FLORIDA OFFICE OF
Insurance
Regulation

Florida Office of Insurance Regulation

Cumulative Substantial Improvement Period Study

Final Report

November 26, 2024

Submitted by:

FSU | RISK MANAGEMENT & INSURANCE CENTER
COLLEGE OF BUSINESS

Executive Summary

The purpose of this project is to evaluate the benefits and long-term effects of Community Rating System (CRS) communities specifying cumulative substantial improvement periods. Objectives of the research include: (1) an evaluation of the benefits and long-term effects of specifying cumulative substantial improvement periods; (2) a recommendation on the maximum length of cumulative substantial improvement periods; (3) recommendations on county and municipality ordinance reporting requirements; and (4) discussion of concerns related to the differentiation between repair, reconstruction, rehabilitation, or improvement of a structure to harden a home for the purpose of resiliency, as a preventative measure (rather than in response to a storm) and local ordinances that make allowances for the repair or replacement of a structure that do not directly harden a home.[1]

Within the flood plain management function of the National Flood Insurance Program (NFIP), the CRS is a voluntary incentive program that recognizes and encourages community flood plain management practices that exceed the minimum requirements of the NFIP. As of April 2024, there are more than 1,700 communities nationally that are eligible to participate in the CRS program; 264 of those communities are in the State of Florida. In CRS communities, flood insurance premiums are discounted based on the community's effort to reduce flood risk. These discounts are earned in CRS communities through an accumulation of points for various efforts. One effort that earns points is defining a cumulative substantial improvement period, or lookback period.

The NFIP has a basic rule: If the cost of improvements or the cost to repair the damage exceeds 50 percent of the market value of the building, it must be brought up to current flood plain management standards. A concern is that a consumer could break any improvement or renovation up into smaller projects that individually do not reach the 50 percent limit but combined do violate that rule. Thus, a CRS community can define a cumulative substantial improvement period, or lookback (e.g. 5 years or 10 years) that tracks the cumulative value of improvement projects during the period to ensure that the 50 percent substantial improvement rule is not violated. If a CRS community defines a substantial improvement period of 5 or 10 years, they can earn points toward discounted flood insurance premiums. This study evaluates the benefits and long-term effects of CRS communities specifying cumulative substantial improvement periods in the state of Florida.

We began our study by identifying the relevant communities in Florida, which involved determining the Florida communities that were eligible for, and are participating in, the NFIP's

[1] The appropriation language defines the term "substantial improvement period" to mean the calculated length of time for any repair, reconstruction, rehabilitation, or improvement of a structure to harden a home for purposes of resiliency, as a preventative measure rather than in response to a storm. The NFIP defines the cumulative substantial improvement period that tracks the cumulative value of improvement projects, without differentiating between improvement projects that may harden a home (e.g., protect against wind) and projects that just add value (e.g., building an addition). This study will focus on the NFIP definition of cumulative substantial improvement period.

CRS, the voluntary incentive program that recognizes and encourages community flood plain management practices. A list of CRS Eligible communities was available from FEMA, and FEMA also provided a spreadsheet called the CRS Communities Credit File, which provided a listing of the credits received by every CRS community in the US, including the lookback period credits. We also used information from Florida's Community Status Book Report, a FEMA publication, to further help identify relevant communities in Florida. At the intersection of these data, we identified 468 total communities, 448 of which had consumers that purchase non-trivial amounts of flood insurance policies from the NFIP. These 448 communities were the focus of our study. Further, of those 448 communities, 264 participated in the CRS while 204 did not. We remove 20 of the communities due to lack of significant NFIP activity to be included in the empirical portions of the study. Parts of our study focus on the 244 communities participating in the CRS.

Next, through discussions among all research team members, as well as an assessment of the data and information pertinent to the study's objective, we identified pertinent stakeholders. While we consider the perspectives of a wide variety of stakeholders including homeowners, flood plain managers, building mangers and property appraisers, we focus on the homeowners to better understand the understanding and perspective of those most impacted by the individual flood insurance market and flood plain managers who have perhaps the greatest knowledge of the rules and processes surrounding flood-related ordinances and processes.

To evaluate the benefits and costs of lookback periods of the communities we identified, we acquired qualitative and quantitative data from various sources. To acquire the qualitative data, we engaged the various stakeholders thorough a series of online surveys, phone interviews, and face-to-face meetings. We acquired quantitative data relating to flood insurance policies from various FEMA sources. We also acquired data on housing values, building permits, and demographic characteristics for each of the communities through various public and proprietary sources detailed later in the report. The totality of the qualitative and quantitative data to examine various potential costs and benefits associated with lookback periods, including take-up rates, premiums, housing values, etc.

We were unable to locate a centralized database that contained lookback period information for all communities in Florida. We therefore identified lookback period information from the following three sources: 1) We searched the online Florida code of municipal ordinances provided by the Municipal Code Corporation (Municode) to find lookback period-relevant ordinances. 2) In our survey of flood plain managers, we specifically asked the respondents to indicate if their community had a lookback period in effect. 3) Using the CRS file, we identified the communities receiving credit for having cumulative substantial improvement restrictions. If any one of these three sources of data indicated the presence of a lookback period, we treated that community as having a lookback period for the purposes of our study.

Our quantitative analysis of lookback periods produced several insights. We present them here in summary form, and detail the finding in the report:

- We find that 12 Florida communities would experience a change in their CRS premium discount if they removed their substantial improvement lookback requirements. Doing so would reduce their CRS discount by 5 percentage points. These 12 communities represent 21 percent of the 57 CRS communities receiving credit for a substantial improvement lookback. [Section 6]
- In 2023, residents in Florida held almost 900,000 policies, paying total premiums of $818 million. Only 22 percent of these policies are in a community with a substantial improvement lookback credit in the CRS. Around 5 percent of policyholders live in a community whose premium discount would change if the lookback were removed. The average policyholder in these communities pays $697 in premiums. Removal of the lookback credit would increase their premiums by $36 on average, a 4.7 percent increase. [Section 6]
- Flood insurance take-up rates in Florida are higher in communities that participate in the CRS. [Section 7]
- When we account for community characteristics, the presence of a lookback period is not statistically related to higher take-up rates. The relationship is also not significant when the sample is divided between Special Flood Hazard Areas (SFHAs) and non-SFHA areas. [Section 7]
- When we account for community characteristics, the *length* of a lookback period is not statistically related to higher take-up rates. The relationship is also not significant when the sample is divided between SFHAs and non-SFHA areas. [Section 7]
- When we account for community characteristics, neither the lookback period nor the lookback period length is statistically related to premiums. The relationships are also not significant when the sample is divided between SFHAs and non-SFHA areas. [Section 7]
- When we account for community characteristics, the presence of a lookback period is not statistically related to housing values. The relationships are also not significant when the sample is divided between SFHAs and non-SFHA areas. [Section 8]
- There is some evidence that the presence of a longer lookback period in a given community is associated with lower housing values. Specifically, communities with lookback periods of 2–5 years are associated with a 4.2 percent reduction in house values, while those with lookback periods exceeding five years are associated with a 5.7 percent reduction. This leads to total property value losses of approximately $9.27 billion and $12.15 billion, respectively, across the affected houses. [Section 8]
- A longer lookback period constrains renovation activity and is statistically significant. [Section 9]

