

Water Resources Research Center

College of Agriculture and Life Sciences, The University of Arizona

Valuing Mexican Effluent in Southern Arizona

Terry Sprouse, Water Resources Research Center, UA

George Frisvold, Agricultural & Resource Economics, UA

Amy McCoy, Ph.D. candidate, UA

Kimberly Bourne, M.S. candidate, UA

SOUTHEAST ARIZONA CITIZENS' FORUM

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Santa Cruz County Board of Supervisors Room, Nogales, Arizona

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What is the Value of Mexican Effluent to Southern Arizona?

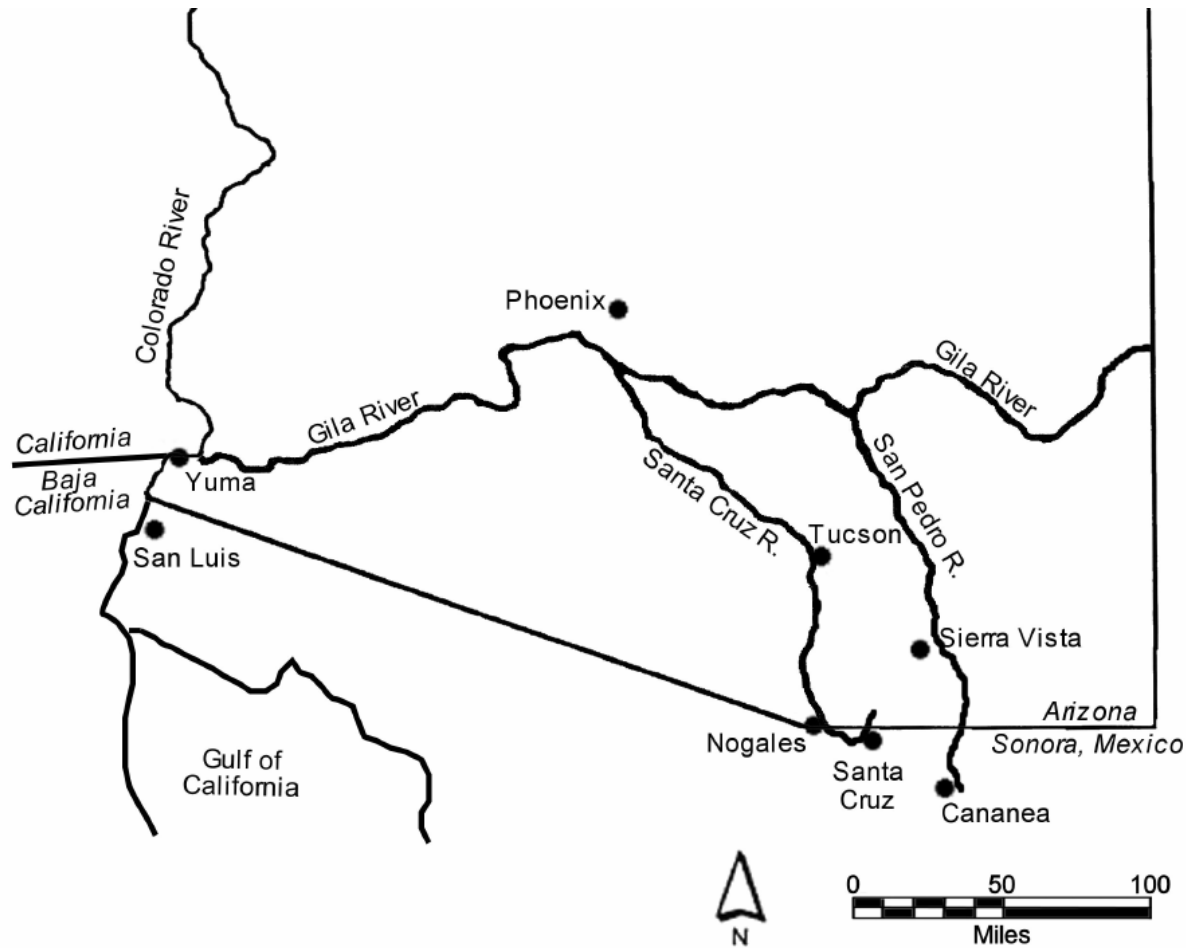
Components of Study:

