

Potential Impacts to Property Values from Long-term Changes in Water Levels on the Colorado River and Its Tributaries: *A Delphi Approach*

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Produced by



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Executive Summary

Water is a major issue in the Western U.S. and especially within areas served by the Colorado River and its tributaries. Protect the Flows, a network of over 800 businesses in the seven Colorado River Basin states, sponsored this research to investigate the economic value that proximity to the Colorado River (and its tributaries) adds to private properties as well as how property values might be affected by changes in river flow. A Delphi survey was used to examine potential changes in property values at different long-term water levels in four targeted geographical areas along the Colorado River and its tributaries. In order to isolate the impact of the Colorado River on sales prices, a hypothetical property was defined and the placement of the house was varied across three different scenarios: 1) river frontage, 2) no river frontage but river view, and 3) no river frontage or river view.

Models produced by the U.S. Department of the Interior project that water flows in sections of the Colorado River system could decrease by an average twenty percent over the next fifty years. Based on the Delphi survey results, an average annual reduction in river flows of approximately 20% is estimated to decrease the sales price of riverfront properties by about 9.5%, while river view properties would see a 5.7% decrease in sales prices. To place these percentage reductions into context, the current selling price of \$574,000 for the hypothetical home in Grand County, CO, where the largest percentage reduction is estimated to occur, is projected to decrease by \$92,000. The current selling price of \$290,000 for the hypothetical home in Farmington, NM, where the smallest percentage reduction is estimated to occur, is projected to decrease by \$24,000. The impacts do vary considerably across the communities. Nevertheless, declines in value such as these across all riverfront and river view residential properties in the Colorado River system would likely result in a substantial aggregate loss.

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Introduction

The Colorado River system begins in Wyoming and touches seven states before it enters Mexico. The Department of the Interior's Bureau of Reclamation is responsible for managing the Colorado River system. Based on increased demand for water for municipal, industrial and agricultural use, hydroelectric power generation, recreation, fish and wildlife and more, the Bureau is currently considering multiple scenarios for future water levels and withdrawals. Across a range of potential scenarios, their results suggest that annual average stream flows could be reduced by approximately 20% over the next fifty years.

The presence of rivers can provide homeowners with not only scenic and privacy benefits but also recreational benefits not available to homeowners in communities without rivers. Studies suggest that projected declines in river flow of this magnitude are likely to negatively impact recreational benefits. The lower the water, the more difficult it will be for residents to launch canoes, rafts, go fishing, swimming, and enjoy other recreational activities. At some point, lower water levels could reduce the number of fish, bird and wildlife species frequently seen by homeowners along the river. With lower water levels comes an increased chance that the sights and sounds associated with living near the river are diminished.

Additionally, a wide range of studies have found that homes located near water bodies tend to have higher values than homes not located near water. A portion of this price premium reflects the characteristics of and benefits provided by a particular location. No one yet knows the extent of the potential changes reduced water levels will bring. This project is intended to help explore the potential changes in real estate values for properties located along the River if stream flow was to drop to lower levels as currently projected. A Delphi technique is employed to investigate the potential impacts, if any, to residential real estate sales prices using of a series of questionnaires delivered across multiple rounds to achieve a convergence of opinion among real estate experts.

Approach

A Delphi survey was used to examine potential changes in property values at different long-term water levels in four targeted areas along the Colorado River and its tributaries. The Delphi technique is a survey method for gathering data from experts when the issue in question, such as the proposed lower water levels, has never been experienced before. The Delphi technique was originally developed by the RAND Corporation in the 1950s to assess the potential effects of military strategies when historic data on possible reactions by opposing countries were not available. Since then, the process has been widely applied to assess the potential effects of various government policies and practices. For this project, real estate experts are asked to consider how property values might be affected if water levels decrease in nearby rivers.

The Delphi process aims to achieve consensus across a panel of experts through the use of questionnaires delivered over multiple rounds of surveys. In a Delphi study, the results from the first survey - such as the effects of varying water levels on real estate values - are summarized and sent back to the experts in a new questionnaire. The experts can reinforce, change, or modify their previous responses based on the responses and reasoning from the rest of the group. To prevent bias, the survey is operated anonymously. The identities of the panelists are not disclosed to the other participants and survey responses are not directly linked to any specific individual in subsequent rounds.

For this effort, four panels, comprising a total of thirty one real estate experts including experienced sales agents, property appraisers, and property tax assessors, were identified in 1) Sedona, Arizona, 2) Aspen and Grand County, Colorado, and 3) Farmington, New Mexico. A total of two survey rounds were implemented in early 2013. The hypothetical property was defined as a single-family home of 2,000 square feet of living space with three bedrooms, two bathrooms, and a two car garage on ¼ acre of land. The house and garage are 15 years old and have been reasonably well maintained. Panelists were asked to consider the impacts on the property value of such a house at three different locations: 1) river frontage, 2) no river frontage but river view, and 3) no river frontage or river view. Give these three locations, each expert was asked to examine potential property sales value changes given projected future stream flows based upon several scenarios concerning demand and supply for water along the Colorado River system.

Findings

Based upon the hypothetical property description of a fifteen year old single-family home of 2,000 square feet of living space with three bedrooms, two bathrooms, and a two car garage which has been reasonably well maintained located ¼ acre of land, each expert was asked to estimate the current selling price in their respective locations. In order to isolate the impact of the Colorado River on sales prices, placement of the hypothetical house was varied across three different scenarios: 1) river frontage, 2) no river frontage but river view, and 3) no river frontage or river view.

Table 1. Current estimated selling price of a hypothetical property

Location	Aspen, CO	Farmington, NM	Grand County, CO	Sedona, AZ
River frontage	\$ 3,262,500	\$ 290,000	\$ 574,286	\$ 563,571
River view only	\$ 2,687,500	\$ 256,875	\$ 304,375	\$ 472,286
No river frontage or view	\$ 2,150,000	\$ 231,349	\$ 245,375	\$ 422,429

N: Aspen=8, Farmington=8, Grand Cty=8, and Sedona=7

In general, selling prices are much higher in the Aspen, CO area relative to the three other locations (Table 1). The riverfront home described in the study sells for more than five and one-half times the price of the same home in the next highest region, Grand County. The average price for the home with river frontage is \$3.2 million dollars in Aspen, \$290,000 in Farmington, \$574,000 in Grand County, and \$563,000 in Sedona.¹

The price premium associated with a river location that provides either frontage or a view is the greatest in Colorado, relative to the other two locations (Table 2). In Grand County, homes that offer a river view are 24% higher than homes without a view and homes that offer river frontage are 134% higher than homes that do not offer either frontage or a view in the same general location. Price premiums in Aspen are 52% and 25% for river frontage and river view, respectively, relative to a home without either characteristic. The Farmington location presents the smallest price premium at 25% and 11% for river frontage and river view, respectively.