Our qualitative analysis of lookback periods produced several insights. We present them here in summary form, and detail the finding in the report:

- A survey of flood plain managers in the state of Florida confirmed not only the wide variation in existence of lookback periods and their lengths but variation in the ways lookback periods are administered and tracked. [Section 10]
- Over half of the flood plain managers in communities with lookback periods reported that they felt the lookback period limits the ability of homeowners to undertake projects to modernize or increase value of homes. Over a third of the flood plain managers felt lookback periods limit homeowners hardening their homes for wind damage or undertaking projects necessary for other insurance purchases. About 34 percent also felt lookback periods impact the effectiveness of programs like My Safe Florida Homes. [Section 10]
- Half of Florida homeowners surveyed did not know if their community participates in the CRS program. Only about one-third of those surveyed were aware that they can receive discounted flood insurance premiums if their community participates in CRS. More than 70 percent of those surveyed were unfamiliar with lookback periods and the rules pertaining to substantial improvements. [Section 10]
- Of the homeowners surveyed, 14.5 percent indicated that they were denied a building permit because of regulations surrounding a lookback period. [Section 10]

When we consider the totality of the quantitative and qualitative evidence of our study, we arrive at the following policy recommendations:

1. Variations in the existence of and length of lookback periods, in some cases within a single county or metropolitan area, may confuse many stakeholders (beyond just end consumers) and increase difficulty in administration and communication. We recommend an overall reevaluation of the use of lookback periods throughout Florida considering the cost and benefits to key stakeholders. There are several key elements of the review we suggest:

    a. Cost-benefit analysis for the community, understanding that initial evidence suggests the reduction in premiums for community members associated with the lookback periods might not offset the costs of the lookback periods for some communities. Costs include the cost of administration as well as potential negative impacts on development and ultimately property taxes among other issues.
    b. The evaluation should include not only the existence of lookback periods but also the length of the lookback period because costs and benefits appear to vary with the extension of lookback periods to longer periods.
    c. The evaluation should also include building code regulations, which can contribute to the resilience of Florida's homes and communities, including codes that reduce flood risks to existing properties. Codes that require modifications to existing homes can be costly. Depending on the characteristics of the home, they may be cost prohibitive, and in these cases, such codes may reduce other investments in the home that would benefit the owner

and their community. Lookback credits for CRS premium discounts are small overall, contributing at most to an NFIP premium reduction of around 5%. These premium discounts alone are likely insufficient to maintaining lookback requirements.

2. For communities electing lookback periods we recommend:

    a. Lookback period should not exceed five years due to potential negative effects on property values and renovations, as well as administrative challenges in enforcement.
    b. Automation of the process to ensure consistency and minimization of costs.
    c. An evaluation of activities that fall under the definition of substantial improvement with care to exclude efforts to harden home from wind mitigation. Explore if local ordinances could allow flexibility for resilience-focused renovations while maintaining cumulative tracking for other types of improvements.
    d. Develop public education campaigns to explain the purpose and benefits of lookback periods, emphasizing the role of these measures in earning flood insurance discounts and reducing flood risks.
    e. Mandate clear disclosure of lookback period policies at the time of property sales and permit applications. This could help reduce confusion and increase compliance with flood plain management standards.
    f. Implement digital tracking systems to reduce the administrative burden of monitoring building permits in floodplain areas. These systems could simplify the management of cumulative substantial improvement periods while enhancing transparency and accountability.
    g. Regularly assess the impacts of lookback periods and adjust policies based on updated data and community needs. This may ensure that resilience measures remain effective and equitable over time.
    h. Ordinance reporting requirements should be standardized to include clear differentiation between resilience improvements and general improvements, transparent tracking of cumulative improvements, regular assessment of economic impacts, and mandatory disclosure requirements in property transactions. This standardization would improve policy effectiveness while reducing confusion and administrative burden.

3. Exploration of other opportunities for receiving CRS credit points that might reduce flood premiums, e.g., open space preservation.

    a. Facilitate knowledge-sharing among CRS communities to identify and adopt best practices for implementing lookback periods. Florida's 264 CRS communities could serve as a valuable resource for understanding diverse approaches to balancing resilience and economic considerations. Our evaluation of CRS credit points earned by communities across the state suggests credits are being earned for a wide range of activities with as many

as 1571 points earned for higher regulatory standards and 1482 points for open space preservation.

4. We also recommend that these activities be undertaken with an understanding of the impact on the incentives to create more resilient properties with respect to both flood and wind. To achieve these goals, additional incentives such as grants, tax credits, or low-interest loans, for homeowners to undertake resilience-enhancing renovations.

List of Contributors

Florida State University

Patricia Born, PhD, Principal Investigator

Trevor Bryan, PhD

Gabriel Carillo

Cassandra Cole, PhD

J. Bradley Karl, PhD

Kathleen McCullough, PhD

Charles Nyce, PhD

David Orozco, JD

Stacy Sirmans, PhD

Tingyu Zhou, PhD

Research Assistants:

Dalton Britner

Kajana James

Cooper Jordan

Christopher Restrepo

Temple University

Benjamin Collier, PhD

Contents

List of Tables

Appendix Tables

List of Figures

1 Introduction

The purpose of this project is to evaluate the benefits and long-term effects of Community Rating System (CRS) communities specifying cumulative substantial improvement periods. Objectives of the research include: (1) an evaluation of the benefits and long-term effects of specifying cumulative substantial improvement periods; (2) a recommendation on the maximum length of cumulative substantial improvement periods; (3) recommendations on county and municipality ordinance reporting requirements; and (4) discussion of concerns related to the differentiation between repair, reconstruction, rehabilitation, or improvement of a structure to harden a home for the purpose of resiliency, as a preventative measure (rather than in response to a storm) and local ordinances that make allowances for the repair or replacement of a structure that do not directly harden a home.[2]

This final report addresses all objectives listed above. We begin with a discussion of our research plan, followed by important background information and a review of the relevant literature. Then, describe how we identified lookback periods and present the results of our quantitative and qualitative analysis. A final section concludes with our recommendations.

1.1 Research Plan

In this section, we discuss the steps taken as we began our study of lookback periods in Florida. Through a series of team discussions, we collected thoughts on how we might identify costs and benefits of lookback periods. It was especially important, at this stage, to gather the relevant institutional information and to determine sources of data that might be needed for analysis. We describe our initial activities in the sections below.

