the river closer to the actual users rather than creating miles of head ditch; and educating ditch users about scheduling and appropriate use of the water. In addition to improving ditch efficiency, several of the respondents propose acquiring ditch rights, then severing and transferring those rights to downstream users, would decrease the need for so much diverted flow. One interviewee, an experienced river runner, advises that that the ditch diversions need some safety and convenience improvements around portage areas. Another interviewee suggests there is a need to understand the relationship between ditch diversion, percolation and return to river flow.

One of the issues most frequently raised by interviewees is the need for more public education about the Verde River and its relationship to quality of life and economic vitality in the Verde River. Several interviewees cite the critical need for funding that is specifically directed to educating children about the Verde River. They note that doing so will instill a value in the river that will increase over time. These respondents recommend that public education programs should include such things as the origin and ecology of the river, the ditch systems and surface water rights. Others advocate funding that supports park rangers and other similarly prepared professionals that could serve as educators about the river.

Several interviewees suggest the funding of an interpretive visitor center. They propose that the center be used as a place to conduct river-related research and to educate people about how and where to gain access to the river, proper use of water and related natural resources and the plant and animal life that the river provides for. Many interviewees suggest that increased knowledge of the river and its environs will increase the general public's concern awareness of the river and the positive value they place on it.

A few respondents indicate a need for grants that would support the development and implementation of school programs so that more children can learn about and connect with the

river more, including field trips to the river. One interviewee/educator proposed that school children could be effective and cost-efficient researchers while they studied about water quality, ecology and other water-related topics. As such, the students could learn about the river and how to conduct research, including documenting their work, as part of an over-all integrative learning process.

Raising and enhancing awareness of the river is cited as a need by many of the interviewees. Some respondents advise the need to expose more people to the river, in differing ways. One suggests that dedicating money for trips along the river, i.e., canoeing, kayaking would help stakeholders and policy makers understand that the river is worth saving. Another respondent suggests production and distribution of a video of the Verde River. The video could then be discriminately placed and discretely shown in a variety of public venues -- an infusion into the public consciousness.

Many respondents note that the river is, in general, poorly understood, and that the data gaps in our knowledge need to be filled by unbiased research. To facilitate educational and public awareness efforts, a number of interviewees suggest the need for an organization that might serve several purposes -- public education, river advocacy, identification of scientific study and general coordination of efforts that focus on the health of the river. One interviewee proposes that this type of organization requires a paid staff, including "a full time facilitator who is an intelligent, analytical thinker who is also articulate and can gin up a vision that we get people to buy into to create a whole big community conversation around the need for collaborative management." A number of other respondents suggested such an organization could also recruit, facilitate and manage volunteers participating in river-related activities and facilitate and coordinate the efforts of other non-governmental, non-profit organizations, in addition to government agencies, working on various river issues. They note there are multiple organizations working on various river and water issues and that these efforts might be more efficient and effective if they were designed, facilitated, coordinated and implemented with the assistance of, or by, a single, well-funded and well-staffed organization. These same respondents suggest that an organization like this could also be a vehicle that strengthens and improves the relationship between the Verde Valley and the Prescott-Prescott Valley side of Mingus Mountain as long as it remained balanced and non-political in its work. Further, they propose that this type of organization could also provide river-related educational programs that raise awareness and inform residents and tourists about the nexus between the health of the Verde River and the Verde Valley economy.

Several respondents suggest that the Verde River needs to hold a more prominent position in the Verde Valley's over-all identity. Some propose that the river should be a "focal point" and that the Verde Valley needs to "brand" itself prominently with the Verde River. Several interviewees mention the need for a business plan that would guide and facilitate sustainable economic development directly along the river.

Water quality improvement is a common theme among several respondents. They observe that water quality issues deserve as much attention as those having to do with water quantity and voice concern about water quality problems – especially those associated with septic systems. One interviewee suggests targeting money for converting septic systems to mechanized

treatment processes that would alleviate at least some of the more obvious sources of pollution in and along the river. Several respondents suggest the need for additional scientific studies that provide information about the origin(s) of water and the impact of ground water withdrawal on flow because it directly informs the health of the Verde River and, in turn, the health of the local economy while others identify the need for studies that identify/define the most effective ways to augment flows and groundwater recharge. Included in this context is the need for studies that identify ways to improve the efficiency of irrigation ditch delivery systems.