¹ Experts were asked to estimate the current selling price for the hypothetical home in their respective locations during round one of the survey effort. In the second round, the average current selling price by region, estimated from responses collected during round one, was shared with the panel of experts. The experts were then given the opportunity to revise their original estimates based upon their collective panel average. Only three experts from two regions (Farmington and Sedona) elected to adjust their estimates. At the completion of Round 1, average estimated current selling prices in the Farmington region were \$286,875 (river frontage), \$255,625 (river view), and \$234,474 (no frontage or view) and in the Sedona area were \$562,857 (river frontage), \$463,000 (river view) and \$397,429 (no frontage or view). Table 1 above reflects the final estimates following round two of the survey effort. Comparing the round one and round two estimates indicates that panelists made only slight adjustments to their estimates and achieved a quick consensus around an average current selling price within their location.

Table 2. Average estimated price premium associated with a riverfront or river view location

Location	Aspen, CO	Farmington, NM	Grand County, CO	Sedona, AZ
River frontage	52%	25%	134%	33%
River view	25%	11%	24%	12%

N: Aspen=8, Farmington=8, Grand Cty=8, and Sedona=7

Hydrologic models produced by the Department of the Interior were used to estimate projected long-term declines in river flow. We incorporated river flow projections produced by these models for two stream gauge locations, the Colorado River at Glenwood, Colorado and the San Juan River at Bluff, Utah. For each location we used six different river flow projection scenarios, covering a range of anticipated water supply and demand patterns. Averaging these scenarios allowed us to capture a “middle of the road” estimate of decline in river flow from 2012 to 2060. Details of the estimation method are provided in the Appendix.

In characterizing future river changes we applied the river flow decline estimates to the four locations of interest for this study. For each location we used the projection estimate for the nearest of the two stream gauge locations where the hydrologic models were run. For Grand County and Aspen, CO we used the Glenwood estimate of a 20% decline in annual river flow. For Farmington, NM and Sedona, AZ we used the Bluff estimate of a 19% decline.

In the case of a home that does not offer either river frontage or a river view, the vast majority of experts (84% overall) anticipate no changes to sales price (Table 3). For homes that offer no river frontage but a river view, the results are mixed. Just over one-half of the experts (52% overall) expect a decrease in sales price while just under half (48% overall) expect that sales prices will be unaffected. A slightly larger majority (58% overall) expect a decrease in sales prices among homes that offer river frontage. Another 39% of the experts expect prices for those particular homes to stay the same even given a reduction in river flow.

Table 3. Expected effect on property sales values given an average year-round reduction in river flows over the long term

Location		Aspen, CO	Farmington, NM	Grand County, CO	Sedona, AZ	Overall
River Front	Increase	0%	12%	0%	0%	3%
	Decrease	38%	75%	75%	43%	58%
	Stay the same	63%	13%	25%	57%	39%
River View	Increase	0%	0%	0%	0%	0%
	Decrease	38%	62%	62%	43%	52%
	Stay the same	62%	38%	38%	57%	48%
Neither	Increase	0%	0%	0%	14%	3%
	Decrease	0%	12%	38%	0%	13%
	Stay the same	100%	88%	62%	86%	84%

N: Aspen=8, Farmington=8, Grand Cty=8, and Sedona=7

It is interesting to note that in both the Farmington, NM area and the Grand County area, the majority of experts (62%) expect a decrease in sales prices for homes offering a water view only. Similarly, 75% of the same experts expect a decrease in sales prices for homes offering river frontage. In Aspen, CO, responses suggest that prices are a bit less impacted by river flows, relative to the other locations.

Across all four regions, the experts estimate an average expected reduction of 9.5%, 5.7%, and 2.3% in sales prices for homes with river frontage, river view only, and neither river frontage nor view, respectively (Table 4). These estimates include respondents who expect no impacts (0% decrease) and those who expect a negative impact on property values. It is estimated that a home sold in Grand County, CO will experience the largest percentage reduction in sales price. Echoing the findings from Table 3, experts anticipate little to no price reduction in the sales price of homes without river frontage or views, particularly in the Aspen, CO area.²

*Table 4. Estimated percentage **decrease** in sales prices given an average year-round reduction in river flows over the long term*

Location	Aspen, CO	Farmington, NM	Grand County, CO	Sedona, AZ	Overall
River frontage	5.0%	8.1%	16.0%	8.6%	9.5%
River view	3.1%	3.1%	10.8%	5.7%	5.7%
River (none)	0.0%	0.6%	5.6%	0.0%	1.7 %

Note: These results includes people who expect no change (0% decrease) and those who expect negative impacts
 N: Aspen=8, Farmington=8, Grand Cty=8, and Sedona=7

To place the reduction in sales price within context relative to the total hypothetical home sales price, Table 5 reflects the estimated reduction in total sales price in dollars. In other words, the 5% estimated decrease in the sales price of \$3.2 million for the hypothetical home with river frontage in Aspen, CO equates to \$163,000. An estimated reduction in price is influenced by both the estimated sales price of the home, which is reflective of its location relative to the river as well the state of residence, and the associated estimated price decrease. As a result, the impact to prices varies widely across the four different geographical regions. In Grand County, CO, where the largest percentage reduction is estimated to occur, the sales price of \$574,000 is

² Experts were asked to estimate the expected effect on property sales values given an average year-round reduction in river flows in their respective locations during round one of the survey effort. In the second round, the average percentage change in price by region, estimated from responses collected from round one, was shared with the panel of experts. The experts were then given the opportunity to revise their original estimates based upon their collective panel average. Only one expert elected to adjust their estimated percent reduction in sales price. No experts made an adjustment to the direction of impact. In other words, each of the four panels quickly found consensus around the type of impact (increase, decrease, or no change) as well as the level of impact. Tables 3 and 4 reflect the final estimates following round two of the survey effort.

projected to decrease by \$92,000. The smallest influence in sales price estimated for a river front home is in Farmington, NM. An 8.1% reduction in price for a home sales price of \$290,000 is projected to decrease by \$24,000.

Table 5. Impact to sales price given the estimated price reduction for an average year-round reduction in river flows

	Aspen	Farmington	Grand County	Sedona
River frontage	\$ 163,125	\$ 23,614	\$ 91,886	\$ 48,306
River view	\$ 83,984	\$ 8,027	\$ 32,720	\$ 26,988
River (none)	\$ -	\$ 1,446	\$ 13,802	\$ -

Many experts offered comments that explain or that provide background for their responses to the questions investigated in the four tables above. These comments are provided in the Appendix Table A1.