1.1.1 Identification of pertinent communities in Florida

Our first step was to identify communities in Florida most relevant for a study of lookback periods. This involves determining which Florida communities are eligible for and are participating in the National Flood Insurance Program's (NFIP) CRS, the voluntary incentive program that recognizes and encourages community flood plain management practices. Individuals in communities that participate in the CRS program and have reached a minimal level of points required receive discounted flood insurance rates that reflect the community's efforts to "(1) reduce and avoid flood

[2] The appropriation language defines the term "substantial improvement period" to mean the calculated length of time for any repair, reconstruction, rehabilitation, or improvement of a structure to harden a home for purposes of resiliency, as a preventative measure rather than in response to a storm. The NFIP defines the cumulative substantial improvement period that tracks the cumulative value of improvement projects, without differentiating between improvement projects that may harden a home (e.g., protect against wind) and projects that just add value (e.g., building an addition). This study will focus on the NFIP definition of cumulative substantial improvement period.

damage to insurance property, (2) strengthen and support the insurance aspects of the NFIP, and (3) foster comprehensive flood plain management."[3]

A list of CRS Eligible communities is available from FEMA.[4] This list shows the level of the discount obtained for each community and ranges from 0 (no participation) to 45 percent (Class 1 participation), where credit points are obtained through 19 creditable activities. The CRS credit points communities for tracking and accumulating substantial improvements over a lookback period of at least five years.[5] FEMA provides a spreadsheet called the CRS Communities Credit File (Last updated Oct 1, 2024). This spreadsheet provides a listing of the credits received by every CRS community in the US, including the lookback period credits. Using this list, we were able to identify every community in Florida receiving credit for having a lookback period of at least 5 years and a maximum improvement threshold of 50 percent.[6] This list includes lookback periods that are currently being enforced and have been reported to the NFIP for credit. It does not include communities that have lookback periods shorter than required for the credit (less than 5 years) or those which allow improvements to be greater than 50 percent of the building value and any communities that may have lookback periods in their ordinances but are not being enforced up to NFIP standards for credit.

The list of communities with lookback periods from the CRS spreadsheet was supplemented by searching the ordinances of every community in Florida that is CRS eligible to determine if lookback periods are present in current law. This allowed enable us to identify communities with shorter lookback periods than the 5-year minimum and allowed us to more precisely identify the lookback periods that differ from the credit minimums. We discuss our approach to developing the list in a later section of this report.

Finally, we surveyed a variety of stakeholders in each Florida community to determine if any communities have lookback periods that we may have missed in the first two methods above. We believe we have identified the most comprehensive list of Florida communities with lookback periods. This step is discussed in more detail later in this report.

1.1.2 Identification of Stakeholders

Through initial discussions among all research team members, we identified the extent of our expertise and knowledge and assessed our access to readily available data and information. These discussions included an itemization of the types of questions we sought to answer in this project

[3] https://www.fema.gov/flood plain-management/community-rating-system
[4] Ibid.
[5] These credits are found under Activity 430, section 432.d in the *CRS Coordinator's Manual (2017).*
[6] A 50% threshold is part of the definition of "substantial improvement" (Title 44, Code of Federal Regulations, Section 59.1). Lower Substantial Improvement Threshold (LSI) credits may be earned by dropping the threshold below the 50%, e.g., 10 points if the threshold is 45% to 49%.

and, consequently the stakeholders that would be best suited to fill any gaps in our expertise and understanding. We identified four sets of primary stakeholders whose experiences and opinions would be especially helpful: (1) flood plain managers, (2) property appraisers, (3) building managers, and (4) Florida homeowners, especially those constituents living in communities in Florida eligible for or participating in the CRS program. Our list of flood plain managers contained many individuals with building permitting authority, so we focused on this group for our first survey. We then developed a survey for Florida homeowners to gain a broader perspective of the lookback issue in Florida. Together, these surveys facilitate a comprehensive evaluation of lookback periods by integrating technical, practical, and social perspectives. Our survey methodology and the results of our surveys are described in Section 10 of this report.

1.1.3 Gathering preliminary data on relevant communities

As we developed our research plan, we identified the specific data needed for each Florida community and, consequently, the sources of this data. We compiled data from federal, state, and local sources to create databases for our quantitative analysis. Later in this report, we describe how we evaluated local ordinance information for those communities that have defined cumulative substantial improvement periods. We also explain how we collected community and property level data (e.g. structure values, tax base, flood plain location, etc.) and information on flood insurance purchases.

1.1.4 Refining Costs and Benefits

Throughout the project, our goal was to identify all potential benefits and costs of implementing a lookback period for substantial improvements to property, thus facilitating a cost-benefit analysis. Different stakeholders experience the costs and benefits in distinct ways. For example, a flood management policy might benefit the broader community by reducing flood risk but impose higher compliance costs on property owners. From the homeowner's perspective, if a lookback period results in an increase in CRS credit points, there should be a benefit in the form of lower flood insurance premiums. We recognized a need to better understand both direct and indirect consequences, e.g., on building permit approvals and housing values. Our initial discussions of these costs and benefits motivated the quantitative and qualitative analysis presented in this report.

1.1.5 Identifying Projects to Enhance CRS Program Benefits

Lookback periods are just one of many tools that allow communities to achieve CRS program benefits (i.e., credits). We conducted a review of the types of projects that have been implemented or are being considered across Florida communities. We include a brief review of the literature that provides evidence of the effectiveness of various flood mitigation activities from around the country.

2 Background

Flood risk poses a significant cost to society. Within the United States, the flood risk in Florida poses a significant challenge due to the topography of the land and hurricane risk. We first provide a summary of key points discussed in detail throughout the background section.

- It is estimated that the annual economic burden of flood in the United States is between $179.8 and $496.0 billion in 2023 dollars. Since 2000, floods have cost an estimated $850 billion to U.S. taxpayers, which is two-thirds of all natural disasters. Most of the top 10 flood event payouts from the NFIP relate to hurricane-related flooding.
- The costs of flood risk go beyond property costs to include impacts on infrastructure, agriculture, healthcare, government expenditures, job loss, tax revenue, as well as the potential decline in tourism.
- While 99 percent of counties in the United States have been impacted by a flooding event between 1996 to 2019, the variation in flood exposure and growth in properties in flood risk areas vary significantly.
- Based on the amount of coastal exposure and its vulnerability to hurricanes, Florida has the highest hurricane coastal flood risk. Florida is the largest state represented in the NFIP with approximately 37 percent of the policies in force and 36 percent of the coverage written. This percentage has grown in recent years. The next closest state is Texas with approximately 14 percent of the policies in force and 15 percent of the total coverage.
- Flood risk varies across the state of Florida differs in coastal exposure, population, property value, and communities' mitigation characteristic. Based on NFIP data, 20 percent of policies in force are in Miami-Dade and followed by approximately 11 percent in Broward, eight percent in Lee, and 7-8 percent each in Pinellas and Palm Beach counties.
- In many cases, the losses associate with flood are not covered to the same extent as other property-related losses. It is estimated that over 87 percent of flood losses for single family homes are not covered by the NFIP coverage and a small amount is covered by private insurance.
- Households that have positive expectations for disaster aid eligibility are 25 to 42 percent less apt to purchase flood insurance.
- The Federal Emergency Management Association (FEMA) and by extension the NFIP operate under the Department of Homeland Security.
- The NFIP is a voluntary program flood insurance is only available to homeowners, renters, and businesses in participating communities, or communities that implement and enforce the NFIP's flood plain management standards. Coverage is mandatory homeowners in Special Flood Hazard Areas (SFHA) for mortgages from government-backed lenders. There were more than 18,500 communities participating in the program with approximately 4.65 million policies in force totaling $1.28 trillion in coverage.
- Flood Insurance is provided by both the NFIP and private insurers. NFIP coverage is limited. For example, the maximum for residential structures for a family of one-to-four is

$250,000 in building coverage and $100,000 in contents coverage. For residential structures of five or more units, the maximum is $500,000 in building coverage and $100,000 in contents coverage. There are options related to deductibles, limits and replacement cost provisions. NFIP rating factors include flood risk, building characteristics, and the replacement cost and coverage levels selected.

