Market Impacts on Elevated Homes in a Known Floodplain

A

Case Study

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ARES Conference
Monterrey, CA

Draft,
April 1, 2003

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Abstract: This study addresses the question of what effect elevating a home has on the selling price when compared to that of non-elevated homes in a known floodplain. The study scope is a single incorporated area, the City of Snoqualmie, Washington. The results show that homes that are not elevated are discounted by the market by an amount that approximates 50% of the cost of elevation of the home.

Introduction

For most of this past century the national policy on controlling floods was to tame rivers with dams, floodwalls and levees. The result was a reduction in the natural capacity of floodplains to attenuate floods and increased development in floodplains by giving people a false sense of safety (Burby et al. 1998). In 1968 the National Flood Insurance Program (NFIP) was created and a shift in policy took place. The focus shifted to land use controls and building standards. (Felton et al. 1974 report on the early years of the NFIP).

Under NFIP congress makes flood insurance available to property owners in communities that agree to adopt floodplain management ordinances meeting criteria set by the Federal Emergency Management Administration (FEMA). There are over 18,000 communities that now participate in the NFIP program. The NFIP has several grant programs administered by FEMA. They are the Hazard Mitigation Grant Program (HMGP) and the Flood Mitigation Assistance Program (FMAP).

The Hazard Mitigation Grant Program (HMGP) is funded by FEMA taking a percentage of the money allocated for a disaster recovery and using the funds to reduce future risks. FEMA can

contribute 15% to 20% of a disaster's cost to the grant program. FEMA maintains regulatory oversight for the HMGP program, but states are responsible for administration and prioritizing projects. The Flood Mitigation Assistance Program (FMAP) provides funding to state and local governments to implement measures to reduce the long-term risk of flood damage. Grants are available to develop flood mitigations plans, technical assistance, acquisition of floodplain homes, and elevation of homes to reduce future losses.

This paper focuses on the elevation of floodplain homes. The HMGP and FMAP are used to elevate a home above the base flood elevation as required by the National Flood Insurance Program (NFIP) for new and substantially improved structures. Elevation through retrofitting is a common practice and continues to receive funds. This study addresses the question of what effect elevating a home has on the selling price when compared to that of non-elevated homes within the same local market. The regional housing market condition, attitudes of buyers, sellers and real estate agents were peripherally included in the study and antidotes.

Literature review

Previous research on floodplain property has focused on whether there is a discount for property within the floodplain. These studies have had mixed results with some reporting a floodplain discount based on the present value of insurance premiums. Others studies showed no discount for floodplain property. Burby (1990) reports no discount for flood zone developed land, however a discount for undeveloped land.

Many of these previous studies, including Shilling et al. (1989), MacDonald et al.(1990) and Shilling et al. (1985) were based on small sample case studies, limiting there application to other markets. In contrast Harrison et al. (2001) made use of a large sample database and reports a flood zone discount less than the present value of insurance premiums.

Another set of research studies property after an actual flood event. The underlying concept is that the price discount effect may be related to the time between events. Skrantz and Strickens (1987) report no property value effect after the flood event, but once hazard insurance premiums increase, a discount is observed. Tobin and Montz (2001) report varying results. They hypothesize that property values fall immediately after the event. Some properties recover and values return to pre-event levels while other do not. They based the likelihood of recovery on the depth of flood waters for each property.

Snoqualmie: Background

The City of Snoqualmie started as a mill town at the turn of the 19th Century. This history provides much of the City's character and identity today. The town center is a blend of museums, a historic railroad yard, a wooden monument to ancient old growth forests and a dozen or so commercial structures.

The original or "historic" City of Snoqualmie has a population of about 1,700 residents. All of historic Snoqualmie except two homes are in the special flood hazard area. This amounts to almost 700 dwelling units. The housing reflects the modest styles that were capable of being built by the mill workers themselves – simple cottages and bungalows constructed with sturdy

old growth timbers. A few post war ranches have replaced the more poorly built and flood damaged homes.