In the second round of the Delphi survey, the influence of seasonal variations of stream flow is explored. Stream flow varies greatly over the course of a single year. And, peak flows vary from location to location. In the Aspen, Farmington and Grand County areas, peak flows are typically highest in late spring and early summer while peak flows in the Sedona area typically peak earlier in the year during late winter and early spring. The predicted decreases in Table 6 are based upon the average expected flows. In some years, the reduction will be greater than those anticipated; in other years the reduction will be less. In other words, the reductions shown in the table eventually would become “the new normal”.

Table 6. Predicted seasonal stream flow changes: 2012-2060

	Aspen, CO ¹	Farmington, NM ²	Grand County, CO ¹	Sedona, AZ ²
Fall	-14%	-7%	-14%	-7%
Winter	-3%	-2%	-3%	-2%
Spring	1%	-15%	1%	-15%
Summer	-46%	-32%	-46%	-32%

¹ Use projections from Colorado River near Glenwood Springs, Colorado

² Use projections from San Juan River near Bluff, Utah

The projected long-term reductions in river flows vary considerably across the seasons. On average, the largest percentage drops are expected to occur in the summer. While the average annual decrease in water flow is approximately 20%, the models predict that river flows in the summer will decline between 32% and 46%. Long-term reductions of this magnitude can be

expected to result in changes to streamside vegetation. For example, there will likely be a noticeable reduction in the number of large cottonwood trees.

On average, the number of home sales is slightly higher in the summer, when stream flow reductions are anticipated to be the greatest (Tables 6 and 7). Spring rather than summer is peak season for home sales in Sedona, AZ. And, home sales are the highest in both summer and fall in the Aspen, CO area. In each location, home sales appear to be the slowest during the winter months, corresponding to the same period when stream flow reductions are anticipated to be the smallest.

Table 7. Approximate percentage of annual residential sales that occur during each of the seasons

Location	Aspen, CO	Farmington, NM	Grand County, CO	Sedona, AZ	Overall
Fall	29%	18%	24%	24%	24%
Winter	19%	13%	18%	19%	18%
Spring	22%	33%	20%	32%	26%
Summer	29%	36%	38%	24%	32%

N: Aspen=8, Farmington=6, Grand Cty=8, and Sedona=7

The next two tables explore the expected impact to sales prices for homes that provide river frontage in light of the seasonal estimates for stream flow along the Colorado River. Despite the fact that the seasonal variations in stream flows are anticipated to have a different impact on sales prices relative to a smaller year-round reduction, there is little evidence in the results to suggest that the influence would be different.

Similar to the results seen earlier in Table 3, the majority (57% on average) of experts estimate that the sales price for the hypothetical home with river frontage would decrease.

Table 8. Expected effect on river front sales prices given the predicted seasonal reductions

	Aspen, CO	Farmington, NM	Grand County, CO	Sedona, AZ	Overall
Increase	0%	0%	0%	0%	0%
Decrease	38%	50%	75%	67%	57%
Stay the same	63%	50%	25%	33%	43%

N: Aspen=8, Farmington=6, Grand Cty=8, and Sedona=6

And, similar to Table 4, experts estimate an average reduction of 9.3% in the sales price for the home with river frontage. Again, these estimates include respondents who expect no impacts (0% decrease) and those who expect a negative impact on property values.

Table 9. Estimated percentage decrease in river front sales prices given the predicted seasonal reductions

Aspen, CO	Farmington, NM	Grand County, CO	Sedona, AZ	Overall
4.4%	6.7%	16.0%	9.5%	9.3 %

N: Aspen=8, Farmington=6, Grand Cty=8, and Sedona=6

Note: These results includes people who expect no change (0% decrease) and those who expect negative impacts

Forty six percent of experts do agree that the seasonal reductions in stream flow would have a different impact on property values, in general, relative to a smaller year-round reduction in river flow (Table 10). Those who responded ‘yes’ suggest that individuals who are already accustomed to lower levels in the fall and winter would become accustomed to consistently lower flows throughout the year rather than dramatic swings in river levels that might occur from season to season. They also suggest that the lower levels presented in the seasonal scenarios (Table 6) in the summer would influence the level of outdoor recreational activity, such as fishing and boating, as well as the fact that the summer season one of the busier seasons for home sales. Additional comments are provided in Appendix Table A3.

Table 10. Different impact on property values given the seasonal reductions versus a smaller year-round reduction in river flow

	Aspen, CO	Farmington, NM	Grand County, CO	Sedona, AZ	Overall
Yes	38%	50%	63%	33%	46%
No	63%	50%	38%	67%	54%
Total	100%	100%	100%	100%	100%

N: Aspen=8, Farmington=6, Grand Cty=8, and Sedona=6

Discussion

Water is a major issue in the Western U.S. and especially within areas served by the Colorado River and its tributaries. This project is intended to help explain the potential changes in residential real estate sales values for properties located along the rivers if water levels were to decrease as currently projected by the U.S. Department of the Interior, Bureau of Reclamation. No one yet knows the extent of impacts, if any, to residential real estate if stream flow is reduced in response to rising demands for water. Therefore, a Delphi technique was selected because of its design as a process which aims to achieve a convergence of opinion across a panel of experts in the field.

The percent of respondents who believe that the selling price of the described property will be impacted by a change in river flow varies by community. In Farmington and Grand County, 75% of the respondents expect that the value of riverfront properties would decrease as a result of reduced river flows. In Aspen and Sedona, roughly 40% of the respondents expect that riverfront property values would decrease. In each community, roughly the same percentages expect properties with river views to be adversely impacted.

Overall, an approximate 20% reduction in river flows would be expected to decrease the sales price of riverfront properties by about 9.5%, while river view properties would see a 5.7% decrease in sales prices. These estimates include respondents who expect no impacts (0% decrease) and those who expect a negative impact on property values. The impacts would vary considerably across the communities. According to the survey respondents, the largest impacts would occur in Grand County, followed by Sedona, Farmington and Aspen.

To place the reduction in sales price within context relative to the total hypothetical home sales price, the estimated reduction in total sales price in dollars is calculated. In other words, the 5% estimated decrease in the sales price of \$3.2 million for the hypothetical home with river frontage in Aspen, CO equates to \$163,000. The impact to prices varies widely across the four different geographical regions. In Grand County, CO, where the largest percentage reduction is estimated to occur, the sales price of \$574,000 is projected to decrease by \$92,000. The smallest influence in sales price estimated for a river front home is in Farmington, NM. An 8.1% reduction in price for a home sales price of \$290,000 is projected to decrease by \$24,000. Declines in value such as these across all riverfront and river view residential properties in the Colorado River system would likely result in a substantial aggregate loss.