- FEMA creates requirements for communities that outline flood-related standards. Additionally, communities cooperate with FEMA in the development of Flood Insurance Rate Maps (FIRM) that outline flood risk areas.
- The CRS allows firms the opportunity to receive credits on NFIP flood insurance. Premium credits are assigned based on the number of CRS credit points earned and assigned to a class of one through ten. CRS Class one communities have over 4,500 points and receive a 45 percent reduction in premium for policies in the SFHA and 10 percent outside the SFHA. Conversely, CRS Class ten communities have less than 500 points and receive no premium reduction
- Points toward credits can be earned for various activities, including, but not limited to elevation certificates, outreach projects, flood hazard mapping, open space preservation, stormwater management, drainage system maintenance, and other related activities specified by the CRS program.
- One possible activity that provides communities the opportunity to earn points toward premium credits is implementing a higher regulatory standard related to substantial improvement of the structure. FEMA defines substantial improvement as "any reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure (or smaller percentage if established by the community) before the 'start of construction' of the improvement.
- There are up to 40 points available for communities with a cumulative substantial improvement provision with a 10-year lookback and up to 20 points for using a 5-year lookback.
- As part of the process, local officials are tasked with the following related to substantial improvements: determining cost, determining market values, making the determination if an improvement is a substantial improvement, and requiring permitting to bring the substantially improved building into compliance with the flood plain management requirements.

In the United States, it is estimated that the annual economic burden of flood is between $179.8 and $496.0 billion in 2023 dollars (Joint Economic Committee, 2024). Abegaz, Wang, and Xu (2024) report that based on NOAA data, flooding is the most expensive natural disaster in the United States costing over $1 trillion in inflation-adjusted dollars since 1980. To understand flood risk, we must understand both the scope of the impact as well as the major types of flood risk.

While damage to personal and commercial property and costs related to loss of use and/or loss of income while property is being repaired are the most common types of losses that most consider, there are much broader impacts. Other economic impacts include infrastructure damage, increased insurance claims, impacts to agriculture and healthcare, government expenditures, job loss, and the potential decline in tourism (Abegaz, Wang, and Xu, 2024). Other related costs include the cost of evacuation as well as physical and mental health issues following the event (Association of State Floodplain Managers, 2020). Communities often face significant cleanup costs, costs of rescue response, and potential impacts to water and wastewater treatment facilities (Association of State Floodplain Managers, 2020). Further, floods can impact taxes and property values. While some of the costs to communities and states may be partially offset by federal relief in large flooding events, smaller events are often not covered.

The cost beyond the direct impact to individual property and businesses are substantial. For example, between 1998 and 2014, the United States spent approximately $48.6 billion to repair damage to the infrastructure related to floods (Abegaz, Wang, and Xu, 2024). Since 2000, floods have cost an estimated $850 billion to U.S. taxpayers, which is two-thirds of all natural disasters (Abegaz, Wang, and Xu, 2024). Given the high economic costs of flood, the potential mitigation and financing of flood risk is of significant importance regardless of one's personal exposure to flood.

2.1 Sources of Flooding

Flood exposure arises from a variety of sources including surface water flooding (pluvial flooding), river flooding (fluvial flooding), and coastal flooding. It can come from flash flooding, man-made events such as a damn breakage, or weather events. For this reason, the amount of warning related to a flood event and the scope of the event varies greatly.

There is some chance of flooding in most counties across the country. According to the Federal Emergency Management Agency (FEMA), 99 percent of counties in the United States have been impacted by a flooding event between 1996 to 2019 (Federal Emergency Management Agency, 2024d). According to the Congressional Budget Office (2023), the 2020 projection estimates that 9.1 percent of the properties in the United States face at least a one percent annual probability of experiencing a flood of a depth of one foot or more. The same study suggests that this will increase to 10.1 percent by 2050. However, the chances of flooding are concentrated in certain states and within particular areas of states.

While flood can come from a variety of sources, a review of the major losses within the United States indicates a significant impact for coastal communities. According to the Insurance

Information Institute, most of the top 10 flood event payouts from the NFIP relate to hurricane-related flooding (2024).[7]

This highlights the potential large-scale impact of storm surge in coastal areas. The same report from the Insurance Information Institute estimates that the storm surge risk for Gulf and Atlantic States in 2024 ranges from 1,304,612 homes with a reconstruction cost of $396 billion for a Category 1 storm to 7,735,659 homes at $2,343 billion for a Category 5 storm Insurance Information Institute, 2024).

2.2 The Challenge of Funding Flood Losses

In addition to the large scale of flood risk, another challenge is that in many cases, the losses associate with flood are not covered to the same extent as other property-related losses. For example, a report by the Society of Actuaries, estimates that expected flood losses to the single-family residence building is over $7 billion a year (2020). Over 87 percent of those losses are expected to be uninsured by the NFIP with the number only marginally improving if private insurance is included (Society of Actuaries, 2020).

The purchase of flood insurance is not mandated for many homes.[8] A recent survey of homeowners' perceptions of risk found that 64 percent of homeowners say that are not at risk for flooding, 14 percent say they do not know, and 22 percent say that are a risk of flooding (Insurance Information Institute and Munich Reinsurance, 2023). Of those who say they are at risk of flooding, only 78 percent purchased insurance (Insurance Information Institute and Munich Reinsurance, 2023). Landry, Turner, and Petrolia (2021) are among studies that examine the potential impact of disaster assistance on the decision to purchase flood insurance. The find that households that have positive expectations for disaster aid eligibility are 25 to 42 percent less apt to purchase flood insurance. According to the authors, this could equate to 817,000 uninsured homes and a loss of $526 million in annual revenue for the NFIP. Thus, it is not surprising that the penetration rated for flood insurance is often very low. While the percentage of homes with flood insurance varies across Metropolitan Statistical Areas (MSAs), it is estimated that in 69 percent of MSAs in the United States, 90 percent or more of the expected flood losses are uninsured (Society of Actuaries, 2020). The same study estimates that only six percent of MSAs have more than 30 percent of their expected flood losses insured (Society of Actuaries, 2020).

2.3 Flood Risk in Florida

Based on the amount of coastal exposure and its vulnerability to hurricanes, Florida has the highest hurricane coastal flood risk (Paleo-Torres et al., 2020). Based on data from the NFIP as of

[7] The list includes Hurricane Katrina, Superstorm Sandy, Hurricane Harvey, Hurricane Ian, and Hurricane Ike. For the full list of the 10 most significant flood events, including number of paid losses and amount paid, see https://www.iii.org/fact-statistic/facts-statistics-flood-insurance.