Legal, legislative and institutional change[s] is a commonly expressed theme among several interviewees. They propose funding for the express purpose of lobbying the legislature for changes to Arizona's water laws. One of the most frequently mentioned is the bifurcated water law concept that legally denies the connection between groundwater and surface water. Some respondents note that existing law precludes other legal remedies for negative impacts to surface flows by groundwater pumping. Others think there may be legal avenues currently available for use in resolving the issue of withdrawals from the Big Chino. A few interviewees are concerned about laws that deny local jurisdictions the right to make planning decisions based on groundwater availability. [Note: This law has been slightly amended in the last few years.] Only one respondent suggested that money should be spent to better define the water rights held by Salt River Project (SRP).

Several interviewees would like to see money focused on economic development efforts. They propose the development and promotion of eco-tourism and other river-related sustainable economic development. Some recommend restaurants and even coffee stands along the river for use by people who walk the river or are floating down the river. Other respondents are less specific but support the notion that when a healthy, local economy depends on maintaining a healthy Verde River, there is strong motivation to keep the river flowing. Promoting river-related events is also noted by some of the interviewees and they specifically identify, among others, the need to increase the capacity of the Verde Valley Birding and Nature Festival (VVBNF) and continued support of Verde River Days. One interviewee suggests additional support to fund staffing for the Verde Valley Regional Economic Organization (VVREO).

Infrastructure projects, ranging from re-contouring parts of the riverbed to creating rainwater detention areas and building a major dam just upstream from Clarkdale in Box Canyon are some projects mentioned by other interviewees. One interviewee suggests building a fish barrier upstream from Clarkdale and using it to eliminate all invasive and non-native species from the upper Verde River for the primary purpose of re-introducing native fish.

Finally, several interviewees stress the importance of developing and implementing a comprehensive strategic plan and/or study so that targeted funding is allocated in the most efficient and efficacious way(s) possible. Many said that some of the money would be best spent on planning the expenditures, getting expert opinions and hiring consultants to facilitate decision making by presenting options to public leaders who then can make, and defend, better informed public policy decisions.

APPENDIX 11

Verde River Public Access Points

Listed from Upstream to Downstream

1. Verde River Greenway (Arizona State Parks) at the Tuzigoot Bridge. Located on the downstream side of Tuzigoot Bridge in Clarkdale is a dirt parking area of approximately two acres allowing access to a cut-bank portion of the Verde River immediately upstream from the Hickey Ditch diversion. There is no signage on any road that directs the public to the site. There are no restrooms or any other facilities. Canoe or kayak launching in this area involves lowering the boat down the cut bank with some difficulty. Swimming and fishing areas are easily accessed. Entry and use are unattended. Hikers and boaters can reach more of the Verde River Greenway downstream from the site, but there are no services or facilities in that area.

Verde River Greenway at Tuzigoot Bridge

2. The Cottonwood Jail Trail. The Jail Trail leads from Old Town Cottonwood to the bridge over the Verde River leading to Dead Horse Ranch State Park. It winds along the riparian corridor. It has no facilities, no boat launch areas and no improvements. There is a paved parking area at the trailhead on Main Street in Cottonwood.

Trailhead at the Cottonwood Jail Trail

3. Dead Horse Ranch State Park. Dead Horse Ranch State Park in Cottonwood has 4 trails that either parallel or terminate at the river's edge. The 300-acre park has excellent facilities for camping, fishing, canoe/kayak use and wildlife viewing. It is a fee area, charging $7.00 per day per vehicle or $3.00 per day for a walk-in.

Entrance to Dead Horse Ranch State Park

4. City of Cottonwood Riverfront Park. This approximately 100-acre municipal has limited and unimproved access to the Verde River at a few points. River access is not emphasized. The park has excellent recreational facilities such as ball fields, a dog park and public open spaces. The park is immediately on the opposite (south) side of the river from Dead Horse Ranch State Park.