Stream flow varies greatly over the course of a single year. In the second round of the Delphi survey, the influence of seasonal variations of stream flow was explored. Despite the fact that the seasonal variations in stream flows are anticipated to have a different impact on sales prices relative to a smaller year-round reduction, there is little evidence in the results to suggest that the

influence would be markedly different. Some experts do agree that the seasonal reductions in stream flow would have a different impact on property values relative to a smaller year-round reduction in river flow, but it appears to be related to the seasonality in home sales.

Reduced sales prices for real estate eventually would translate into reduced property tax assessments for the affected properties. The marginal reduction in assessed values for the riverfront and river view properties would likely have an effect on local tax revenues. The impacts would vary depending on the total reduction in the property value and the composition of the entire taxable property base for a community, specifically the proportion of riverfront and river view property relative to the proportion of all other properties. No attempt was made to estimate the total amount of reduced property values associated with a reduction in river flows or the potential marginal reduction in property tax revenues. Such estimates were beyond the scope of this study. Nevertheless, it is reasonable to assume that in cases where the impact is substantial, local governments would be faced with the choice of replacing the lost revenue with small increases in the property tax rate for *all* property owners or reducing services in response to reduced revenue. Regardless, it is important to recognize that the flow reductions and associated impacts on property values are projected to take place over a long time horizon. The effects on tax revenues and local governments' responses, while potentially substantial over the long term, may be largely imperceptible from year to year.

From an economic standpoint, the long-term reduction in river flows ultimately could have a larger effect on the overall economic well-being of river communities if the result is to make the communities less aesthetically appealing. Research over the past fifteen years suggests that natural amenities play a role in the economic development of rural communities. In a 1999 study on this topic, researchers in the Food and Rural Economics Division of the U.S. Department of Agriculture found that population and employment growth in rural areas between 1976 and 1996 were highly related to natural amenities.³ That study was based on an index of natural amenities constructed from several measures including climate, topography and water area. Although it does not specifically address the role of river flows, the implication is that rural places with attractive natural resource amenities, such as healthy rivers, enjoyed higher rates of growth.

Deller et al. (2001) advanced the literature on the role of natural amenities in economic growth by categorizing amenities into five types and examining their role in relation to changes in population, employment and per capita income.⁴ All five types of natural amenity including climate, developed recreational infrastructure, land, water and winter were found to be positively associated with at least one measure of growth. Henderson (2005) grouped natural amenities into

³ McGranahan, David. 1999. Natural Amenities Drive Rural Population Change. Food and Rural Economics Division, Economic Research Service, U.S. Department of Agriculture. Agricultural Economic Report No. 781.

⁴ Deller, Steven C., Tsung-Hsiu (Sue) Tsai, David W. Marcouiller, and Donald B.K. English. 2001. "The Role of Amenities and Quality of Life in Rural Economic Growth", *American Journal of Agricultural Economics*, 83(2): p 352-365.

two broad categories (landscape including water, and climate) and explored their relationship to changes in different sectors of the economy.⁵ Climate amenities were found to be related only to retail employment growth while landscape amenities were positively related to employment growth in all non-manufacturing sectors. Although mindful of the potential dangers of promoting the growth of low-paying service sector jobs, Henderson suggests that natural amenities are central to the rural quality of life characteristics that “are increasingly appealing to high-skilled, high-income populations and may be a driver in high-skilled industry and high-wage job growth”.

Recent work by McGranahan et al. (2011) appears to support the important role that natural amenities play in attracting a high-skilled population.⁶ McGranahan argues that some creative class workers may choose to forego higher earnings opportunities in urban areas for improved quality of life offered by rural settings with high natural amenities. A critical mass of skilled, entrepreneurial professionals then leads to business creation and economic growth. Henderson tested this hypothesis by modeling the role of creative class workers and entrepreneurial context on measure of growth (new business startups, number of businesses, job growth) at three levels of natural amenities. The results found that counties with higher levels of creative workers and local entrepreneurial activity had greater gains in establishments and jobs, *but primarily in places with high levels of natural amenities*. McGranahan concludes that there are two growth tracks for rural areas: 1) high amenity places that attract creative, high-skilled people to support local entrepreneurial growth, and 2) low amenity places that must rely on outside employers (smokestack chasing) seeking low-cost labor and proximity to urban areas.

Research over the past 10-15 years has found clear evidence that rural places with high quality natural amenities have enjoyed higher rates of population and economic growth. The mechanism behind that growth appears to be the ability to attract (or retain) educated, highly-skill people drawn to rural places with a higher quality of life. While no studies appear to target river flows specifically, the clear implication is that any actions that detract from the stock of natural amenities or degrades the quality of local amenities is likely to limit future economic growth.⁷ Toward that end, it would seem important to protect the river flows in the Colorado River system. The existence and the perception of the river as a healthy, high quality natural amenity can only be regarded as a positive attribute supporting future economic growth of river communities.

⁵ Henderson, John R. 2005. “Natural Amenities and Rural Job Growth: A Sector Analysis”. Center for the Study of Rural America, Federal Reserve Bank of Kansas City, Kansas City, Missouri.

⁶ McGranahan, David A., Timothy R. Wojan* and Dayton M. Lambert. 2011. “The rural growth trifecta: outdoor amenities, creative class and entrepreneurial context”, *Journal of Economic Geography* 11, pp. 529–557

⁷ For some communities in the study area, the river is not the only natural amenity. For example, Aspen benefits from the built-up recreational facilities and Sedona is noted for its striking red rock landscape.

Appendix

- Estimation of 49-year river flow declines for each of the two hydrologic models
- Round One Letter and Survey
- Round Two Letter and Survey
- Comments provided to explain reasoning behind responses
- Comments provided by real estate experts who responded “yes” when asked if the influence of the river on property values in their location is unique to the area.
- Comments provided to explain why differences are estimated to be different between seasonal reductions versus a smaller year-round reduction in river flow

Estimation of 49-year river flow declines for each of the two hydrologic models
(1. Colorado at Glenwood, CO. 2. San Juan at Bluff, UT)

A. Estimate flows and percent changes in flows (separately for each month)

For each of 12 months:

For each of 6 projection scenarios:

- a. Take median of simulation runs for each year (“typical” river flow in selected month)
- b. Estimate linear trend in median flow over 49 years: $\text{flow} = a \cdot \text{year} + b$
- c. Estimate percent change in flow over 49 year period = $(\text{flow}(2060) - \text{flow}(2012)) / \text{flow}(2012)$

Percent change in flow 2012 to 2060 = mean(percent change for 6 projection scenarios)