[8] A review of the mandates related to flood insurance purchase can be found in Appendix A of this report.

September 30, 2024, the top 10 states by number of policies are reported in Table 1. Given the large coastal exposure in the state of Florida coupled with its hurricane risk, it is not surprising that Florida is the largest states represented in the NFIP. Based on policies in force on September 20, 2024, approximately 37 percent of the policies in force and 36 percent of the coverage written are in Florida (National Flood Insurance Program, 2024). The next closest state is Texas with approximately 14 percent of the policies in force and 15 percent of the total coverage.

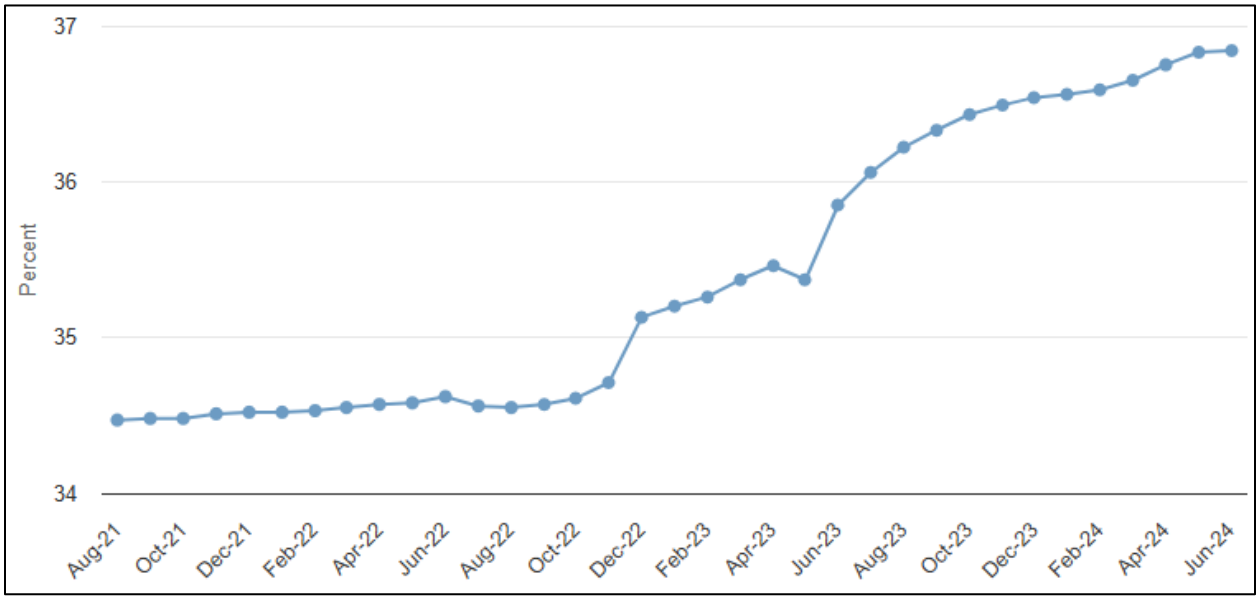
Table 1. Top Ten States by Number of Policies

State	Sum of Policies in Force	Sum of Total Coverage	Sum of Total Written Premium + FPF	Sum of Total Annual Payment
Florida	1737117	$ 461,290,250,000	$ 1,434,126,360	$ 1,767,534,316
Texas	644812	$ 195,697,000,000	$ 548,580,320	$ 682,738,851
Louisiana	436741	$ 123,780,845,000	$ 387,552,479	$ 484,766,255
California	186534	$ 56,636,725,000	$ 167,136,267	$ 211,518,723
South Carolina	198616	$ 54,835,826,000	$ 135,986,177	$ 171,025,185
New Jersey	202251	$ 53,409,768,000	$ 197,743,148	$ 250,547,211
New York	168330	$ 47,771,768,000	$ 184,603,498	$ 228,730,679
North Carolina	129850	$ 36,146,604,000	$ 103,512,708	$ 134,367,333
Virginia	92421	$ 26,230,363,000	$ 65,289,782	$ 82,441,053

Note: Information obtained from the NFIP website available at https://nfipservices.floodsmart.gov/reports-flood-insurance-data.

Figure 1 shows how the percentage of NFIP policies written in Florida has increased over the past four years.

Figure 1. Percentage of NFIP Policies from Florida



Source: NFIP

The types of flood exposure and potential severity vary dramatically across the state. As one would expect, given the difference in coastal exposure, concentrations of populations, and variation in property value, the number of policies in force through the NFIP varies dramatically by county. About 20 percent of the policies in force and coverage in force are in Miami-Dade. This is followed by approximately 11 percent in Broward, eight percent in Lee, and 7-8 percent each in Pinellas and Palm Beach counties. The top 10 counties by volume of exposure in the NFIP are provided in Table 2.[9]

Table 2. Top Ten Florida Counties by Number of Policies

County	Sum of Policies in Force	Sum of Total Coverage	Sum of Total Written Premium + FPF	Sum of Total Annual Payment
Miami-Dade County	356920	$ 88,546,648,000	$ 201,628,255	$ 249,729,761
Broward County	200911	$ 52,906,921,000	$ 110,201,555	$ 137,437,441
Lee County	139405	$ 35,886,168,000	$ 183,189,159	$ 222,914,832
Pinellas County	130376	$ 32,906,380,000	$ 157,558,867	$ 190,533,934

[9] For comparison, a table of all counties in Florida is provided in Table B-1 in Appendix B.

Palm Beach County	129990	$	35,921,254,000	$	65,998,488	$	82,884,854
Collier County	105064	$	27,643,178,000	$	107,405,068	$	132,067,944
Hillsborough County	64060	$	18,557,022,000	$	76,242,595	$	93,031,881
Sarasota County	61799	$	16,643,934,000	$	66,612,100	$	81,582,581
Volusia County	47452	$	12,137,038,000	$	26,042,787	$	32,157,072
Brevard County	44860	$	12,787,240,000	$	27,421,284	$	34,008,010

Note: Information obtained from the NFIP website available at https://nfipservices.floodsmart.gov/reports-flood-insurance-data.

2.4 The Creation of the Department of Homeland Security

To understand the current approach to managing flood risk in the United States, it is important to understand the creation and growth of the NFIP. Its origin begins with the Department of Homeland Security (DHS). DHS was created with the passage of the Homeland Security Act of 2002. The Act was in direct response to the terrorist attack on 9/11. The involvement of various government offices in an effort to coordinate resources and increase security revealed the need for a more coordinated structure for protecting the United States at home. The stated purpose of DHS is to:

- "prevent terrorist attacks within the United States;
- reduce the vulnerability of the United States to terrorism;
- minimize the damage, and assist in the recovery, from terrorist attacks that do occur within the United States;
- carry out all functions of entities transferred to the Department, including by acting as a focal point regarding natural and manmade crises and emergency planning;
- ensure that the functions of the agencies and subdivisions within the Department that are not related directly to securing the homeland are not diminished or neglected except by a specific explicit Act of Congress;
- ensure that the overall economic security of the United States is not diminished by efforts, activities, and programs aimed at securing the homeland; and
- monitor connections between illegal drug trafficking and terrorism, coordinate efforts to sever such connections, and otherwise contribute to efforts to interdict illegal drug trafficking" (Public Law 107-296, 2002).