- Agriculture
- Property values
- Tourism
- Intrinsic values – riparian habitat for endangered species, biodiversity, and habitat; removal of contaminants from water

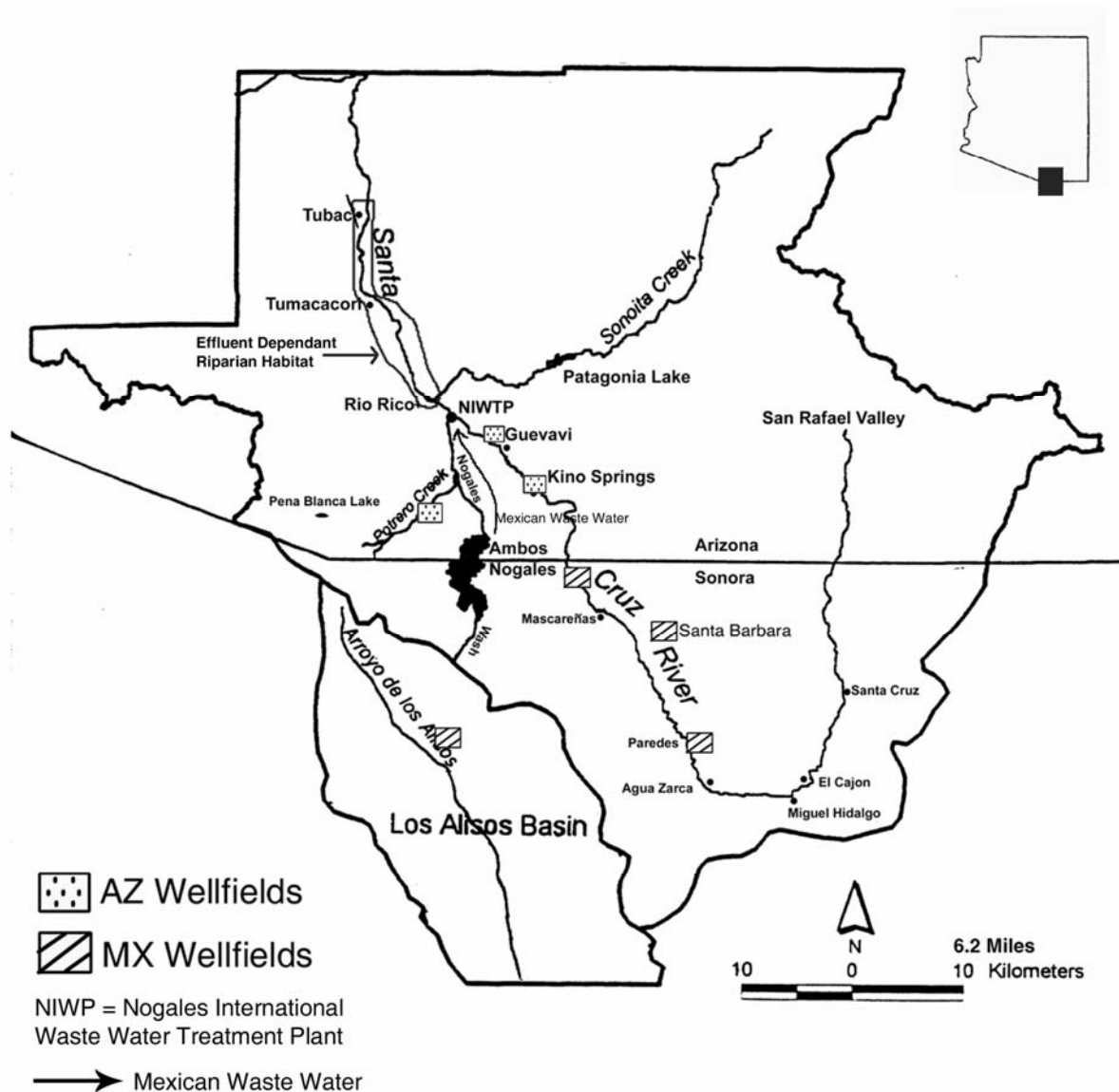


Figure 1

Arizona-Sonora Major Transboundary Rivers



Upper Santa Cruz River



Key Issues

- **Effluent generated in Mexico is valuable to southern Arizona**
- **Morehouse, et.al. “achieving safe yield would be virtually impossible without Mexican effluent”**
- **Mexico could decide to use the effluent within its boundaries**