Flow in 2012 = mean(flow(2012) for 6 projection scenarios)

Flow in 2060 = (Flow in 2012) * (Percent change in flow 2012 to 2060)

B. Estimate percent change in flow by season

For each of 4 seasons:

Seasonal Flow in 2012 = sum(flow in 2012 for 4 months in season)

Seasonal Flow in 2060 = sum(flow in 2060 for 4 months in season)

Percent change in season = $(\text{seasonal flow in 2060} - \text{seasonal flow in 2012}) / \text{seasonal flow in 2012}$

C. Estimate annual percent change = mean(percent change for all 12 months)

Annual Flow in 2012 = sum(flow in 2012 for all months)

Annual Flow in 2060 = sum(flow in 2060 for all months)

Percent change in year = $(\text{annual flow in 2060} - \text{annual flow in 2012}) / (\text{annual flow in 2012})$

Round One Letter and Survey: Sedona, AZ example

The influence of Oak Creek on real estate prices: Sedona, AZ

Purpose

Thank you for your participation.

Water is a major issue in the Western U.S. and especially within areas served by the Colorado River and its tributaries such as Oak Creek. This project is intended to help explain the potential changes in real estate values for properties located along Oak Creek if it eventually was to drop to lower water levels as currently projected by the U.S. Department of the Interior, Bureau of Reclamation.

This project has been commissioned by Protect the Flows, a non-profit organization made up of businesses interested in maintaining healthy water levels in the Colorado River and its tributaries. We appreciate your input, and will provide you with a monetary stipend when the last of three surveys are complete.

Study Method

You are participating in a Delphi survey to examine potential changes in property values at different long-term water levels in Oak Creek. The Delphi technique is a survey method for gathering data from experts when the issue in question, such as the proposed lower water levels, has never been experienced before. The Delphi technique was originally developed by the RAND Corporation in the 1950s to assess the potential effects of military strategies when historic data on possible reactions by opposing countries were not available. Since then, the process has been widely applied to assess the potential effects of various government policies and practices. For this project, real estate experts such as you are being asked to consider how property values might be affected if water levels decrease in nearby rivers.

The Delphi process aims to achieve consensus across a panel of experts through the use of questionnaires delivered over multiple rounds of surveys. We anticipate three surveys, with the first being the longest (approximately 15 to 20 minutes). In a Delphi study, the results from the first survey - such as the effects of varying water levels on real estate values - are summarized and sent back to the experts in a new questionnaire. The experts can reinforce, change, or modify their previous responses based on the responses and reasoning from the rest of the group. To prevent bias, the survey is operated anonymously. The identities of the panelists will not be disclosed to the other participants and survey responses will not be directly linked to any specific individual.

For this effort, four Delphi panels are being assembled. Your panel will examine potential property value changes in the area of Sedona, Arizona. Other panels are focused on locations in Colorado and New Mexico. Approximately thirty one other real estate experts including experienced sales agents, property appraisers, and property tax assessors are also participating. After you have completed all three surveys, the agreed stipend will be mailed to you through the Sedona/Verde Valley Association of Realtors. The

survey is being operated by our contractor, Southwick Associates. If you have any questions about the survey, please contact Lisa Parks (Lisa@SouthwickAssociates.com).

PAINTING THE PICTURE

The presence of rivers can provide homeowners with recreation, scenic and privacy benefits not available to homeowners in communities without rivers.

A wide range of studies have found that homes located near water bodies tend to have higher values than homes not located near water. The increase in property values typically is not as great for homes located further from the water bodies. This may or may not also be true for your community.

The Colorado River system begins in Wyoming and touches seven states before it enters Mexico. The Department of the Interior’s Bureau of Reclamation is responsible for managing the Colorado River system. Based on increased demand for water for municipal, industrial and agricultural use, hydroelectric power generation, recreation, fish and wildlife and more, the Bureau is currently considering multiple scenarios for future water levels and withdrawals.

The lower the water, the more difficult it will be for residents to launch canoes, rafts, go fishing, swimming, and enjoy other recreational activities. At some point, lower water levels could reduce the number of fish, bird and wildlife species frequently seen by homeowners along the river. With lower water levels comes an increased chance that the sights and sounds associated with living near the river are diminished. No one yet knows the extent of these potential changes. Therefore, we have a few questions for you to help people begin to understand the potential impacts, if any, to residential real estate from lower water levels in Oak Creek.

For the purposes of this survey, please consider a single-family home of 2,000 square feet of living space with three bedrooms, two bathrooms, and a two car garage on 1/4 acre of land. The house and garage are 15 years old and have been reasonably well maintained.

1. What is the current approximate selling price for such a house in the Sedona area? *

With frontage on the river \$	<input type="text"/>
Without river frontage but with a view of the river \$	<input type="text"/>
Without river frontage and no river view \$	<input type="text"/>

The Bureau of Reclamation has conducted studies to project future stream flows based on several scenarios concerning demand and supply for water in the Colorado River system including its tributaries such as Oak Creek. Across a range of potential scenarios, the results suggest that annual average stream flows in Oak Creek could be reduced by approximately 20% over the next fifty years. The exact effect of lower flows on the height of the river in any specific location depends on the shape of the river bed. The drop in water level in places where the river is wide may not be as noticeable as in places where the river

bed is steep and narrow given the same reduction in flow. Regardless, studies suggest that these projected declines in river flow are likely to have a negative impact on recreational opportunities.

The image below shows a segment of Oak Creek in the Sedona area that was taken in May 2012.



2. In your opinion, given the potential change in water level described above, would the selling price increase, decrease or stay the same for a house in the Sedona area similar to the one described earlier with river frontage? *

- Increase Decrease Stay the same
-

How much would you think the typical sales price would change, in percentage terms? *

-- Please Select -- ▾

3. In your opinion, would the selling price increase, decrease or stay the same for a house in the Sedona area similar to the one described earlier without river frontage but with a view of the river? *

- Increase Decrease Stay the same
-

How much would you think the typical sales price would change, in percentage terms? *

-- Please Select -- ▾

4. In your opinion, would the selling price increase, decrease or stay the same for a house in the Sedona area similar to the one described earlier without river frontage and no view of the river? *

- Increase Decrease Stay the same
-

How much would you think the typical sales price would change, in percentage terms? *

-- Please Select -- ▾

5. Briefly explain the reasoning behind your responses to the preceding questions. How does the presence of the river affect (or not) the selling price of houses in the Sedona area? How do changes in river flow affect (or not) the sales price? *

6. Tell us if you think that the influence of the river on property values in Sedona is unique to this area. Would reductions in river flow have a different effect on sales prices in the Sedona region than in other communities along the ? *

Yes No

Please explain how changes in river flow would affect property values differently here than in other river communities: *

Thank you for taking our survey. Your response is very important to this study. Your responses will be combined with those of other people who are participating in this survey and we will summarize the results. In early January, we will provide you with the results and ask you a few, short follow-up questions. The process will be repeated in a brief, final round to address any needed clarifications in the results. After the completion of the third and final round, you will receive the agreed-upon stipend. To ensure that you receive your stipend, please provide the following information. This is the name and address to which the stipend check will be mailed:

7. Please provide the following information: *

First Name

Last Name

Street Address

City

State

Zip

Email Address

Phone Number

Round Two Introductory Letter and Survey: Sedona, AZ example

Welcome to Round Two of our survey exploring potential impacts on property values that might result from projected long-term changes in water levels in Oak Creek and the Verde River.