As outlined in the Proposal to Create the Department of Homeland Security (2002), the purpose was to increase the efficiency within which agencies with corresponding missions operated by lessening redundancies and improving allocation of resources. The DHS is organized into four divisions, each with specific responsibilities. Border and Transportation Security became the division responsible for managing all aspects of entry into the United States. The Chemical,

Biological, Radiological and Nuclear Countermeasures division was tasked with planning for and managing risks related to weapons of mass destruction. As the name implies, the Information Analysis and Infrastructure Protection division dealt with gathering and analyzing intelligence information related to threats and providing assessing the "vulnerabilities American's critical infrastructure." The last division was the Emergency Preparedness and Response division. This division was responsible for assisting in the preparation for, mitigation of, responses to, and recovery efforts from domestic disasters.[10] The Federal Emergency Management Agency (FEMA) became a critical part of this division.

2.5 The Creation of the Federal Emergency Management Agency

In the early 1800s, the Federal government began providing disaster assistance and/or relief to its citizens. This included responses to fires in Portsmouth, New Hampshire (1802) and Chicago, Illinois (1871), and flooding in Johnstown, Pennsylvania (1889). As disasters continued to occur, the need for Federal intervention grew. At the same time, advancements in technology and the government's growing knowledge of hazard risks increased its abilities to assist with "mitigation methods to reduce vulnerability and impacts of disasters" (Federal Emergency Management Agency, 2019a). Under the system in existence at this time, Congress had to pass a law after a disaster to support those impacted by the event. To improve the existing system, a federal law was passed in 1950 that allowed state governments to ask for Federal support from the President and granted the President the ability to declare disasters.[11]

The idea for a federal flood program had been discussed as early as 1917, when the U.S. Congress first passed the Flood Control Act. Twenty years later, in 1936, Congress passed a second iteration of the Flood Control Act. Then, in 1951, President Harry Truman pushed for a federal system of flood insurance but was unsuccessful (American Academy of Actuaries, 2011). Then, in 1965, Hurricane Betsy made landfall first in Florida and then in Louisiana. This hurricane resulted in seventy-six deaths and an estimated $1.42 billion in damages (University of Rhode Island, 2024). A few short years after Hurricane Betsy, Congress enacted the National Flood Insurance Act of 1968 which created the NFIP (NFIP) and a program focused on risk mitigation efforts.[12] The NFIP was created primarily due to costs associated with increased federal disaster assistance in response to flooding during a time where flood damage was considered "uninsurable" in the private market (National Association of Insurance Commissioners, 2024).

[10] For additional information on the motivation for the creation, structure, and responsibilities of the organizations within DHS as well as the existing and new agencies of each of the four divisions, see The Department of Homeland Security (2002).

[11] Around the same time, World War II and the Cold War brought attention to issues related to both security and continuity of operations. This led to the Federal Civil Defense Act of 1950 which provided a similar system focused on civil defense.

[12] The National Flood Insurance Act of 1968 was part of the Housing and Urban Development Act of 1968. With the availability of flood insurance through the NFIP, the Flood Disaster Protection Act of 1973 subsequently mandated that flood insurance be purchased on properties in high-risk flood areas. This Act is discussed in National Flood Insurance Program section.

These early efforts laid the foundation for FEMA, which was created shortly after the partial nuclear meltdown of a reactor at Three Mile Island which again brought to light the need for more coordinated disaster responses. Specifically, when Executive Order 12127 was signed by President Carter in early 1979, FEMA was created and absorbed the functions previously the responsibility of a variety of other agencies such as the Department of Commerce, the National Fire Prevention and Control Administration, and the Department of Housing and Urban Development. These responsibilities included management of the NFIP, the ability to "borrow from the Treasury to make payments for reinsured and directly insured losses," and control of the Emergency Broadcast System (Executive Order 12127, 1979). Just two months later, President Carter signed Executive Order 12148 which expanded the mission of FEMA to also include civil defense.

Over the years, there have been a number of changes to FEMA. Commonly called the Stafford Act, the Disaster Relief and Emergency Assistance Amendments of 1987 increased the maximum grant amount that the Federal government could provide to states for disaster preparedness programs, added temporary housing as part of the Federal assistance, mandated that the President create standards for determining the "efficiency and effectiveness of major disaster and emergency assistance programs" that are part of the Act, and established the Federal share amount for essential benefits after a major disaster at 75 percent (100th Congress, 1988). In addition, it changed the definition of an emergency and defined 'major disaster.'

As noted in the previous section, FEMA became part of the DHS with the passage of the Homeland Security Act of 2002. This resulted in the expansion of the responsibilities of FEMA beyond emergency assistance and civil defense to include domestic disasters such as acts of terrorism. The Post-Katrina Emergency Management Reform Act of 2006, which was part of the Department of Homeland Security Appropriations Act, was passed in response to Hurricane Katrina in 2005, one of the deadliest and costliest hurricanes in U.S. history. This hurricane impacted multiple states, led to over 1,800 deaths, and resulted in more than $100 billion in property damage (National Weather Services, 2024). The Post-Katrina Emergency Management Reform Act of 2006 established new objectives for FEMA, restructured the organization of the agency, and expanded the agency's authority (109th Congress, 2006). Prior to this Act, there were four components to the mission of FEMA – prevention, protection, mitigation, and response. This Act added a fifth component – recovery. As such, the responsibilities of FEMA now included:

- "leading the nation's CEM efforts (including protection) for all hazards, including catastrophic incidents;
- partnering with non-federal entities to build a national emergency management system;
- developing federal response capabilities;
- integrating FEMA's CEM responsibilities;
- building robust regional offices to address regional priorities;
- using DHS resources under the Secretary's leadership;

- building non-federal emergency management capabilities, including those involving communications; and
- developing and coordinating the implementation of a risk-based all hazards preparedness strategy that addresses the unique needs of certain incidents" (Bea, 2007).

In October of 2012, Superstorm Sandy struck a large area along the northeastern coast. Though New York and New Jersey sustained the most damage, it resulted in a loss of power to 7.5 million households and businesses across 15 states and the District of Columbia (Duke, 2012). Due to its large size, it resulted in property damage in excess of $70 billion, making it one of the costliest hurricanes/storms in U.S. history (Peer, 2024). A few months later, President Obama signed the Sandy Recovery Improvement Act into law.[13] The focus of the Act was on assistance programs. Specifically, the program created alternative procedures for work and debris removal grants, confirmed childcare qualified as eligible expenses for reimbursement, and granted FEMA the authority to lease property for the purpose of temporary housing. It also mandated that the agency regularly evaluate the factors considered when determining whether people qualified for assistance (113th Congress, 2014a).