NIWTP discharge



Flow into the NIWTP: 1998-2005

Average flow into NIWTP (1998-2005)

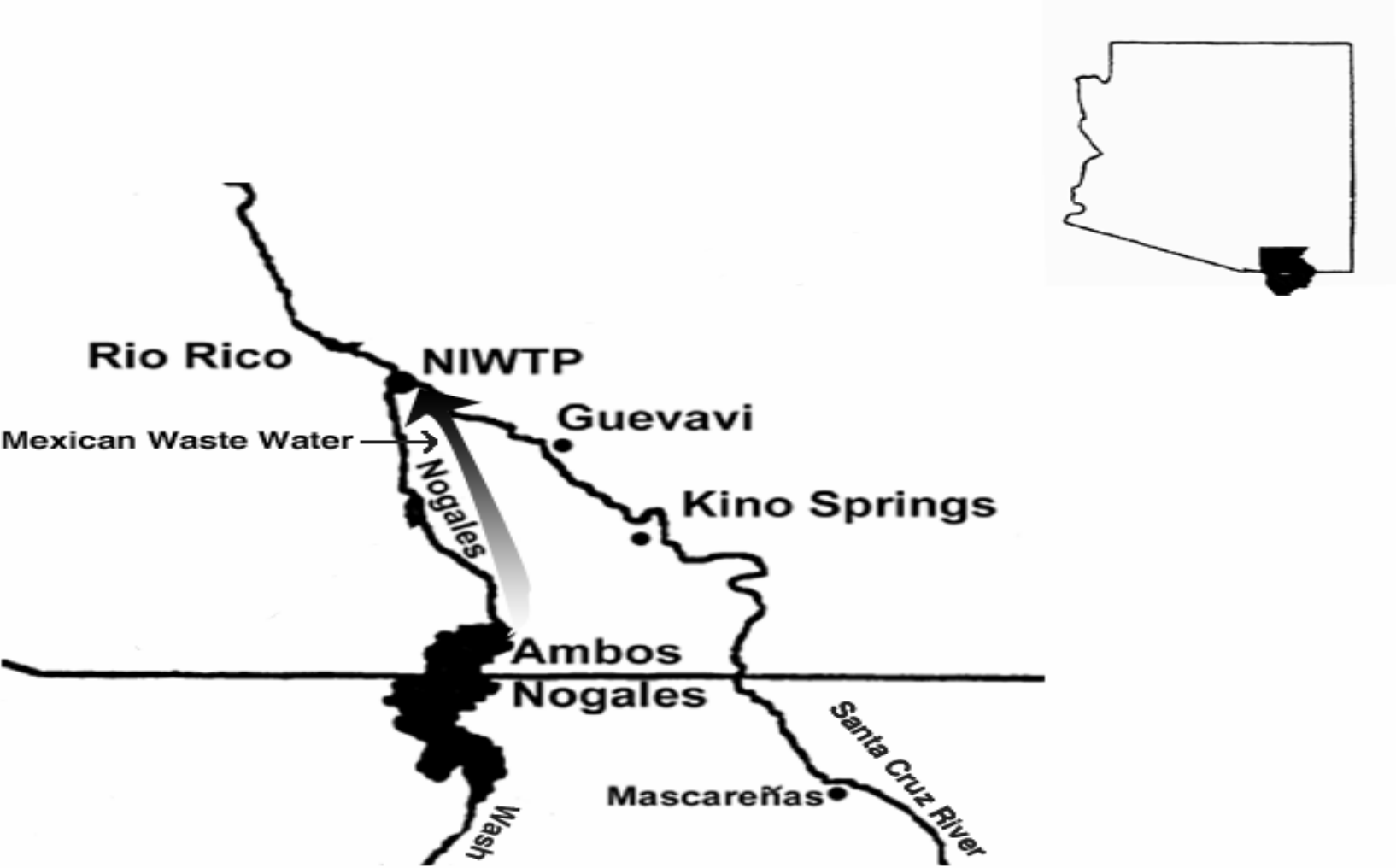
Nogales, AZ 4.9 mgd 33%

Nogales, Son 9.9 mgd 67%

Aeration ponds at treatment plant



Mexican Wastewater Path



NIWTP = Nogales International
Waste Water Treatment Plant

Objectives of Research

To quantify the impacts of effluent by examining:

- Contribution of nature-based tourism to local economy
- Benefits of riparian ecological processes
- Value of effluent to local agriculture
- Impact of proximity to the riparian area on property value



Nature-based Tourism Expenditures in Santa Cruz County

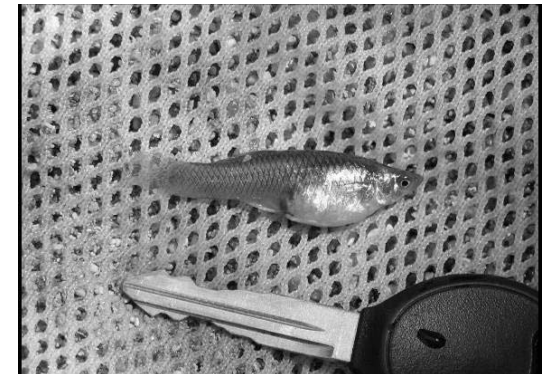
Surveys quantify tourism expenditures related to:

- Birding
- Horseback riding and hiking on the Anza Trail
- Tumacácori National Historical Park (NHP)
- Sonoita Creek State Natural Area
- Travel distances
- Rooming & restaurant expenditures



Riparian Values and Ecosystem Services

- Provides services such as flood control, erosion mitigation, aquifer recharge, and filtering for pollutants washing downstream
- Home to over 568 species of plants, insects, birds, reptiles, and mammals
- Provides habitat for Federally registered endangered species - including the jaguar, the Gila topminnow, and the Southwestern Willow Flycatcher.