In the first round, we asked you to provide some baseline information about the current selling prices for a developed parcel of real estate at different locations relative to Oak Creek and the Verde River. We asked you to consider a single-family home of 2,000 square feet of living space with three bedrooms, two bathrooms, and a two car garage on 1/4 acre of land. The house and garage are 15 years old and have been reasonably well-maintained.

In this round of the survey, we will provide you with some summary results from the first round. If you choose, you will be able to revise your earlier estimates from Round 1. We will then present you with some additional information from the U.S. Department of the Interior river flow projections that was not included in Round 1. You will then be asked about impacts on property values in light of this additional information

Approximately eight people in each of four locations are participating in this survey. The communities are located on the Colorado River or one of its tributaries and include:

- Aspen, CO
- Farmington, NM
- Grand County, CO
- Sedona, AZ

Round 1 results: estimated average sales prices

Below are the average estimated selling prices as reported by the survey respondents for the described property with river frontage, a river view, and with neither frontage nor a view.

Current approximate selling price of the described property

	Area			
	Aspen	Farmington	Grand Cty	Sedona
River frontage	\$ 3,262,500	\$ 286,875	\$ 574,286	\$ 562,857
River view	\$ 2,687,500	\$ 255,625	\$ 304,375	\$ 463,000
River (none)	\$ 2,150,000	\$ 234,474	\$ 245,375	\$ 397,429

Based on the average selling prices reported in Round 1 of the survey, we estimated the price premium that is accorded to a riverfront or river view location compared to a similar property that has neither. These are shown in the table below.

Average estimated price premium associated with a riverfront or river view location

	Area			
	Aspen	Farmington	Grand Cty	Sedona
River frontage	52%	22%	134%	42%
River view	25%	9%	24%	16%

Having had the opportunity to view the average responses from other people in the same location as you, would you like to make any changes or adjustments to the average selling prices that you provided in Round 1?

Yes No

[If YES, then show the following question from Round 1]

. What is the current approximate selling price for such a house in the Sedona area? *

With frontage on the river \$

Without river frontage but with a view of the river \$

Without river frontage and no river view \$

Round 1 results: impacts of reduced river flows

The percent of respondents who believe that the selling price of the described property will be impacted by a change in river flow varies by community. In Farmington and Grand County, 75% of the respondents expect that the value of riverfront properties would decrease as a result of reduced river flows. In Aspen and Sedona, roughly 40% of the respondents expect that riverfront property values would decrease. In each community, roughly the same percentage expects both riverfront and river view properties to be adversely impacted.

Percent of respondents who report that a 20% reduction in river flow will have the following effects on property values:

Location	Effect on Sales Price	Area				Overall
		Aspen	Farmington	Grand Cty	Sedona	
River Front	Increase	0%	12%	0%	0%	3%
	Decrease	38%	75%	75%	43%	58%
	Stay the same	62%	13%	25%	57%	39%
River View	Increase	0%	0%	0%	0%	0%
	Decrease	38%	62%	62%	43%	52%
	Stay the same	62%	38%	38%	57%	48%
River (none)	Increase	0%	0%	0%	14%	3%
	Decrease	0%	12%	38%	0%	13%
	Stay the same	100%	88%	62%	86%	84%

The table below shows the average extent to which property values might be adversely affected by reduced river flows as reported by the survey respondents. These estimates include respondents who expect no impacts (0% decrease) and those who expect a negative impact on property values. Overall, an approximate 20% reduction in river flows would be expected to decrease the sales price of riverfront properties by about 10%, while river view properties would see a 6% decrease in sales prices. The impacts would vary considerably across the communities. According to the survey respondents, the largest impacts would occur in Grand County and Sedona, followed by Farmington and Aspen.

Estimated percentage DECREASE in sales prices associated with an approximate 20% reduction in river flows over the long term.

	Area				Overall
	Aspen	Farmington	Grand Cty	Sedona	
River frontage	5%	8%	16%	11%	10%
River view	3%	3%	11%	7%	6%
River (none)	0%	1%	6%	0%	2%

Having had the opportunity to view the average expected impact on prices as reported by other people in the same location as you, would you like to make any changes or adjustments to the information that you provided in Round 1?

YES NO

2. In your opinion, given the potential change in water level described above, would the selling price increase, decrease or stay the same for a house in the Sedona area similar to the one described earlier with creek or river frontage? *

- Increase Decrease Stay the same

How much would you think the typical sales price would change, in percentage terms? *

-- Please Select --

3. In your opinion, would the selling price increase, decrease or stay the same for a house in the Sedona area similar to the one described earlier without river frontage but with a view of the creek or river? *

- Increase Decrease Stay the same

How much would you think the typical sales price would change, in percentage terms? *

-- Please Select --

Seasonal impacts on water flows

In Round 1, we used projections by the Department of the Interior to estimate the expected long-term reductions in annual average stream flows. However, stream flow varies greatly over the course of any single year. In Sedona, flows are typically highest in the Spring months, and lowest in the Summer and Fall. Similarly, the projected long-term reductions in river flows vary considerably across the seasons. On average, the largest percentage drops are expected to occur in the summer. While the average annual decrease in water flow is approximately 20%, the models predict that river flows in the summer will decline between 32% and 46%.

Predicted seasonal streamflow changes, 2012 to 2060

	Area			
	Aspen ¹	Farmington ²	Grand Cty ¹	Sedona ²
Fall	-14%	-7%	-14%	-7%
Winter	-3%	-2%	-3%	-2%
Spring	1%	-15%	1%	-15%
Summer	-46%	-32%	-46%	-32%

¹Colorado River near Glenwood Springs, Colorado

²San Juan River near Bluff, Utah

The predicted decreases in the table above are based on the *average* expected flows. In some years, the reduction will be greater than those shown in the table; in other years the reduction will be less. In other words, the reductions shown in the table eventually would become “the new normal”. Long-term reductions of this magnitude can be expected to result in changes to streamside vegetation. For example, there will likely be a noticeable reduction in the number of large cottonwood trees.

