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CURRENT AND FORECASTED WATER CONSUMPTION
PATTERNS OF ARIZONA SECOND-HOME OWNERS¹

by

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The literature on recreation and leisure-time research has shown a growing demand for recreation homes and second homes. These trends are very applicable to Arizona, especially in the nondesert, higher elevation areas of the state.

Second-home owners are water users. Their demands affect the allocation of scarce water among alternative uses; water consumption also creates a waste water problem for the second-home areas and the areas immediately adjacent to the second-home locations.

The purpose of this paper is to present selected findings from a larger study conducted during 1974-1976 for the Eisenhower Consortium for Western Environmental Forestry Research. The larger study, entitled THE IMPACT OF SECOND-HOME DEVELOPMENT ON WATER AVAILABILITY IN NORTH CENTRAL ARIZONA, was an empirical examination of the number of second homes in the study region along with an analysis of the water consumption patterns of second-home occupants. The findings of the study have relevance for a broad range of persons interested in water research and water resources management.

THE INCIDENCE OF SECOND HOMES

Numerous definitions are found in the literature for second homes. Some definitions allow only permanent physical structures; others allow mobile structures that have property improvements. For this study related to North Central Arizona, a liberal definition was used. In general, included are residences established by families for the purposes of recreation and/or leisure-time activities.

The incidence of second-home ownership is a rapidly growing trend in the United States. In a 1967 study conducted by the National Forest Service and the U. S. Bureau of the Census, approximately 1.7 million second homes were identified. The 1970 Census of Population had a question relating to the ownership of second homes. At that time, 2.9 million second homes were identified. The most current estimates for 1975 were that 4.2 million second homes existed in this country.

The growth of second homes owned by residents of Maricopa County, Arizona (Phoenix) is similar to that recorded nationally. In 1976, approximately 19,000 households in Maricopa County owned a second home. In 1966, only 7,000 second homes were owned by Maricopa County households. The change represents a 171.4 percent increase over the 10 years, and it outpaced the total growth of Maricopa County population. Total households in the same period of time grew at a slightly smaller figure of 101.3 percent.

While an estimate of the number of second-home owners in Maricopa County exists, there were no estimates for the number of second homes located in North Central Arizona prior to the original research related to this paper. A major objective of this research was to develop such an inventory. For the year 1975 the Arizona Department of Revenue records were accessed. At that time approximately 10,545 second homes in Coconino, Gila, Navajo, and Apache Counties were identified. The study presents an inventory of those second homes by assessor maps which allowed a further analysis by hydrolic basin. In an attempt to determine a growth rate, another time period inventory was necessary. Because Arizona Department of Revenue records do not date back to 1967 in a usable format, another methodology was required to develop an inventory for that period. Through the use of detailed maps prepared by the National Forest Service, a count of structures in areas known to consist of second-home development was accomplished. Approximately 5,519 second homes were identified from the inventory. Based upon trends identified both from

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the two inventories and from data provided in the annual study, Inside Phoenix, estimates have been developed for the total number of second homes in the study area. Also, through forecasting, it is anticipated that by 1980 the number of second homes will increase to 15,800 and by 1985 the figures should increase to 21,200.

Data relative to the incidence of second-home ownership by Maricopa County residents is shown in Table 1. Also, data relative to the change in second homes in North Central Arizona are presented in Table 2. Finally, the trend forecasts for North Central Arizona second homes is presented in Table 3.

TABLE 1

NUMBER OF HOUSEHOLDS IN MARICOPA COUNTY
OWNING A SECOND (VACATION) HOME IN ARIZONA

Year	Percent Households	Households	Total Households
1976	4	19,000	477,000
1975	5	23,000	461,000
1974	4	18,000	450,000
1973	4	17,000	430,000
1972	4	15,000	387,400
1971	3	10,000	339,000
1970	3	10,000	320,600
1969	3	8,000	281,200
1968	3	8,000	258,700
1967	3	7,000	241,000
1966	3	7,000	237,000

Source: Inside Phoenix by Phoenix Newspapers, Inc., Phoenix, Arizona, various issues 1966-1976.