This once remote community continues to become a bedroom community of Seattle. Snoqualmie was rediscovered as commuters found the 30-minute trip from Seattle increasingly manageable with infrastructure build-up, and the mill town more affordable than the closer in suburbs. An example is the annexing by the city of a newer development some years ago. This new community is located on a ridge some distance from the original town site and is located out of the special flood hazard area. This "Ridge" community has a totally different character and excluded from the study.

The city is located on the higher foothills of the Cascade Range. Above the original town site two river forks merge with the Snoqualmie River. The Snoqualmie river forms the eastern most boundary of the city limits. At the lower end of the city limits the River reaches Snoqualmie Falls. Snoqualmie Falls creates a restriction that impedes the flood flows causing a backing up of the water into the town. Floodwater is relatively free of sediment, and neither its rise nor its current is life threatening. About every five years the town is flooded with possible depths exceeding six feet above grade in some housing areas. These occurrences led to the City of Snoqualmie's inclusion in 13 presidential flood related declarations between 1965 and 2001.

Retrofitting History

To make Snoqualmie a more livable community, many residents have elevated their existing homes. Home elevation is a complicated process because the City is in a seismic ICBO zone 3,

soon to be a designated a zone 4. Combined with the high cost of construction in the Puget Sound area relative to other areas of the state and region.

About 60 homes have been retrofitted through elevation between 1987 and the spring of 2002. Another 100 homes have been constructed since the City entered the National Flood Insurance Program (NFIP) requiring the homes to be elevated as part of the initial construction. The first significant elevation/retrofitting project occurred in 1987 after a Federal disaster declaration. The City revised its Flood Hazard Regulations to define "Substantial Improvement" as any repair, reconstruction, or improvement of a structure, other than a flood-damaged residential structure, the cost of which equals or exceeds 50% of the market value of the structure. With respect to a flood-damaged residential structure, "substantial improvement" means any repair, reconstruction, or improvement of a structure, the cost of which equals or exceeds 10% of the market value of the structure. This definition far exceeds the minimum set by the NFIP. Accordingly, the Small Business Administration made loans available to homes that met existing codes, and about a dozen homes were elevated. Another 50 homes where elevated through the Hazard Mitigation Grant Program (HMGP) after presidential disasters in the November 1995, February 1996 and Winter Storms of 1997 flooding events.

The HMGP program is both a federal and state sponsored program that contributed 75% - 87.5% of funds to the cost of elevating the home. The homeowner contributed the remaining 12.5% - 25% cost of elevating depending on federal guidelines in place at the time of the award. The homeowner's contribution for many of the retrofitted homes was 12.5% because the state of Washington covered 50% of the remaining costs after the grant. The City also received Flood

Mitigation Assistance funding to elevate three repetitive loss homes, requiring the homeowner to contribute 25% of the costs of elevation. In addition, six to seven elevation retrofits occurred without outside assistance with the homeowner paying the entire cost of elevating the home.

Preliminary Interviews

Preliminary interviews were undertaken with local government officials to develop a project scope and potential research questions. Additional interviews were performed with local real estate agents and residents to develop an understanding of perceptions in the local market. The following questions for study were developed from the series of interviews.

- What value is added/subtracted through elevation?
- Do the market effects of elevation change through time? (Is there a threshold that when reached, the market would reflect the cost of elevation?)
- When, if ever, do elevated homes approach the market value of comparable non-floodprone homes?
- Is the cost of retrofitting through elevation realized in the market place?
- What are the public policy implications if the market does reflect the cost of elevation?

Knowing that the study area had a limited number of sales and available years of sales data it was imperative to reduce the focus of the empirical research. The following are based on observations of topics from the developed question set.