In Round 1, approximately one-half of the respondents expected little or no change in property values from an average annual decline in river flow of approximately 20%. In their reasoning, most of those respondents suggested that a 20% decline in river flow would not have a noticeable impact on the rivers’ amenity values. On a seasonal basis, however, the models project that summertime flows will be reduced considerably more than the annual average but with only modest reductions in the remaining months. We would like to know how you think these seasonal impacts might affect property values.

Consider the same house that was the subject of the first survey (a single-family home of 2,000 square feet of living space with three bedrooms, two bathrooms, and a two car garage on 1/4 acre of land that is 15 years old and well-maintained).

Please indicate the approximate percentage of annual residential sales that occur in your community during each of the following seasons:

- _____ % Fall (September, October, November)
- _____ % Winter (December, January, February)
- _____ % Spring (March, April, May)
- _____ % Summer (June, July, August)

In your opinion, given the projected seasonal reductions shown in the table above, would the selling price increase, decrease or stay the same for a house in the Sedona area with creek or river frontage?

Increase Decrease Stay the same

[If Increase or Decrease then show..]

How much would you think the typical sales price would change, in percentage terms? *

In your opinion, given the projected seasonal reductions shown in the table above, would the selling price increase, decrease or stay the same for a house in the Sedona area similar to the one described above without river frontage but with a view of the creek or river?

Increase Decrease Stay the same

[If Increase or Decrease then show..]

How much would you think the typical sales price would change, in percentage terms? *

Do you think that the seasonal reductions in river flow shown above would have a different impact on property values than a smaller year-round reduction in river flow?

Yes No

Please explain how the impacts would be different.

Table A 1. Comments provided to explain reasoning behind responses

	<p>Briefly explain the reasoning behind your responses to the preceding questions How does the presence of the river affect (or not) the selling price of houses in the Aspen area? How do changes in river flow affect (or not) the sales price?</p>
Aspen	<ul style="list-style-type: none"> - Recreational uses don't impact the value in Aspen because the flows and access don't typically allow heavy use. - Aspen real estate is already restricted by local government. There are only so many houses with river frontage. When you have a scarce commodity, like river frontage, being chased by wealthy people, the price naturally increases. The upper Roaring Fork River typically has ample water flow because of the melting snowpack. I don't think that it is reasonable to assume that the flow in this part of the valley will be affected by your theory. - River frontage is one of numerous factors that drive value including proximity to Aspen, views of the surrounding mountains, and allowable floor area that can be built to name a few. - River frontage is highly valued but a change of 20% in stream flow over 50 years does not seem that significant. Hard to assess the impact on sales prices from changes in flow as we have that now with periodic changes in snowpack from year to year and there is no impact on value that we can discern. - Buyers are willing to pay a premium for river frontage. However, I don't think a 20% decline in river flow over a 50 year period is a 0.40% decline annually I don't think market will notice. - I believe the people on the river will feel the effects more. If you are seeing the River the effect would be less. - River front properties in are already scarce, creating the supply in demand that help increase values, with river front being in demand, any negative impact on the river would reasonably have a negative impact on homes with river frontage. - 20% will not be very perceptible to most Aspenites.
Farmington	<ul style="list-style-type: none"> - If you are buying riverfront property it affects the price. If not on the river I don't believe it would affect the price of the property. - The river water is used in the Farmington area for recreation, irrigation of crops and serene beauty. It also produces great animal and bird habitat areas. The reduction of this water would greatly change all of the above and would have some consequence on the price of homes in our area. - Having the river level drop on a riverfront home, would make it less desirable. Having a river view even if the level of the river has dropped would not change the value of the home unless the view changed drastically. - Access and view amenities for the property with river frontage. View amenity for the property with only a view. No amenity for the property without either. - If the river flows do not decrease to the point where fish and wildlife habitats are affected the real estate values will decrease slightly based on the fact that the general sights and sounds of a healthy river attract the real estate owner/buyer. If the river appears unhealthy the Buyer sees it as a liability. - With the small acreage of the hypothetical home, no recreational value is likely on any of the homes but the view and ambience would not change significantly with flow changes. - River Frontage adds value to the property - Houses bought at higher prices partly attributed to river frontage or river views would obviously decrease in value with the lack of that selling benefit.

Grand Cty	<ul style="list-style-type: none"> - The only riverfront properties in the Kremmling area are in Blue Valley Acres, and the riverfront properties are on top of a bluff. The depth of water wouldn't have as much of a value impact as if the property were at river height. - If the banks of the river became very steep or inaccessible, then I believe that would affect the value of river-front property. For properties with a river view the value would be decreased, but not as much. For properties with no view or frontage I don't think the values would be affected. - Sales prices are always higher in a recreational area where fishing, boating, etc. prevail. Water is a precious resource and limited land available for river frontage purchase - or views..... decreased availability equals higher valued prices. - Values of properties with river frontage would be more sensitive to the change water levels than properties that do not have the frontage. My reasoning is that the river is an integral contribution of value to homes located on the river. and not so much for properties with just a view or no view. I believe that there would be an economic impact from reduced flows to the community. - Houses on the river would drop because of the beauty, and because the decreased water flow would result in less fishing. Houses near or far from the river would drop more because of the lessening of demand for fishing. The house on the river would retain more value because the house would still be on a river - and in Colorado overall, that is rare. - The entire market will be effected, even the non -river ft. homes -- as the market overall depreciates. River Ft. is the most difficult commodity to achieve with a residential home. Most river ft. is in Public Lands, larger ranches, etc... Mtn Views as an example are everywhere....river ft. and river view parcels are considerably more rare. Losing the 'strength' of the frontage or view logically decreases the value. - Water drives value more than any other aspect in Grand County. loss of flow will decrease values for every property - There are too many variables to state categorically 'yes'. Primary industry in this area is tourism based on outdoor activities so health of river is vital. To what degree recreation affects general economy, which affects property values, is unknown.
Sedona	<ul style="list-style-type: none"> - Sedona buyers traditionally move here because of our beautiful red rocks and the creek is just a plus. Buyers looking for property fronting on the creek are usually interested in Oak Creek Canyon and are buying a vacation home to get out of the heat and a drop in water levels would make a creek front property less desirable. Prices of creek view properties may be impacted less if the change in water level is not as noticeable to the naked eye. - Sedona is an area of very mixed styles and price-range homes built over the last 80 years or so. Homes built along the creek or on a hill above the creek with views are a mix of luxury homes and old cottages. The old cottages tend to command a price that reflects the value of the lot, which is the water access or view, rather than the house itself. When you compare similar (size, lot, amenities) properties - one on the creek against one in Sedona but not near the water, the one on the creek has always commanded a 20-60% premium for the creek access, depending on the type of home. Similarly one with creek views will also command a premium similar to a home with excellent red rock views. Comparing otherwise alike properties, one with excellent red rock or creek views can bring in 10 - 30% more than one with only good or minimal views. Direct water access has the highest premium. Sedona is hot, people want to get in the water or sit by it for the cooling effects of evaporation. If the water level drops by 20%, many properties would find themselves on a small ditch of barely moving water and not on a babbling creek. Properties that were near but not directly on would lose all benefits of being by the creek and values would go down. Many properties with views of the water would lose that if the water level dropped at all from where it is now, as the water tends to be very low almost all the time.