Riverfront Park

5. Skidmore Lane and Prairie Lane Access Points. These two U.S. Forest Service recreation areas are small, very basic access points situated immediately south of the Verde Village subdivisions south of Cottonwood. Each has a small parking area and a few picnic tables. Neither has a restroom. Unimproved trails lead to the river, terminating in very small "beaches," only big enough for one family to enjoy at a time. Neither area has any signage on any road directing the public to it, and neither is publicized in any meaningful way. If you don't know where these are, they are difficult to find.

Prairie Lane Forest Service Access

Skidmore Forest Service Access

6. Bignotti Beach Recreation Area. This U.S. Forest Service area is 1.25 miles down a single-lane dirt road off Thousand Trails Road, between Camp Verde and Cottonwood. It has a small parking area, a single composting outhouse, a picnic table, and a few unimproved trails leading to the river. The river access is small and uninviting. There is a sign directing the public from Thousand Trails Road, but none from Highway 260.

Bignotti Forest Service Recreation Area

7. Rezzonico Family Park, Camp Verde. Rezzonico Park is a small, approximately 2-acre municipal park owned by the Town of Camp Verde. It is located immediately downstream from Black Bridge and has a picnic table, trash cans, a porta-potty and cleared area suitable for family picnics. In the summer, the river's base flow in that area is less than 20 CFS, so the river is not deep enough for swimming, floating or fishing. Since the flow is so low, algae dominates the shoreline for several feet out into the water. There is no way finding signage to the park on any main thoroughfare.

Rezzonico Family Park, Camp Verde

8. White Bridge. This is a U.S. Forest Service site at White Bridge, on the downstream side of Camp Verde, just off Highway 260. Signage is minimal. There is a paved parking area and a nice restroom. Trails lead to the river, but access at the river is through unimproved, overgrown trails that lead to very poor recreational sites.

White Bridge Forest Service Access Area

APPENDIX 12

Major Ditch Systems in the Verde Valley

Ditch Name	Withdrawals at Peak (CFS)	Acres Served	User Accounts	Miles of Ditch
Cottonwood Ditch	60	672	200	8
Verde Ditch	50	1450	685	17
OK Ditch	30	620	107	5.5
Diamond S Ditch	21	385	82	4.9
Eureka Ditch	20	441	191	7.6
Red Rock Ditch Assn.	?	50	42	4.9
Mason Lane Ditch	20	300	102	4.9
Cornville Ditch	9	168	59	3.9
Pioneer Ditch	10	150	50	1.9
Page Springs Ditch	10	103	13	2.5
Totals	**230**	**4339**	**1531**	**61.1**

Source: Verdenews.com, June 30, 2009

Cottonwood Ditch Diversion at Tuzigoot National Monument

APPENDIX 13

Interview Keyword Analysis

The following is a table of keywords tested against the transcribed interviews and their occurrence in those interviews.

River Health		
Health/Healthy	349	
Water quality	61	
Water quantity	18	
	Flow	308
	Pollution/runoff	87
	Trash/Garbage/Litter	88
	Drought	38
Flood	120	
Invasive(s)/invasive species	59	
Wells/Groundwater	240	
Irrigate(s)/Irrigation	261	
	Ditches	358
	Sustainable	374
Understanding of Information and Facts		
Educate/education/ public education	432	
	School and college	247
Science/scientific	646	
	Ground water/groundwater	100
	Surface water/surface flow	55
	Hydrology	65
	Ecology/ecosystem	84
	Climate/Weather	38
	Watershed	78
	Riparian	90
Newspaper/Media	115	

Past/present/future economic development activities and opportunities		
Tour	22	
Tourism	272	
Train/Railway	58	
Agriculture/farm	444	
Viticulture/wine/grapes	480	
Recreate/recreation	156	
	Picnic	25
	Boat	63
	Kayak	86
	Canoe	66
	Hike/hiking	50
	Bike/biking	41
	Bird/birding/bird watching/ birdwatching	224
	Fish	274
	Real estate	26
	Nature/habitat/natural	357
Promoting connection(s) between the Verde River and economic development		
Access	203	
	Park	350
	Trail	155
	Greenway	73
Branding/Marketing/Identity	241	
Potential supporters		
Birding & Nature Festival/ birding festival	69	
Chamber	130	
Verde Valley Regional Economic Development Organization/VVREO	55	
Development/includes contexts of real estate, economic and sustainable economic	895	
Business	289	
Elected	32	
Municipalities/Cities/Towns	134	