Value Added

Retrofitting a floodprone home through elevation presents some design challenges. For a home elevated a few feet above grade, the peculiar aspects of the elevation can be camouflaged through decking or landscaping. Elevating 4 to 6 feet is more difficult to aesthetically soften. In Snoqualmie a combination of landscaping and decking was the common approach used to visually distract the impacts of elevation. Elevating eight feet was impossible to conceal, but along with the challenges there were opportunities. Often the first floodprone floor could be

designed to look like a lower floor and most importantly value added when elevating the home. A garage under the "first floor" could be incorporated into the design along with additional storage space. In a couple of rare instances actual additional floor space could be added. These were mostly "slab on grade" homes with attached garages where the entire home was elevated including the space allocated for the garage. A floor was constructed under the entire structure and the garage was placed under the floor. Value added concerns were addressed to the extent possible. However, because this study was of a single community, with similar flooding characteristics and housing stock, conclusions on value added effects are cautiously interpreted. The concern of value added was previous addressed by Chivers (2001) who used GIS mapping to determine if homes were gaining views after elevation. His finding were mixed. After adjusting for view, a price discount for flood zone properties was observed for the two years immediately after a flood event, but not thereafter.

Perception Through Time

From discussions with residents and FEMA personal involved with elevation projects over the years, it was their belief that the first set of elevation projects of Snoqualmie homes had a neutral affect on the market price of that home. But over time the addition of more retrofitted homes raised a red flag by signaling to prospective buyers that this house and neighborhood floods. In addition, if not well planned, the elevated house can look strange and out of character with the neighborhood and priced accordingly by the market, along with extended time on market before a buyer is found.

However, as additional homes are elevated, attention is then diverted to non-elevated homes, a change in perception occurs and non-elevated homes become a concern to buyers. At this point non-elevated homes become apparent and values for these homes incorporate deferred elevation remedies.

The time until the threshold was reached could not be answered without studying similar floodprone communities of elevated homes within the contexts of comparable non-floodprone neighborhoods. Informal discussions with local Realtors© disclosed a belief that elevation of the home is being priced in the market. However, results of this investigation for one market suggest there is an evolution of acceptance. With only 10% of the homes within the floodplain elevated, it appears that a threshold has been reached and non-elevated homes are a concern to buyers.

These informal interviews lead to a consideration as to whether the buyers of homes in this market had full knowledge of flood history. Although we did not test for the knowledge level of participants, we do believe that participants did know a flood risk was present. Since 1995 the state of Washington has required the use of a property disclosure form where sellers must disclose pertinent facts about the property, such as flooding history. The continued addition of newly retrofitted homes in the local market gives a visual signal to prospective buyers when they are searching for a residence. In addition, local media traditionally broadcast live from towns in the Snoqualmie valley each winter and spring when floodwaters cover low-lying roads. Last, the sales database only includes the most recent years when knowledge of flooding history is more likely. A recent study by Chivers et al. (2002) does question the knowledge base of buyers. They

report that many buyers in the Boulder Colorado area did not know about a flood risk until the real estate closing.

DATA

In order to study the housing market conditions in Snoqualmie recent housing sales were researched. Sales of home between 1998 and June 2002 were extracted from the Northwest Multiple Listing Service. A follow up review was performed by physically driving each of the streets in Snoqualmie to verify the home locations and condition. The database of sold homes was then cross-checked against the city of Snoqualmie list of elevated homes to determine how many elevated homes had been sold since it was retrofitted.

The original sample size for this study included 240 home sales from 1998 to May 2002. The physical attributes of these homes were used to create a database that included sales price, time on market, and other pertinent seasonal and time variables. These variables are shown in Table 1. The physical characteristic variables included the number of baths, bedrooms, fireplaces and whether the home had a basement or garage. Quality variables were the type of roof and siding. A seasonal variable for which quarter of the year the home sold was implemented. Since certain seasons tend to have greater transaction volume and flooding conditions effecting the sales price of a sold home. The sales price, listing price, and time on market (TOM) were calculated to examine the current housing market conditions. Last, a set of dummy variables were included for each year of the study period. They were used to isolate the price increase trend in the market, a reflection of the greater Puget Sound market that had double-digit price increases per year during the time period of the home sales in this study.