More recently, the Disaster Recovery Reform Act of 2018 was signed by President Trump. This Act contained 56 provisions designed to simplify FEMA and better prepare for future catastrophic events (Federal Emergency Agency 2021b). Provisions cover a wide range of topics including wildfire prevention, evaluation routes, mitigation activities, expanding the list of relief organizations, and a number of reporting requirements. Collectively, these provisions were aimed at reducing operational costs and increasing the response of assistance of FEMA. One year after the Act was passed, it was reported that 29 of the provisions had been implemented with an additional 12 provisions expected to be implemented by the end of the year. By year end 2020, the total reached 46.[14]

In furtherance of its five mission areas, FEMA currently manages the NFIP and a variety of individual assistance programs.[15] It also is responsible for periodic studies for the purpose of finding areas susceptible to flood, flood-related erosion, and mudslides; evaluating flood risk; and identifying insurance zones. As part of this process, FEMA develops Flood Insurance Rate Maps (FIRMs), commonly called flood maps, through a process called Risk Mapping, Assessment and Planning, (Risk MAP).[16] Five goals were established for Risk MAP:

[13] This Act was part of a larger Act titled Making supplemental appropriations for the fiscal year ending September 30, 2013, to improve and streamline disaster assistance for Hurricane Sandy, and for other purposes.
[14] For a detailed discussion of the provisions and related implementations, see Federal Emergency Management Agency (2019b), Federal Emergency Management Agency (2024a), and Webster, Lee, Lindsay, Normand, Horn, and Paris, 2021).
[15] For more information about the individual assistance programs of FEMA and how these can coordinate with Small Business Administration loan programs, see Lindsay and Webster (2019).
[16] This process is undertaken cooperatively with the NFIP.

- "Address gaps in flood hazard data to form a solid foundation for risk assessment, flood plain management, and actuarial soundness of the NFIP.
- Ensure that a measurable increase of the public's awareness and understanding of risk results in a measurable reduction of current and future vulnerability to flooding.
- Lead and support states, local and tribal communities to effectively engage in risk-based mitigation planning resulting in sustainable actions to reduce or eliminate risks to life and property from hazards.
- Provide an enhanced digital platform that improves management of Risk MAP, stewards the information produced by Risk MAP and improves the communication and sharing of risk data and related products with all levels of government and the public.
- Align Risk Analysis programs and develop synergies to enhance decision making capabilities through effective risk communication and management" (Federal Emergency Management Agency, 2009).

The most recent plan published by FEMA notes several strategic changes identified for the 2023-2027 timeframe. First is a change in the way risk is evaluated. FEMA expects to move away from the updating of regulatory maps and shifting to the use of "more comprehensive flood hazard and risk information" (Federal Emergency Management Agency, 2023). Second is gaining a better understanding of the factors that impact the decision-making of communities and customers so that specific and targeted messaging could be developed. Finally, FEMA will shift to a more customer-based method of managing the NFIP and work more with key organizations. These strategic changes resulted in the updating of four of the five Risk MAP goals discussed above.[17]

The Creation of the National Flood Insurance Program

As indicated in the preceding section, the NFIP was created with the passage of the National Flood Insurance Act of 1968 for the purpose of making flood insurance available and mitigating flood risk. This Act states "(1) from time to time flood disasters have crated personal hardships and economic distress which have required unforeseen disaster relief measure and have placed an increasing burden on the Nation's resources; (2) despite the installation of preventative and protective works and the adoption of other public programs designed to reduce losses caused by flood damage, these methods have not been sufficient to protect adequately against growing exposure to future flood losses; (3) as a matter of national policy, a reasonable method of sharing the risk of flood losses is through a program of flood insurance which can complement and encourage preventative measures; and (4) if such a program is initiated and carried out gradually, it can be expanded as knowledge is gained and experience is appraised, thus eventually making flood insurance coverage available on reasonable terms and conditions to persons who have need for such protection" (90th Congress, 1968).

[17] For specific information on how the goals have changed and how the new goals will be implemented, see Federal Emergency Management Agency (2023).

Initially, coverage was available for owners of single-family homes, multi-unit residential properties with four or fewer units, and businesses in areas that, by the end of June 1970, would have adopted land use and safeguards that were consistent with those outlined in the Act. The Act also contained information around the development of rates, the creation of the National Flood Insurance Fund, and general financing of the NFIP. An initial limit of $2.5 billion was set for the maximum coverage in force.

As noted in the Act, it was expected that the NFIP would change over time. The Flood Disaster Protection Act of 1973 indicated that "annual losses throughout the Nation from floods and mudslides are increasing at an alarming rate, largely as a result of the accelerating development of, and concentration of population in, areas of flood and mudslide hazards" (93rd Congress, 1973). As a result, this Act mandated the purchase of flood insurance by those supported by "Federal programs or by federally supervised, regulated, or insured agencies or institutions" that were in or would be in high-risk flood areas. It also mandated that communities at the state and local level had to take part in the flood insurance program to be eligible for Federal financial assistance in the future. In addition to these requirements, the Act also increased the limits of liability for flood insurance policies.

The National Flood Insurance Reform Act of 1994 was part of the Riegle Community Development and Regulatory Improvement Act of 1994 and included provisions that focused on improving compliance with the requirement of flood insurance in high-risk areas by instituting fines for lenders that did not verify that flood coverage was purchased, increasing flood insurance coverage levels, limiting annual rate increases, allowing private insurers to participate in the NFIP, and requiring a review and revisions of flood insurance maps on a regular basis. It also created the CRS which is discussed later in this report (103rd Congress, 1994).

The Bunning-Bereuter-Blumenauer Flood Insurance Reform Act of 2004 targeted what was termed 'repetitive-loss properties' in an effort to decrease future losses, noting that "repetitive-loss properties comprise approximately 1 percent of currently insured properties but are expected to account for 25 to 30 percent of claims losses" (108th Congress, 2004). This Act outlined a pilot program available to states focused on mitigation of these properties. It also included a buy-out option for repetitive loss properties if certain conditions were met.

As noted earlier, Hurricanes Katrina was one of the deadliest and costliest hurricanes in U.S. history. Hurricane Rita occurred just one month later. These hurricanes accounted for payments of around $20 billion. Before 2006, the NFIP had only paid out $15 billion since its creation. The financial repercussions of Hurricanes Katrina and Rita ultimately led to an increase in the borrowing allowance granted to the NFIP. According to the American Academy of Actuaries, "In March 2006, President Bush signed S. 2275, which authorized the NFIP to increase its borrowing authority to $20.775 billion" (American Academy of Actuaries, 2011). This dramatic increase in

financial resources allotted to the NFIP helped push the program to its current state, focusing on more than just aiding communities after flood damage.