Current or potential barriers			
Legal and legislative			
	Legis: includes legislation/ legislature	198	
		Water law	16
	Rights	222	
		Water	99
		Property	49
	Water adjudication/adjudication	23	
Government	161		
Politics/political/politician	100		
	Big Chino	44	
Salt River Project	114		
General			
Verde	1,978		
River	3,697		

APPENDIX 14

Glossary

1575 (SB1575) – An Arizona State law passed in 2008 that allows cities, counties and towns outside Arizona's AMAs (see below) to adopt the law that requires new subdivisions to obtain a certificate of "Adequate Water Supply"(see below) from DWR before building. Under this law, if subdividers cannot prove adequacy of their water supply to DWR they are not allowed to build. If a county adopts the provisions of 1575, all municipalities in the county (except those in AMAs) are bound by the law. If a county does not adopt the law, which Yavapai has not to date, then municipalities can adopt it themselves. Clarkdale was the second municipality in Arizona to adopt the provisions of 1575.

404 Permit: In general, Section 404 of the Clean Water Act requires permits for the discharge of dredged or fill material into waters of the United States, including wetlands. However, certain activities are exempt from permit requirements under Section 404(f). The Army Corps of Engineers administers 404 permitting.

More info: http://www.usace.army.mil/inet/functions/cw/cecwo/reg/sec404.htm

Acre-foot (A-F): A measure of large water volumes, equal to the amount of water required to cover an acre to a depth of 1 foot, or 325,851 gallons. In our area, and at today's average consumption, one acre-foot is generally enough water for 2-3 households for 1 year. In some areas, it's only enough for one. 1 CFS of spring or river flow would equal 724 A-F in a year's time.

ADEQ: The Arizona Department of Environmental Quality. This agency is responsible for enforcing environmental regulation in Arizona. In many cases the U.S. Environmental Protection Agency (EPA) has given responsibility for enforcing certain federal environmental regulation to ADEQ.

More info: http://www.azdeq.gov/

Adequate Water Supply: A Certificate of Adequate Water Supply (Adequacy) is issued to potential subdividers outside AMAs if DWR or a certificated water supplier that will service the development determines that the development will have adequate water for their uses for 100 years. This certificate is not required for the user to build unless he is building in a jurisdiction that has adopted "SB1575" regulations (see above). If a builder outside an AMA and outside a jurisdiction that has adopted 1575 cannot obtain a certificate, they must notify only the first buyer of each lot of the inadequacy.

AMA: Active Management Area. There are five Active Management Areas in Arizona. Inside these areas ADWR regulates groundwater. In essence, each AMA must not withdraw more water from its aquifers than is recharged to them. How this is

accomplished takes a number of approaches. The closest AMA to our area is the Prescott AMA, which extends from Chino Valley to Dewey-Humboldt to about 10 miles west of Prescott. It includes the cities of Prescott, Prescott Valley, Chino Valley and Dewey-Humboldt.

More Info:
http://www.azwater.gov/WaterManagement_2005/Content/AMAs/default.htm

APP: Aquifer Protection Permit. Administered by ADEQ. You need to obtain an Aquifer Protection Permit, or APP, if you own or operate a facility that may discharge a pollutant either directly to an aquifer or to the land surface or the vadose zone (the area between an aquifer and the land surface) in such a manner that there is a reasonable probability that the pollutant will reach an aquifer.

More info: http://www.azdeq.gov/environ/water/permits/app.html

Appropriated: Appropriated surface water in Arizona is water that state law treats as the property of a particular user, in other words the user has a right to that surface water. The doctrine of *prior appropriation* governs how these rights are adjudicated. This means that the rights holder with the oldest claim has a right to use his entire allotment before any downstream junior rights holder has any right to use his at all. The oldest surface rights in the Verde Valley belong to some of the ditch companies, the Tribe, and SRP.