The original sample of home sales was then paired down. Several sales were removed because of missing data due to incomplete county records (3). The sample was further reduced by excluding homes that were not in the flood prone area of the city. This eliminated the newly created ridge community that has no flooding threat. The final study sample was 128 homes in the flood prone area of town. From this final sample we identified 15 homes that were previously retrofitted by elevating.

METHODOLOGY:

In order to further investigate the market pricing effect of elevating homes a regression analysis was developed. A hedonic pricing model was used to investigate whether the elevation of a home was significant in the sales price of a home in the study sample. The concept of a hedonic pricing model is well documented in housing research literature. The theory is that the selling price of a home is based on the components of the home, the market conditions at the time of the sale. The selling price of the home is the dependant variable and a function of explanatory variables that include physical and market attributes. The basic equation is as follows:

$SP_i = f(H, M, T)$

The selling price is a function of housing characteristics (H), market conditions (M) and year of sale (T).

$SP_i = C + B_j H_{i,j} + B_k M_{i,k+} B_l T_{i,l} + \varepsilon$

Where C is the constant and represents unidentified explanatory variables.

B is the coefficient for each attribute

H is a vector of physical characteristics variables

M is a vector of market condition variables

T is a set of dummy variables for years

ε is an error term

and

SP_i is the actual selling price of ith the home

These Variables are listed below in Table 1

TABLE 1

Variable	Description
LNSP	Log of the selling price
TOM	Time on the market
Elevation	Yes =1 no = 0
Heat source	Yes = 1 for gas, 0 otherwise
Bath	Number of bathrooms
Bedroom	Number of bathrooms
Basement	Yes =1 no = 0
Garage	Yes =1 no = 0
Exterior Finish	Yes = 1 for metal or siding, 0 otherwise
Fireplace	Yes =1 no = 0
Roof	Yes =1 no = 0
Flood	1= in the flood plain, not in flood plain =0
Summer	Season of Sale, Dummy variable
Spring	Season of Sale, Dummy variable
Fall	Season of Sale, Dummy variable
Winter	Season of Sale, Dummy variable
1999	Year of sale dummy variable
2000	Year of sale dummy variable
2001	Year of sale dummy variable
2002	Year of sale dummy variable

Table 2 shows descriptive statistics for elevated homes that sold during the study period. Of particular interest is the average selling price of these properties was $194,167 (145/sq.ft) and the average time on market (*TOM*) was 62 days.

Table 2
Elevated homes

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
selling price	15	115000	320000	194166.67	50380.94
sp/lp ratio	15	.0979	1.0229	.929529	.231091
LP	15	122500	2095000	322013.33	493073.02
TOM	15	1	164	62.20	42.32
BEDROOMS	15	1	4	2.67	.72
BATH	15	1.0	2.5	1.683	.671
Total Square Feet	15	540	1994	1335.73	421.96
Valid N (listwise)	15				

In comparison, homes not elevated are shown below in Table 3. The *TOM* for the non-elevated group was 58.5 days and the average selling price was $233,275 (138/sq.foot). Thus, elevated homes surprisingly took a greater time to sell. This result may be explained by the individual homes that happen to sell during the period of the study if they were perceived to be out of character with the neighborhood.

Table 3
Non-elevated homes

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
selling price	113	75000	798000	233275.51	95950.64
sp/lp ratio	113	.8571	1.1092	.997847	3.31916E-02
LP	113	75000	875000	234572.61	103442.50
TOM	113	1	354	58.50	64.90
BEDROOMS	113	0	4	2.90	.73
BATH	113	.5	3.5	1.883	.737
Total Square Feet	113	280	4669	1689.47	650.48
Valid N (listwise)	113				

The regression results shown in Table 4 show the variables of significance in predicting the selling price of the house. *TOM* was omitted because the literature has demonstrated that *TOM* and the selling price (*SP)* are linked with a simultaneity problem. *TOM* effects selling price and

SP effects TOM. The interpretation is that the coefficients represent percentages of the sales price. For the variable of interest, E*levation* has a coefficient of 0.07636 or 7.636% of price. The average selling price for the sample homes was $228,692, multiplied by 7.636% is equivalent to a discount of $17,463 for not elevating a home. These results show that elevation does pay a dividend to the owner.