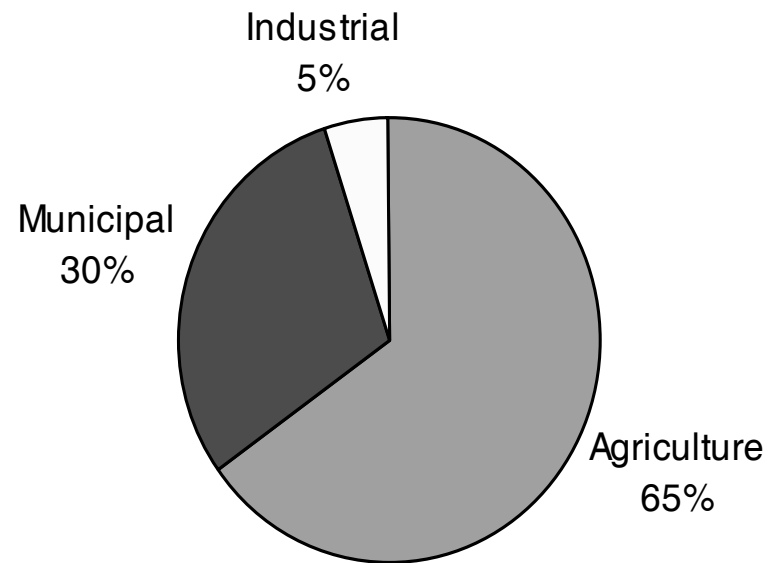


Value of Effluent to Agriculture

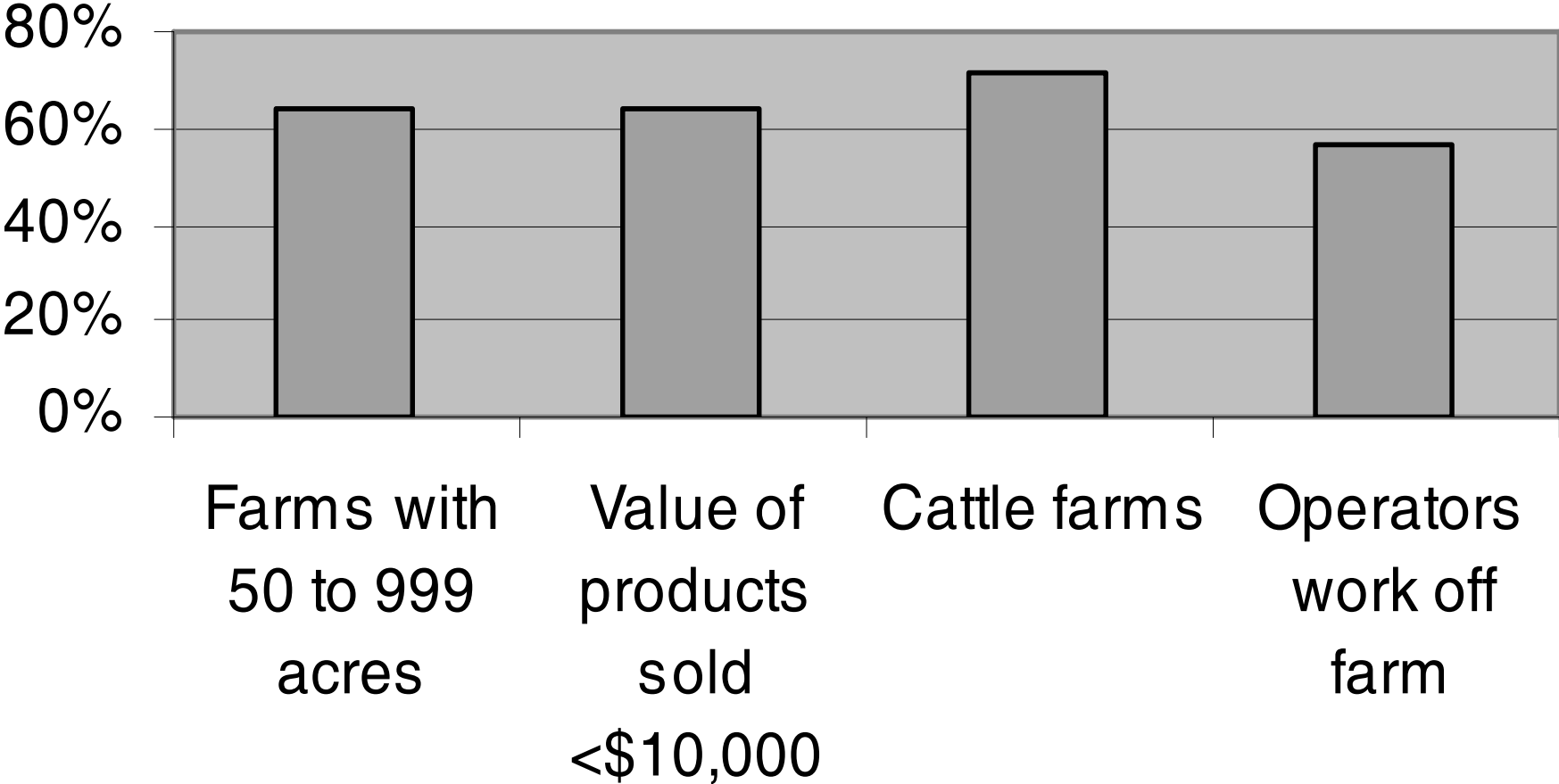
- River flows and groundwater support family-owned agricultural operations that contribute to local economy
- Study will examine water usage rates and farm locations from Arizona Dept. of Water Resources
- Develop figures to calculate the relationship of effluent flows, depth to water and pumping cost