Aquifer: A geological formation capable of storing and yielding significant quantities of water. It is usually composed of sand, gravel, or permeable rock which lies upon a layer of clay or other impermeable material. This impermeable layer does not allow the water to penetrate to lower depths. An aquifer that sits on top of an impermeable layer below which there are other aquifers is sometimes called a "perched" aquifer, q.v. below.

Aquifer, Perched: An aquifer containing unconfined (unpressurized) groundwater held above a lower body of groundwater by an unsaturated zone; often a result of clay lenses in the soil strata. Think of a perched aquifer as a lake below the surface of the ground. If that lake has a side entrance or exit it is not "perched."

Aquifer, Confined: A Confined aquifer is one that does not have a natural outlet. Think of a bathtub buried beneath the ground, and full of water. These aquifers are often pressurized to some extent by the weight of the material above them, and they can lead to an "artesian" well, q.v., below.

Artesian Well: A well that flows without a pump. Artesian wells often drain confined, or pressurized aquifers, q.v., above. An artificial spring.

Assured Water Supply: The Arizona Department of Water Resources (DWR) issues certificates of Assured Water Supply to potential water users within AMAs. These certificates state that DWR believes the user will have sufficient water that is legally, practically and continuously available for a 100-year period. The supply must also not

interfere with other certificated users' water supplies. Similar to the certificate of Adequate Water Supply issued outside AMAs. Builders or developers who do not obtain the Assured determination are not allowed to build in the AMA.

Base Flow: The minimum flow of a river after a long period of no precipitation at a particular point. The base flow of the Verde River at the Clarkdale gauge (which is just upstream from Clarkdale) is about 60 cfs. Base flow at the Paulden gauge just downstream from the headwaters, is about 19 cfs. Base flows can change from natural or man-made causes. Excess pumpage from an aquifer that contributes to a river can reduce the base flow artificially. Prolonged drought can reduce it naturally.

CFS: Cubic feet per second, used as a measure of a river or stream's flow. The Verde River's base flow near its headwaters is about 16 cfs, near Clarkdale it's about 57 cfs. One cubic foot of water equals 7.48 gallons. One cfs flowing for a year will supply 724 acre-feet of water, or enough to serve about 2500 homes (6300 people) for a year.

Clean Water Act: The Clean Water Act (CWA) is the cornerstone of surface water quality protection in the United States. The Act does not deal directly with groundwater nor with water quantity issues. The statute employs a variety of regulatory and non-regulatory tools to sharply reduce direct pollutant discharges into waterways, finance municipal wastewater treatment facilities, and manage polluted runoff.

For more information: http://www.epa.gov/watertrain/cwa/

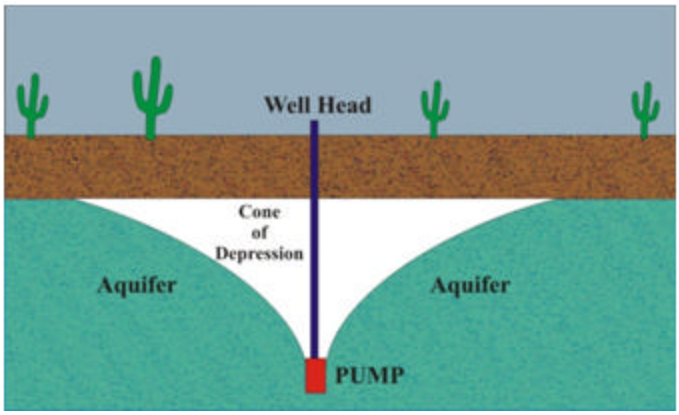
COE: US Army Corps of Engineers – responsible for issuing and administering "404" permits. (see above)

Compounds of Concern: Also known as "Microconstituents" or "Compounds of Emerging Concern," these are any of several hundred chemicals that may not be removed from wastewater by traditional methods. Since they remain in effluent, they can enter the groundwater and surface water near the points of effluent discharge, where they may be persistent or may even concentrate. They include many pharmaceuticals and other chemicals that may be harmful to humans or the environment in sufficient concentrations. Some of these may act as "endocrine disrupters" or hormones and have adverse effects for people and for wildlife exposed to them in the water. Removing these compounds is expensive and often impossible. The best way to avoid compounds of concern in wastewater is to prevent them from entering the wastewater system. Programs to encourage proper drug and hazardous waste disposal are aimed at this problem.