TABLE 2

ESTIMATED FUTURE SECOND-HOME INVENTORY

1975	10,545
1980	15,800
1985	21,100

Source: Prepared by authors.

TABLE 3

SECOND-HOME INVENTORY IN SELECTED COUNTIES OF ARIZONA
1967 and 1975

County	1967	1975
Coconino	1,106	1,749
Gila	1,532	2,953
Navajo	413	2,594
Yavapai	2,388	3,249
Total	5,519	10,545

Source: Bureau of Business and Economic Research, College of Business Administration, Arizona State University, Tempe, Arizona, 1977.

WATER CONSUMPTION ESTIMATES

Empirical estimates of the water consumption by second-home owners in the study area were developed from sampling. Initially key water companies, serving the second-home areas, were identified. Once water company cooperation was obtained, then second-home metered water records were surveyed on a random sample basis. Data were collected on a monthly basis and converted to a quarterly basis in order to obtain water consumption estimates by season. Quarter I was defined as the three-month period, March through May; Quarter II was defined as June through August; Quarter III the autumn months of September and October and Quarter IV was December through February. There was a great deal of quarterly variance by area. These variances show the heavy seasonal nature of second-home occupancy. They also show that water management (waste water management) must plan for the seasonal peaks. Records from the 747 sampled households are summarized in Table 4.

TABLE 5

**AVERAGE SECOND-HOME QUARTERLY WATER CONSUMPTION
BY SURVEYED WATER COMPANIES, 1974
(Data in Hundreds of Gallons)**

Area/Sample Size	Quarter I March, April, May	Quarter II June, July, August	Quarter III September, October, November	Quarter IV December, January, February	Yearly	County
Pinewood-75	11.25	136.40	74.60	8.35	230.61	Coconino
Pinetop Estates-24	68.25	129.50	77.17	24.83	299.75	Navajo
Lakeside Seven-30	14.93	71.40	53.40	25.13	164.87	Navajo
White Mountain-63	0*	143.24	59.76	4.48	207.48	Navajo
Lakeside 17-53	20.87	67.25	37.49	12.83	138.43	Navajo
Christopher Creek- 54	41.98	67.30	27.35	0.48	137.11	Gila
Strawberry I-93	43.96	91.71	42.00	18.93	196.59	Gila
Willow Lakes Estates- 51	123.04	232.39	170.60	118.70	644.72	Coconino
Yavapai Mobile Homes-23	98.49	216.38	188.62	99.17	602.66	Yavapai
Cottonwood-132	28.52	48.40	27.99	15.29	120.19	Yavapai
Blue Hills Farm-25	79.41	245.76	176.93	72.54	574.65	Yavapai
Thunderbird Meadows- 29	86.03	243.12	170.49	86.67	586.31	Yavapai
Overgaard-44	24.73	65.23	45.61	17.68	153.25	Navajo
Lakeside 5-31	10.65	43.29	25.68	10.52	90.13	Navajo
Strawberry II-20	62.60	115.30	56.80	32.60	267.30	Coconino
All Areas-747	40.13	111.69	67.40	28.40	247.63	

*Data were not available.

Source: Survey data, Bureau of Business and Economic Research, College of Business Administration, Arizona State University.

In addition to the seasonal pattern, the average annual consumptions are also shown in Table 4. While the average of all 747 second homes showed an annual consumption of approximately 25,000 gallons, the variance was considerably sharp from one second-home area to another, i.e., annual average consumption varied from a 9,000 gallon low in one Lakeside area to a 64,000 gallon high in Willow Lake Estates.

