

A large graphic of water splashing with many bubbles, set against a background of a red and blue curved band that sweeps across the page.

FRESNO STATE

California Water Institute
**The Capitalized Aesthetic Value
of Stormwater Retention Basins
on House Prices in Fresno and
Clovis, California**

A Project White Paper



Month Year

The Capitalized Aesthetic Value of Stormwater Retention Basins on House Prices in Fresno and Clovis, California

A Project White Paper

Prepared by:

Craig School of Business

Andres Jauregui, associate professor of Real Estate and director of the Gazarian Real Estate Center

Jacquelin Curry, assistant professor, Gazarian Real Estate Center

Qin Fan, associate professor, Department of Economics

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Research Team



Andres Jauregui
TITLE

Andres Jauregui graduated with a bachelor's degree in International Economics from the International University of the Americas in San Jose, Costa Rica in 1999. He obtained an M.Sc. in Economics and Ph.D. in Applied Economics from Auburn University, in Auburn, Alabama, in 2006. His dissertation essays were in the areas of real estate, environmental, and urban economics.

Jauregui is currently an Associate Professor of Real Estate in the Department of Finance and Business Law in the Craig School of Business at Fresno State. Besides his teaching and research responsibilities, Jauregui is also Director of the Gazarian Real Estate Center, which promotes the advancement of real estate education and research in the Central Valley. He has also been on the Board of Directors of the Community Housing Council and the Kings River Conservancy, and currently serves on the Board of Directors of the U.S. Green Building Council Central California Chapter.

Jauregui conducts high-quality research in the areas of real estate economics and finance. He has published papers in the Journal of Real Estate Finance and Economics, Housing Policy Debate, Journal of Regional Science, Journal of Housing Research, and Journal of Real Estate Research. I have a profound interest in conducting research on the linkages between real estate and environmental issues, particularly related to water.



Jacquelin Curry
TITLE

Jacquelin Curry is an assistant professor at California State University, Fresno. She earned a bachelor's of science degree in business administration with an option in real estate and land economics from Fresno State. She also earned a Juris Doctor from San Joaquin College of Law in Clovis, California.

Dr. Curry's intellectual contributions and professional activities focus in the areas of finance, real estate valuation, real estate law and ethics, and effectiveness of business communication instruction. She currently teaches real estate appraisal, real estate law, business law, and business communication. Her professional activities focus in real estate and include practicing as a Realtor; she also has a California Real Estate Brokers license. She supports programs that focus in helping under represented populations attain and retain homeownership through education and support.

Dr. Curry has worked in the real estate industry since 2004 in various positions from project and customer service roles at a new homebuilder firm to acquisition manager of an investment firm. She is a board member of the Gazarian Real Estate Center at Fresno State, as well as an academic advisor on certain projects within the MBA program at the Craig School of business and the construction management department in the Lyles College of Engineering.



Qin Fan
TITLE

Dr. Qin Fan is an Associate Professor of Economics in Craig School of Business at California State University, Fresno. She received her Ph.D. from the Pennsylvania State University in 2013. Dr. Fan's primary research and teaching interest is Environmental Economics with a focus on climate change and natural disasters. Water resources and water pollution are important aspects of her research areas. Dr. Fan's research focuses on the linkage between human behavior and environmental system.

Dr. Fan has published numerous peer reviewed journal articles in top field journals including topics on water amenity, water use, floods, their local and regional economic impacts, and housing market, and labor market feedback. Dr. Fan has also presented in many national and international conferences in the field of resource and environmental economics, regional science, climate change and natural disasters. Dr. Fan enjoys interdisciplinary research that bridges economics, natural science, and engineering. Through leading several research projects funded by the governments, Dr. Fan collaborated with researchers across disciplines to examine climate change impacts and adaptation including drought and water scarcity. Through the community outreach office, Dr. Fan involved in several economic development and water related projects in California's Central Valley and she also provided consultation services for local authorities and financial institutions. Dr. Fan integrates her research into teaching materials and increases student engagement in active learning using applicable research and case studies. One of her honors students and research advisees presented their research work on water use and economic growth and the student received Outstanding Oral Presentation Award at the Annual Central California Research Symposium and this work was later published as a student co-authored peer reviewed journal article.

Problem Statement

The main goal of this research project is to increase our understanding of the potential capitalization effects of stormwater basins on urban residential house prices. The existing literature provides limited information on the impact of basin features and designs on house prices, as this information is scarce and particularly difficult to collect. In close collaboration with the Fresno Metropolitan Flood Control District (FMFCD), we consider the house price impact of various aesthetic and design features for the more than 150 stormwater basins in Fresno and Clovis, California.

Technical Background

The existing literature has extensively documented the community benefits and costs provided by stormwater basins. Benefits considered include controlled flood risk and improved water quality, yet stormwater ponds may create habitats that may lead to unsafe and unhealthy outcomes (for example, rats and mosquitoes).

The literature focusing on the basins' housing market capitalization effects is, surprisingly, quite limited and presents mixed results. Sohn et al. (2020) suggest positive amenity value of stormwater retention basins as well-maintained basins provide scenic beauty and nature exploration. Using a sample of housing transactions from Houston, Texas, they find that multifunctional retention pond fair positive capitalization effects on house prices relative to detention pond. Further, conversion from a detention pond to a retention pond reverses this impact.

Irwin et al. (2017), however, provide evidence of negative capitalization effects in Baltimore County, Maryland. They find that properties directly adjacent to a stormwater retention basin may result in 13% to 14% decrease in the mean house price. Further, basin age increases the house price discount to 17% for properties adjacent to a basin at least 7 years old.