For more information:
http://www.wef.org/ScienceTechnologyResources/AccessWaterKnowledge/Microconstituents/index.htm

Cone of depression: A depression in the groundwater table that has the shape of an inverted cone and develops around a well from which water is being withdrawn. The slopes of the cone become increasingly steep the closer they are to the well. Its trace

(perimeter) on the land surface defines the zone of influence of a well. Also called cone of drawdown.



Direct/Indirect Potable Reuse: Potable reuse water is water that has been purified by a wastewater treatment facility and brought up to drinking water standards. If the water is returned directly to the potable water system, it is called "Direct Potable Reuse" or "DPR". If it is used to recharge an aquifer, river or lake from which potable water is then withdrawn, it is called "Indirect Potable Reuse."

Discharge: The amount of water leaving an aquifer or system by all means – drainage, consumption, evapo-transpiration, etc.

Draw down: The extent to which pumping lowers the groundwater in a well.

DWR: The Arizona Department of Water Resources. The Arizona Department of Water Resources works to secure long-term dependable water supplies for Arizona's communities. Its responsibilities are to:

- administer and enforce Arizona's groundwater code, and surface water rights laws (except those related to water quality);
- negotiate with external political entities to protect Arizona's Colorado River water supply;
- oversee the use of surface and groundwater resources under state jurisdiction; and
- represent Arizona in discussions of water rights with the federal government.

More info: http://www.azwater.gov/dwr/

Effluent: Water that has completed its trip through a wastewater treatment facility. Effluent grades from A+ to C are assigned depending upon the degree to which the water has been treated. Treated effluent can be used for various non-potable uses, as in the table below.

Ephemeral Stream: A river or stream that flows intermittently and briefly, usually due to high runoff or rapid snowmelt. These are sometimes called "storm channels." See Intermittent Stream. Dry Creek, near Sedona, is an ephemeral stream.

Evapo-transpiration: Water loss to an aquifer or system caused by uptake by plants and evaporation. Often referred to as "E-T." E-T changes with the seasons in most areas, with summer being the highest months of E-T.

Exempt Well: An "exempt well" is a well within an Active Management Area (AMA) that draws 35 gallons per minute (gpm) or less. These are generally residential wells used to supply a typical household. They are exempt from most AMA restrictions. The term "exempt well" is also commonly used outside AMAs to mean any small residential well, especially those that draw under 35 gpm.

GPM: Gallons per minute. A measurement of well output or other water flows. A typical household well pump can produce about 10 gpm. Large industrial, agricultural or municipal wells often produce more than 500 gpm.

GPCD: Gallons per capita, per day. The average number of gallons of water used each day by each person in a population. The average in the US is about 110 gallons. In Arizona it's about 125 gallons. GPCD is not figured the same by all utilities. Sometimes heavy commercial users or irrigators are omitted from the calculation. It may be more meaningful to report GPCD in specific terms, such as "GPCD-R" for purely residential uses, or "GPCD-T" for total water pumped divided by the population served, etc.

Gross Regional Product: The market value of the goods and services produced or derived from a geographic area, usually an area that is economically interdependent and related. It is similar to the Gross National Product, but on a regional scale.

Groundwater: Under Arizona State Law, water that is withdrawn from the ground by wells and other means. Groundwater falls under different laws and regulations that surface water. In general, outside an AMA groundwater is neither regulated nor appropriated.

Historically Irrigated Agricultural (HIA) Lands: Land that is or was at some point in the past irrigated to raise crops. When ADWR gives "credit" for retiring lands that were HIA, it usually assigns 3 acre-feet of credit for each acre of land retired. The assumption, therefore, is that agricultural land uses about 3 acre-feet of water per year, or enough for about 7-8 households.