Water Use by Sector in the Santa Cruz AMA – North of the NIWTP



Study Area Farm Statistics USDA



Proximity of riparian area to property values



Sales Price and Structural Characteristic Data

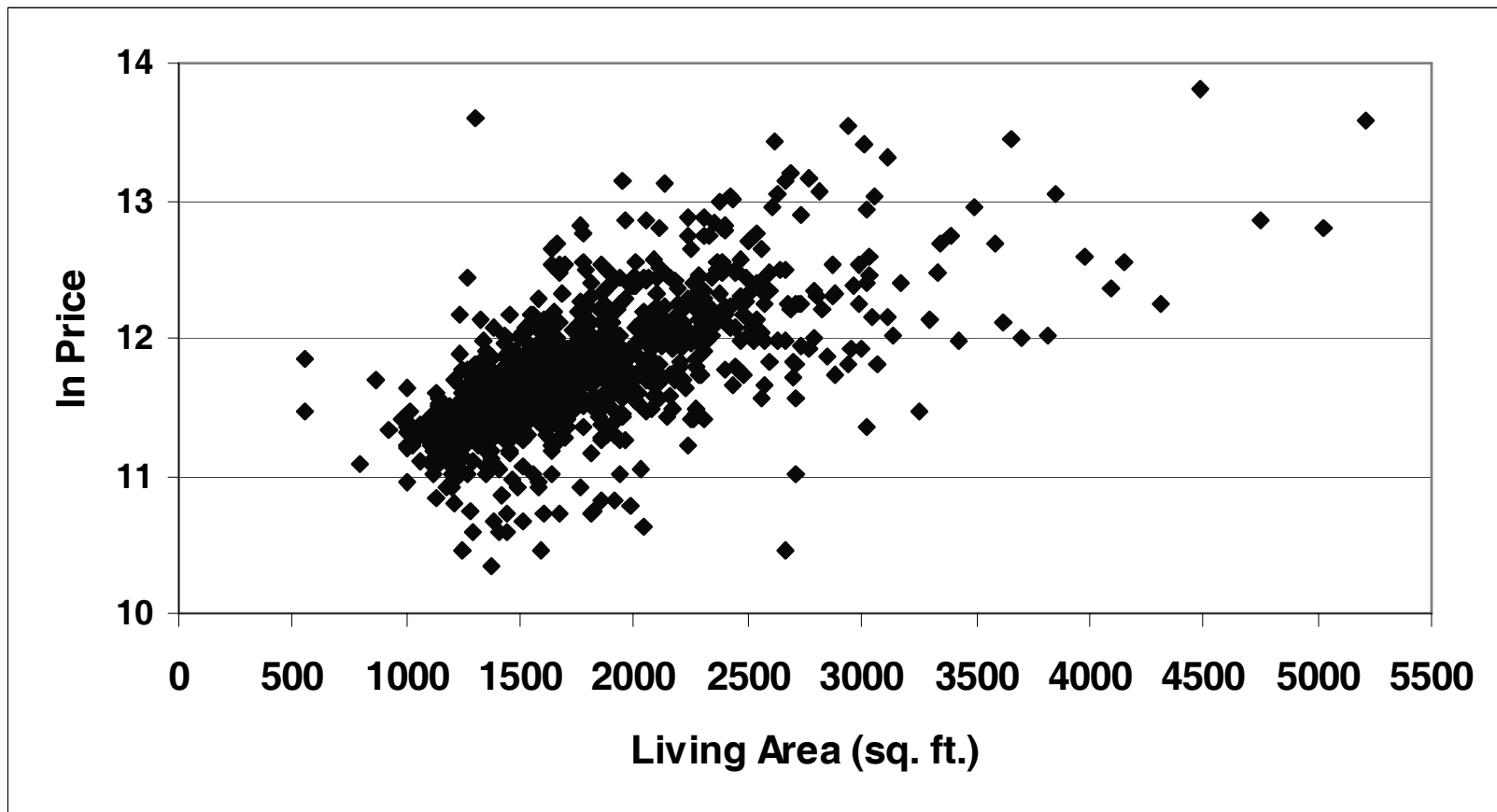
- Over 1,300 single family home sales from 2001 – 2005
- Santa Cruz County from Rio Rico north to Amado
- Data come from SC County Assessor's Office and Arizona Department of Revenue