Assuming that there were 10,545 second homes in the study area as identified and assuming that on the average, water consumed was 24,760 gallons per year, then total consumption for the area would have amounted to 263.6 million gallons per year or approximately 809 acre feet. This consumption totals approximately 1/200 of one percent of the total water consumption throughout the state of Arizona under normalized conditions. If one were to exclude water consumed by agriculture in the computations, water consumed by second homes equals approximately .24 percent of the total municipal and industrial usage. These figures indicate that the usage of water by owners of second homes is very small when compared to the total water usage throughout the state.

WASTE WATER ESTIMATES

Second homes are not only consumers of water from the state's valuable water supply; second homes are also producers of waste water that enter the environment immediately affecting the second-home areas. Although the examination of waste water produced by second homes was not a direct objective of the study, it was important enough for estimates to be included in the analysis. Visual inspection of the study area yields a low incidence of lawn, flower, and garden usage for water. Thus, a relatively high proportion of total water consumed is believed to result in waste water. Estimates in the literature show a waste water range of 86 to 96 percent of total water consumption. Assuming that an average of 90 percent of the gross water consumption results in waste water, the average second home in the study area would directly produce 22,500 gallons of waste water per year. This figure was particularly seasonal with nearly 50 percent of this volume expected to occur during Quarter II, of June-August. Second homes, then, are not only consumers of water but they are producers of waste water in great volume on a particularly seasonal basis.

WATER CONSUMPTION AND WASTE WATER FORECASTS

Forecasts have been developed for 1980 and 1985 second-home water consumption and waste water production for the study area in North Central Arizona. Basically, linear forecasts were used. The rationale for the linear forecasts was as follows. Timothy D. Hogan in his study, Second-Home Ownership in Northern Arizona, A Profile and Implications for the Future, found that approximately 90 percent of the second homes in Northern Arizona had indoor plumbing. Moreover, approximately 89 percent of those homes had baths. Thus, for the future it can be anticipated that most second homes will be similarly equipped. The incidence of retrofitting of nonplumbed second homes is also expected to be low during the next few years. Finally, water consumption patterns should follow a similar seasonal pattern as revealed in the earlier tables.

Utilizing the projected number of second homes, and assuming that the average annual consumption remains constant, then the demand of second homes for water in the second-home area in 1980 would be 395,000,000 gallons or 1,211 acre feet. By 1985 the figure would rise to 527,500,000 gallons or 1,618 acre feet. These forecasts are shown in Table 5.

TABLE 4

SECOND-HOME WATER DEMAND FOR STUDY AREA

<u>Year</u>	<u>Number of Second Homes</u>	<u>Average Annual Consumption</u>	<u>Gallons (000)</u>	<u>Acre-Feet</u>
1975	10,545	25,000	263,625	808.67
1980	15,800	25,000	395,000	1,211.67
1985	21,100	25,000	527,500	1,618.10

Source: Developed by authors.

The waste water proportion for the future should also remain in the 85 to 95 percent of water consumption range. Waste water proportion increases that could be attributed to a greater incidence of plumbing will be partially offset by factors that could decrease household consumption, such as expected smaller sized households.

OVERVIEW

In the aggregate, there appears to be little reason for concern about continued growing second-home development in Northern Arizona. Total water consumed and hence waste water generated are a very small proportion of the state total.

Yet on a disaggregated basis, attention needs to be focused on counties and smaller political areas. There are scarce water areas in the state. Where surface water rights are not available to second homes, then water can only be furnished from the water table. In many areas, second-home growth will add to current and forecasted overdrafts.

Moreover, the modern trend is for second homes to become more clustered. This occurs because of second-home developments (lot sales) and for reasons of cost sharing on common amenities. Concentration,

however, creates potential problems such as environmental carrying capacity for waste water and related occupancy concentration problems.

The literature is virtually nonexistent regarding water planning for second homes in Northern Arizona. While we hope these conclusions add new information on second-home inventories, water consumption, and waste water generation, we also recognize there is a serious need for more data. Planners, developers, and other officials could profit from better data relative to second-home concentrations, local area water inventories, and environmental carrying capacity for waste water.