Holocene Alluvium: The Holocene Alluvium is that saturated area adjacent to a river in which the river flows underground. It is generally the historic (up to 10,000 years ago) flood plain of the river as it has meandered through time. This alluvium is usually composed of gravels, rocks and sands that have at one time formed the river's bed, and which currently continue to conduct the "sub-flow" of the river. The Holocene Alluvium is important in Arizona since the General Stream Adjudication will define which areas near rivers are within that alluvium and which are, therefore, actually using river (surface) water rather than groundwater. Since surface water is subject to prior appropriation, the "sub-flow" in the alluvium may be judged to belong to the surface right holders.

Instream Flow Rights: Appropriated rights that give a landowner a right to a particular volume of flow in a river or stream that flows across or adjacent to his property.

Irrigation: Watering of plants by any method.

Intermittent Stream: A river or stream that flows seasonally, usually after prolonged snowmelt of other times of high runoff. Intermittent streams often have persistent pools of standing water and may have some sub-flow perennially. An example in the Verde Valley is Sycamore Creek.

Management Strategies: Water management options for communities or watersheds, several are listed below:

- **Status Quo**: Continue with existing water management practices.
- **Managed Planned Depletion**: Preserve existing economies for as long as feasible; allow pumping to deplete groundwater to a predefined level that must be maintained.
- **Safe Yield**: By a predetermined date, achieve and thereafter maintain a long-term balance between the annual amount of groundwater withdrawn within a groundwater basin and the annual amount of natural and artificial recharge. Safe Yield does not take into account natural discharge from springs, rivers, etc.
- **Sustainability**: Provide a reliable source of water for use within the a specified area to promote and support a viable economy and high quality of life while preserving existing flowing streams at a defined level and protecting riparian resources.
- **Integrated management**: Integrated management of water, land, and ecological resources to sustain use in manner that takes each resource into account. Clarkdale has declared Integrated Management to be its option of choice.

More Info: http://www.co.yavapai.az.us/Content.aspx?id=20562 (click on "Water Management")

Monitor Well: A well that is used to monitor the condition of the aquifer in which it sits. Monitor wells can be used to periodically (or continually) monitor the depth to the water table, water quality, groundwater flow, recharge rates, etc.

NAMWUA: The Northern Arizona Municipal Water User's Association. This is an organization of municipal water providers in Northern Arizona. Currently (3/2008) the members are Clarkdale, Cottonwood, Sedona, Prescott, Prescott Valley, Chino Valley, Dewey-Humboldt, Williams, Flagstaff, and Payson. The primary objective of NAMWUA is to work toward ensuring adequate water supplies for its member municipalities and their citizens.

For more information: http://namwua.org/index.html

Non-AMA: Not in an Active Management Area (see above), or rules and regulations that apply specifically to areas not in an AMA.

NPDES: As authorized by the Clean Water Act, the National Pollutant Discharge Elimination System (NPDES) permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States. Point sources are discrete conveyances such as pipes or man-made ditches. Individual homes that are connected to a municipal system, use a septic system, or do not have a surface discharge do not need an NPDES permit; however, industrial, municipal, and other facilities must obtain permits if their discharges go directly to surface waters. In most cases, the NPDES permit program is administered by authorized states. In Arizona, NPDES permitting is handled by ADEQ.

More info: http://cfpub.epa.gov/npdes/ ;
http://www.epa.gov/region09/water/npdes/arizona.html

Peak Flow: The highest flow the river experiences in a given time fame. Since the Clarkdale gauge was installed in 1966, the peak flow was 53,200 CFS on February 20,1993. Base flow as of this writing (2011) is around 58 CFS, making the peak flow in 1993 over 900 times the summer base flow! On that day the river at the Clarkdale gauge was more than 26 feet deep.

Perennial Stream: A river or stream that flows all year long without interruption. Examples in the Verde Valley include the Verde River and Oak Creek.