- Because being on the river is very attractive and soothing. River=Life+trees. People will pay a premium to be on the river. River flow is still there even if it is less, no effect on price.
- There is not much rec activity for much of Oak Creek in regard to the example referenced above. As long as there is adequate water flow even if it is diminished the green areas along the creek side will still have animal life and pleasant green views. Any green zone in the Sedona area will be prized and have value because there is so little of it. As long as there are water and green areas they will hold value. Now if there is a drastic reduction or even dry creek beds and the greenery disappears then there will surely be a noticeable decrease in value. (I am using Oak Creek for the Sedona area; The Verde River is in the Cottonwood area but would also be affected the same way.)
- Due to the limited nature of properties with views of the creek and/or frontage on the creek, a reduction in flow would not necessarily greatly diminish the properties values as long as there still was running water.
- It is not just Oak Creek...it is everything that is associated ...quiet, babbling brook, fishing, wildlife. Without these items value would be less. EG. There are 50 yr. old mobile homes located on the creek that sell for 10 or 20 times their value if they were not on the creek they would be tear downs.
- Sales price in Sedona is not directly associated with Creek use, view or access so much. It is more dependent on Red Rock Views than anything else.

Table A 2. Comments provided by real estate experts who responded “yes” when asked if the influence of the river on property values in their location is unique to the area.

Area	Please explain how changes in river flow would affect property values differently here than in other river communities:
Aspen	<ul style="list-style-type: none"> – More rec use further down valley. – I think that the farther you get from Aspen and the four ski areas, the greater influence river frontage has on overall value. – Aspen's economy is not dependent upon irrigation, many others are.
Farmington	<ul style="list-style-type: none"> – There would be less access to the river and all the enjoyments it offers.
Grand Cty	<ul style="list-style-type: none"> – River front properties in other areas of the county are truly riverfront, at high water mark, and would have a greater impact. – Local ranchers would be effected by a decrease in water flow as they would not have enough water to irrigate their pastures and therefore have less hay for their livestock and hence a less value for the working ranch. – Closer to Winter Park the HIGHER the price increases and decreases would be felt. – Every area is unique, but this section of the river is very close to the town and easily accessible and viewed. It's very difficult to say area by area, but I feel the close proximity to Kremmling and the public’s ability to visit/see the river should be considered to a greater extent. – Depends on river use. Eastern portion of county is more developed than western. west portion is primarily ag uses, river flow/water rights will determine amount and quality of irrigated lands
Sedona	<ul style="list-style-type: none"> – Oak Creek has the designation of a Wild and Scenic Waterway and that alone affects any property along its banks or within sight. Changes that would lead to the loss of that designation, such as reduced water flow, would be severely damaging to property values. Not many communities have such a designated waterway so that is why I believe Sedona is somewhat different than other places on the water. Oak Creek is a treasure providing our small town with a central heart. It is the focus of community activities, tourism, and wildlife habitat as well as providing our drinking water. However, any community that is located on a waterway and uses that waterway as a focal point for community activity, tourism, wildlife, and their drinking water will be impacted by a reduction in water flow. – In Sedona the amount of land on the creek is extremely limited and is mostly for aesthetic beauty and perhaps fishing. In areas where the creek is used for irrigation, farm activities, and recreational usage, in places neighboring Sedona such as Page Springs and Cornville, I can see the diminished water flow having a greater effect. – The creek runs in a canyon and has all the amenities associated with that as mentioned above. Much different ambience than just flat land that is beside a river or creek. – It will have more of effect on prices in the lower basin along the Verde than it will in Sedona where the Views of our beautiful red rock formations are more important.

Table A 3. Comments provided to explain why differences are estimated to be different between seasonal reductions versus a smaller year-round reduction in river flow

Area	Explanation
Aspen	<ul style="list-style-type: none"> – It seems logical that a small reduction, although year round, we be easier to adjust too and have less impact on value. The larger seasonal impact would be more dramatic and therefore have more impact on values. – summer flow is probably more important to buyers than other times of the year – Summer is Aspen's peak season; losing half of the river flow then is more significant than a 20% average loss.
Farmington	<ul style="list-style-type: none"> – consistent flows would not impact 'time of year' sales as substantially as a periodic 'dry river bed' – I believe the buyer or potential buyer of river front/river view property expects to see a 'Healthy River'. That term is relative but if a seasonal flow begins to affect that image the property values will suffer. The more radical seasonal swings will cause areas of the river bed to look dry and unhealthy. – Since summer is the high selling time for real estate, if the river flow was noticeably reduced it would have a high impact on the selling price.
Grand Cty	<ul style="list-style-type: none"> – Summer season would suffer the most, followed by spring. Locals expect low flows in fall, and in winter the water level has minimal impact. – The large difference, especially is summer would be easily evident. Also, that is the largest season for fishing and rafting which are huge near Kremmling. – The largest percentage is stream flow reduction in the table occurs in the summer. Summer is when the river amenity carries the highest utility to a homeowner with river front property. Therefore it is my belief that the largest or most significant reduction occurring during the season that produces the highest utility for the river front property owner would generate the highest impact. – the recreational usage will decline significantly because of reduced fish populations and riparian habitat – The summer seasonal impact being so much greater, almost 50%, would be so much more visually noticeable in the summer when the majority of people are out/on the rivers. Winter, it's more expected to see lower flows and the % is so much less.
Sedona	<ul style="list-style-type: none"> – Because a lot of people choose spring and summer to enjoy the river that represent a lot of swimmers and fishermen. If the flow diminish the activities would be seriously diminished and the refreshing feeling provided by the large sycamore and cottonwood would progressively disappear. – To reduce of the flow of the creek 32% in the summer time when people are most enjoying the usage and sound of that waterway is more dramatic than averaging out the reductions to be about a 15% year round reduction.