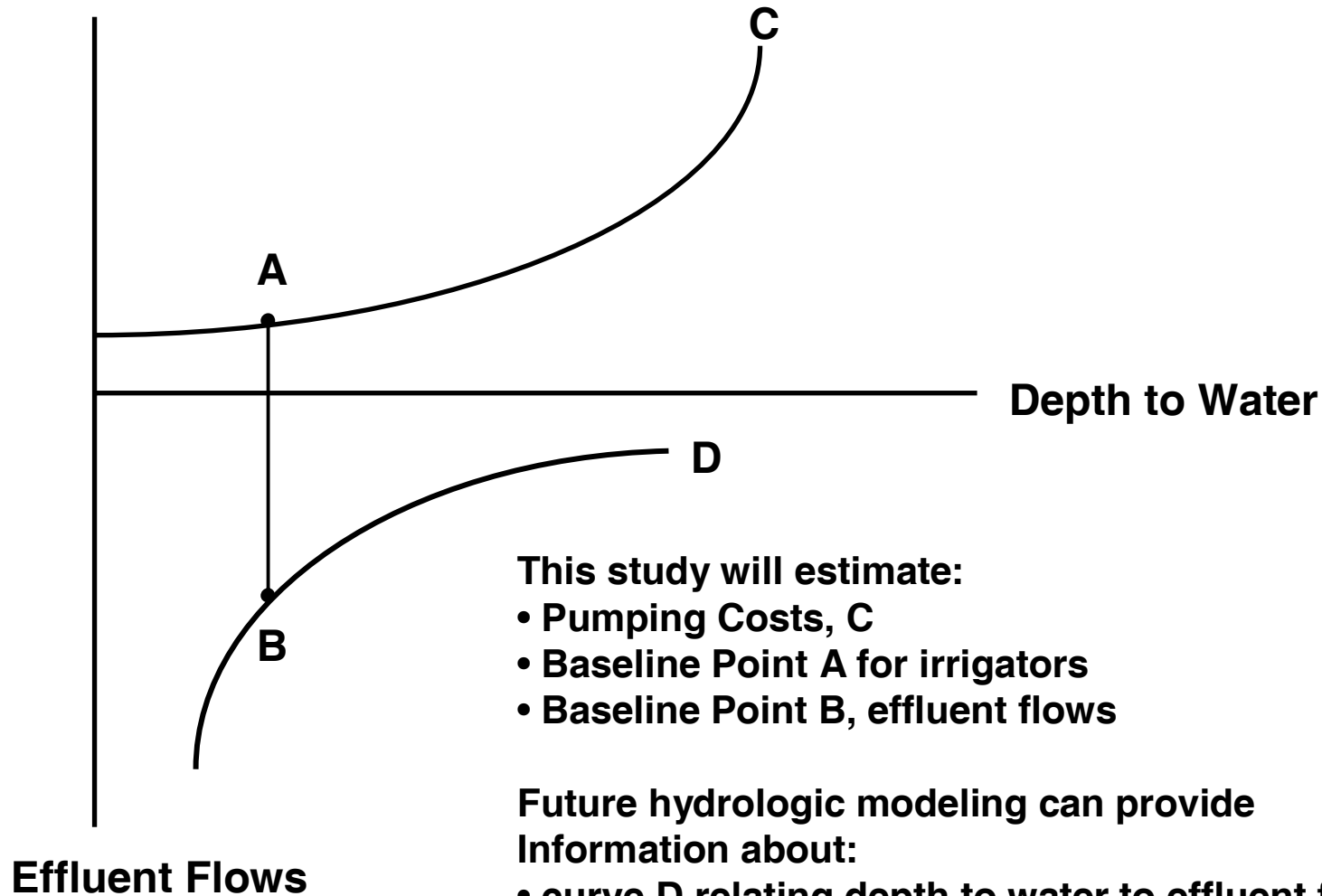
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Living area explains much – but only part – of sales price



Pumping costs (\$ / AF)



This study will estimate:

- **Pumping Costs, C**
- **Baseline Point A for irrigators**
- **Baseline Point B, effluent flows**

Future hydrologic modeling can provide Information about:

- **curve D relating depth to water to effluent flows**
- **how changing effluent flows affects pumping costs (when combined with C)**



Regression Equation:

$$\ln P_{it} = \alpha_t + \beta' S_{it} + \gamma' N_{it} + \delta' E_{it} + \epsilon_i$$

$\ln P_{it}$ = natural log of home sales price (dependent variable)

α_t = time-specific factors (e.g. average mortgage rates)

S_{it} = structural features of property (e.g. square feet, whether it has a pool, etc.)

N_{it} = neighborhood effects (e.g. distance from freeway, distance from golf courses)

E_{it} = environmental effects (e.g. distance from river, distance from landfill, in FEMA flood zone?)



Work thus far on property values

- Structural Characteristics account for about 70% of variation in sales prices
- What's missing? . . . Location, location, location
- In process of geo-coding data to capture neighborhood and environmental effects



Preliminary Observations

- Effluent from Mexico is important to the ecological and economic vitality of the river corridor.
- A reduction of effluent would affect ecological services provided by the riparian corridor, diminish tourism revenues, influence agricultural pumping costs, and impact housing prices.
- The results from this study will inform policy discussions about the future of the effluent.