Potable Water: Pronounced as in "quotable", potable water is drinking water, and must meet the EPA's National Primary Drinking Water Regulations (NPDWRs or primary standards), which are legally enforceable standards that apply to public water systems. Primary standards protect public health by limiting the levels of contaminants in drinking water.

For more information: http://www.epa.gov/safewater/contaminants/index.html

Recharge: The amount of water added to an aquifer by all means, such as precipitation, contribution from a river, or artificial (effluent) recharge projects. In general rivers and streams represent discharge from an aquifer or drainage. The Verde River, for instance, is the discharge from the aquifers of the Verde River Basin. It contributes very little and only very locally to the Verde Valley's aquifers.

Reuse/Reclaimed Water: Reclaimed or Reuse water is water that has been "reclaimed" from the wastewater treatment process. It has been through the wastewater system and cleaned to the point that is useable for some specified uses, depending upon the treatment level (see "**Effluent**", above). If purified sufficiently, reclaimed water can be used for such things as watering parks and landscaping, dust control, or to water livestock. At some point in the future, we will probably be purifying our wastewater enough to reuse the treated water as drinking water.

Safe Yield: The management goal of most of Arizona's AMAs. Safe Yield seeks to take no more water from the basin than is recharged to that basin by natural or artificial

recharge. Safe Yield does not take into account discharge from the basin as surface water, so rivers, springs, etc. are not protected by Safe Yield management practices.

Sever and Transfer: When a surface water rights holder wishes to sell his right to a downstream user on the same river or stream, he must sever his right and transfer it to the new user. Severance and transfer of rights usually apply to situations where a current rights holder does not need his right any longer, and another user in a different part of the watercourse wants it. An example might be when an agricultural user with a right to water from the Verde River builds houses on the area he formerly irrigated and no longer needs the right. He can then sell his allocation to another party. Severances and transfers require DWR approval.

Sub-flow: Sub-flow is a term used to describe the flow of a river or stream's water that is underground. It is usually immediately adjacent to the river or stream. Sub-flow can account for a large portion of the water in a river.

Surface Water: In Arizona, water flowing on the surface of the ground and water below ground that has a direct effect and connection to water on the surface, such as adjacent to a river or spring. Surface water can be appropriated (see above) in Arizona, whereas groundwater generally cannot.

SWPPP : Storm Water Pollution Prevention Plan. This is a plan required of some construction projects to prevent silt and other pollutants from contaminating waterways adjacent to the site.

TDS: Total Dissolved Solids. These are minerals, salts, metals, cations or anions dissolved in water. This includes anything present in water other than the pure water (H_20) molecule and suspended solids. (Suspended solids are any articles/substances that are neither dissolved nor settled in the water, such as wood pulp.)

Vadose Zone: The zone of earth that lies between the surface and the water table. The unsaturated area above an aquifer.

VRBP: Verde River Basin Partnership. Federally-chartered organization founded in 2005 to assess the impact of land trades in the Verde River Basin on water supplies and management.

More information: http://www.vrbp.org/

WAC: The Yavapai County Water Advisory Committee. The committee is comprised of representatives from each incorporated municipality in Yavapai County as well as a representative from each of the three county districts, a representative from ADWR and Tribal representatives. As of June, 2007, each member of the board of Supervisors is also a member of the WAC. The mission of WAC is to conduct studies and advise the members on all water issues in the County.

More information: http://www.co.yavapai.az.us/Content.aspx?id=20562

Water Budget: An accounting of all the water that enters a system and all the water that leaves it (recharge and discharge). A water budget will help tell you whether your consumption is sustainable or not.

Watershed: That area of land whose precipitation contributes to a particular drainage, usually a river. The Verde River Watershed extends from south of Prescott Valley to north of Paulden, east to the Mogollon Rim, and south to the Salt/Verde Confluence. Since the Verde flows into the Salt, the Salt's watershed includes the entire Verde's and those other watersheds that contribute to any of the Salt's tributaries. The Colorado River's watershed includes the Salt's, Gila's, etc.

Water Rights: See "Appropriated", above. Only surface water can be appropriated in Arizona.

Water Table: The uppermost surface of an aquifer. Below the water table the soils are saturated with water. It can also usually be defined as the depth to water in a well.