Table 4

Hedonic Regression Coefficients			
Model variables	Coefficient	t-stat	Significance
Constant	11.4	157.87	.000 ***
Elevation	0.07636	1.70	.034 **
Bedrooms	0.0851	3.56	.000 ***
Bath	.263	9.55	.000 ***
Flood	-0.0129	-.443	.658
Heat source	-0.04428	-1.096	.274
Exterior Finish	-.128	-3.767	.000 ***
Basement	0.05023	1.224	.222
Garage	-0.0384	-.997	.320
Fireplace	.123	4.147	.000 ***
Roof	.495	10.86	.000 ***
Winter	-0.0384	-.958	.339
Spring	0.055	1.456	.147
Summer	0.0247	.665	.513
Year 2000	.13	3.725	.000 ***
Year 2001	.157	3.876	.000 ***
Year 2002	.120	1.75	.001 ***

Rsq = .68
a.Dependant variable =LNSP
*** 99% level
**95% level

Return on Investment

The first retrofits were initiated in 1987 within the City of Snoqualmie. The costs ranged from $5,000 to $15,000 in 1986 dollars depending on how much of the work was done by the owner. These homes were predominantly financed though loans provided by the Small Business Administration. Today elevation costs from $30,000 to $40,000, much of which is complying with seismic codes.

Our investigation concludes that the dollar value of home elevation reflected in the market is 50% of the average cost of elevation in today's dollars. Specifically, if a home cost $35,000 in today's dollars to elevate a home, the home would return on average $17,463 dollars in a market value adjustment. Most of the homeowners elevated their homes through HMGP funds and were required to pay between 12.5 and 25 percent of the cost of elevation. Clearly this study supports that elevating was a sound investment by the property owner.

Policy Implications

The state and federal agencies that support floodplain management can learn from this investigation in several ways. 1.) They can be confident that the moneys spent on elevation created usable dwellings. 2.) The sales price gain from elevation is within the cost of construction. 3.) The State of Washington is prevented from providing public investment for private gain. Their participation in the elevation of homes is undertaken because such investment is deemed for the public good, not private gains. This concept is known as the "betterment issue" in the insurance industry. The betterment issue is not an overriding concern and can be addressed. The community at large benefits by reducing future flood claims that are a financial burden on emergency services. It is also a sound investment for the federal government lowering future insurance claims and demands on FEMA personnel. 4.) Coordination of federal and state programs to expedite elevation may be warranted. Although this has been a successful program in Snoqualmie, less than 15% of the homes affected have been elevated.

Conclusions and Further Study

This study was motivated by a desire to answer the question of whether the NFIP flood program and the City of Snoqualmie were successful in remediating homes. The results are evidence that

the program was successful. Buyers in the market for housing positively perceive elevated homes. The results of the statistical model shows the elevation was statistically significant and equates to an additional $17,463 on average, to the sales price in the market.

There is a need for further study to gain additional insight into the results of the NFIP and home prices. An expanded study of multiple markets is desirable. This expanded study could investigate whether the pricing of elevated homes is market specific or a larger phenomenon. The use of statistical methods would have greater support because of a larger sample size and a refinement of issues would be addressed.

Another area of further research is the use of survey methodology. A formal survey of previous buyers and sellers could reveal the motivations and the degree of floodplain knowledge of both parties to a transaction. The survey would also give further insight as to whether participants believe they priced flood risk in their transaction price. This question could be segmented into a grouping of participants that experienced a flood and those who have not.

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