More recently, Jauregui, Fan and Curry (2021), find that proximity to a stormwater retention basin in Fresno and Clovis, California, has a non-linear negative effect on house prices. Their findings indicate that houses located within the first 100 feet of a stormwater retention basin sell for 4.66% less than properties located at 400 feet or more, while properties located between 100 and 200 feet away from a basin sell at a discount of 4.84% relative to the control group. Further, homebuyers are willing to pay price premiums for proximity to a pond that is 50% or less excavated, but as time passes and construction is completed, ponds no longer represent an amenity.

Our current research expands on Jauregui et al. (2021)'s empirical modeling and results. Besides considering each basin's excavation percentage, we can distinguish basins by their purpose and aesthetic characteristics. Basins in Fresno and Clovis are designed as either residential or non-residential

basins. Each basin, at the same time, is designated as a recharge basin, recreation basin, dual basin, or stormwater only basin. Recharge basins collect stormwater and further replenish the groundwater supply. According to the FMFCD, recharge basins are “connected to irrigation canals so that they can receive water during the summer months for groundwater recharge” (personal communication with FMFCD, 2022). Recreation basins are also used for “public open spaces, playing fields, and other organized and unorganized recreation” (FMFCD, 2016). Dual basins are used for groundwater management and recharge recreational purposes. Stormwater only basins collect stormwater but are not connected to an irrigation canal and therefore do not receive water during the summer for the recharge program (personal communication with FMFCD, 2022).

According to the FMFCD, residential basins eventually have 75% of the basin acreage landscaped, while non-residential basins eventually have the top 33% of the basin site landscaped. Currently, not all residential basins are landscaped as landscaping projects have been halted if non-contaminated reclaimed water is not available for irrigation (personal communication with FMFCD, 2022).

Table 1 presents a breakdown of the different basins by design and landscaping. Close to 20% of the residential basins have any landscaping, and most of the non-residential basins are not landscaped. With respect to basin designation, Table 2 shows that more than 75% of the recreation basins are landscaped and the majority of the dual, recharge and stormwater only basins are not landscaped.

Table 1. Basins by design and landscaping

Row Labels	Residential	Non-Residential
Not landscaped	81.91%	92.86%
Landscaped	18.09%	7.14%
Total	100.00%	100.00%

Table 2. Basins by designation and landscaping

Row Labels	Dual	Recharge	Recreation	Storm Water Only
Not landscaped	68.00%	90.00%	23.81%	62.50%
Landscaped	32.00%	10.00%	76.19%	37.50%
Total	100.00%	100.00%	100.00%	100.00%

Scientific Approach

The hedonic price model (Rosen, 1974) is a well-known and extensively used economic theoretical framework that is used to gauge the value of non-market characteristics on house prices. In equilibrium, house prices collapse information from the property and its surroundings, including features such as proximity to schools, parks, and multiple sources of water, including stormwater retention basins. Further, the real estate literature argues that house prices are contemporaneously correlated to the

time it takes to sell the property, so we are also interested in the impact of proximity to stormwater retention basins on days on the market (DOM). Our final empirical specification takes the following form:

$$P_i = DOM_i\theta_1 + H_i\alpha_1 + N_i\alpha_2 + \epsilon_1$$

$$DOM_i = P_i\gamma_1 + H_i\beta_1 + N_i\beta_2 + \epsilon_2$$

where P_i is a vector of housing prices, H_i is an $n \times k_1$ matrix of housing characteristics, N_i is an $n \times k_2$ matrix of neighborhood characteristics, DOM_i is a vector of days on the market, $\alpha_k=1,2$, $\beta_k=1,2$, θ_1 , and γ_1 are parameters to be estimated, and ϵ_i is assumed to be a vector of i.i.d. errors. The housing characteristic variables include house size, house age, number of bathrooms and bedrooms, and whether the house includes a chimney, a pool and/or solar panels. We also control for the type of financing used to purchase the house (cash, conventional loan, FHA loan, or VA loan). The neighborhood characteristics include proximity to the nearest park and our variable of interest, proximity to the nearest stormwater retention basin. Proximity to the stormwater retention basins is further divided by their purpose and landscaping. We will consider 1) proximity to residential versus non-residential basins, 2) proximity to landscaped versus not landscaped basins, and 3) proximity to recreation, recharge, dual, and stormwater only basins, as well as other possible distance combinations between basin design, basin designation, landscaping, and excavation percentage.

Anticipated Outcomes

We expect to find sensible results that can be used for policy purposes. Previous research in Fresno and Clovis finds that proximity to stormwater basins negatively capitalize on house prices within 200 feet from the property, yet this depends on whether the basin has been fully excavated or not (Jauregui et al., 2021). We expect to find that landscaped basins, specially landscaped parks that serve multiple recreational and functional purposes, have a positive capitalizing effect on house prices. This information is currently crucial for the Fresno Metropolitan Flood Control District as landscaping projects have been halted in the last few years because of various technical reasons (i.e., water shortages). Providing valuable information to the FMFCD that asserts the potential positive impact of landscaping on house prices would encourage them to continue landscaping and maintaining the basins.

Target Audience

Our results are relevant for homebuyers, policymakers, and particularly, flood control agencies.

List of References

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2703 E Barstow Ave, MS JC133 • Fresno, Ca 93740
559.278.7001 • www.californiawater.org