The Biggert-Waters Flood Insurance Reform Act of 2012 was part of a much larger bill titled Moving Ahead for Progress in the 21st Century Act or MAP-21. The subsection related to flood insurance primarily aimed to improve the financial soundness of the NFIP. Specifically, it changed the rating structure and created the Technical Mapping Advisory Council. It set forth the organization of the Council and outlined its purpose as such: to "develop recommendations on how to—(i) ensure that flood insurance rate maps incorporate the best available climate science to assess flood risks; and (ii) ensure that the Federal Emergency Management Agency uses the best available methodology to consider the impact of—(I) the rise in the sea level; and (II) future development on flood risk" (112th Congress, 2012). In addition, it expanded coverage for multi-unit residential properties to include those with five or more units. Finally, it created the National Flood Insurance Reserve Fund which could be used to pay claims, pay back debt, and cover future obligations as needed.[18]

The Consolidated Appropriations Act of 2014 barred the implementation of a Section 100207 of the Biggert-Waters Flood Insurance Reform Act, essentially delaying the requirement of full risk rates, as a result of concerns regarding rate increases (113th Congress, 2014b). The Homeowner Flood Insurance Affordability Act of 2014 repealed some of the provisions of Biggert-Waters Flood Insurance Reform Act and instituted a rate increase limit of 18 percent on certain properties. It also charged FEMA with the directive to attempt to limit the number of policies with rate increases of more than one percent and to obtain reinsurance from private reinsurers and the capital markets "in an amount sufficient to maintain the ability of the program to pay claims" (113th Congress, 2014c).

As indicated in the prior section, in addition to managing the NFIP, FEMA was also tasked with flood mitigation efforts which includes the Flood Mitigation Assistance (FMA) Program. The FMA Program awards participating communities with grants towards additional flood damage prevention projects. The funding for the FMA Program is provided from revenue created by the NFIP (Horn and Brown, 2018). Additionally, FEMA and the NFIP work cooperatively to create and manage flood maps. These flood maps are publicly available and allow property owners to make informed purchase and mitigation decisions. They are also used by mortgage lenders to determine if flood insurance is required on a property and by communities to "plan development and make infrastructure improvements" (Federal Emergency Management Agency, 2024c).

[18] For a timeline of the implementation of this Act, see https://www.fema.gov/sites/default/files/2020-07/timeline-bigger-waters-flood-insurance-act-2012.pdf.

2.6 National Flood Insurance Program Policies

In its current form, the NFIP is a voluntary program for communities. However, flood insurance is only available to homeowners, renters, and businesses in participating communities, or communities that implement and enforce the NFIP's flood plain management standards. Additionally, those with mortgages provided by government-backed lenders must purchase flood insurance if they reside in a Special Flood Hazard Area (SFHA) and the community "participates or has participated in the NFIP" (Horn and Webel, 2024).[19] Coverage is provided through both private insurance companies and NFIP Direct. There are currently three standard flood insurance policies (SFIPs) available: the Dwelling Policy, the General Property Policy, and the Residential Condominium Building Association Policy. The maximum coverage available for homes with one to four units is $250,000 for the building and $100,000 for contents. The limits for other residential properties are $500,000 for the building and $100,000 for contents. For non-residential properties, the limits are $500,000 for building and $5000,000. Finally, renters can purchase content only coverage up to the limits specified (Horn and Webel, 2024).

It should be noted that since the coverage offered by the NFIP may be less than the true dollar amount of the damaged properties, individuals can purchase additional flood insurance through the private market if they so choose. Another important caveat to the NFIP is properties built before December 3, 1974, or before the community's first Flood Map was created, can receive lower premium rates.

To determine the rate for coverage, the NFIP considers multiple factors to evaluate the true flood risk of the property, including on where the property is located, the property characteristics, and the replacement cost and coverage selected. With property location, the distance to flood sources, ground elevation, and other characteristics are considered. In terms of building characteristics, factors such as the type and use of the property, the foundation, construction type, the height of the first floor, and the number of openings are evaluated. Finally, the replacement cost as well as the coverage amount and deductible levels selected impact the cost of coverage.[20]

As of September 2024, there were more than 18,500 communities participating in the program with approximately 4.65 million policies in force totaling $1.28 trillion in coverage (Federal Emergency Management Agency, 2024a). Financials for years 2021 and 2022 indicate that the National Flood Insurance Fund experienced a net loss in both years while the National Flood Insurance Reserve Fund has had positive net income (Federal Emergency Management Agency, 2024b).

[19] Government-backed lenders include the Department of Veterans Affairs, the Federal National Mortgage Association, the Federal Home Loan Mortgage Corporation, and federally-regulated lenders

[20] For additional details on rating factors considered by FEMA, see the "Rate Explanation Guide" available at https://agents.floodsmart.gov/sites/default/files/fema-risk-rating-rate-explanation-guide.pdf.

2.7 Flood Plain Management

The minimum flood plain management standards for participation in the NFIP are defined by FEMA. FEMA creates specific requirements for communities based on their unique flood risk and the level of data FEMA provides to the community. "Key conditions of the NFIP minimum standards include, among many other conditions, that communities require permits for development in the SFHA, require elevation of the lowest floor of all new residential buildings in the SFHA to or above the Base Flood Elevation (BFE), restrict development in the regulatory floodway to prevent increasing the risk of flooding, and require certain construction materials and methods that minimize future flood damage" (Horn and Brown, 2018). Through adherence to these standards, FEMA is able to "(1) constrict the development of land which is exposed to flood damage where appropriate, (2) guide the development of proposed construction away from locations which are threatened by flood hazards, (3) assist in reducing damage caused by floods, and (4) otherwise improve the long-range land management and use of flood-prone areas" (Horn and Webel, 2024).

For the NFIP to assess the overall flood hazard of different areas, it requires participating communities to cooperate with FEMA to create FIRMS. Currently, there are several different flood zones that are identified by symbols. Zones A (A1-30), AE, AH, AO, V, VE, VO, and V1-30 are designated SFHAs. These are areas "exposed to a 1 percent or greater risk of flooding every year" (Horn and Webel, 2024). Additionally, V zones are areas exposed to coastal flooding. The complete list of Flood Zones is provided in Table C-1 in Appendix C.

Developing and updating FIRMS can take up to three to five years, so the process is extensive. FEMA utilizes local engineers, community members, and computer models to create and update FIRMS. Essentially, these flood maps tell a community how likely a specific area is to flood. Communities participating in the NFIP are effectively entering a long-term partnership with the NFIP and FEMA to prevent and limit flood damage in exchange for flood insurance programs.

2.8 The Community Rating System

FEMA also provides communities with an opportunity to receive discounted rates through the CRS. As outlined in the NFIPs CRS Coordinator's Manual, the CRS has 10 classes, with 1 being the best rating and receiving the highest premium discounts. By taking steps to reduce flood risk in addition to the minimum required standards, communities in SFHAs can earn points within the CRS. Beginning in Class 9, communities receive a five percent discount, with an additional five percent discount for each higher class, with the maximum discount of 45 percent for Class 1. Communities outside of SFHAs can also earn discounts, but the maximum discount is 10 percent (for Classes 1 through 6). The specific credit points required for each class are shown in Table 3.

Table 3. Community Rating System Classes, Credit Points, and Discounts

CRS Class	Credit Points	Premium Reduction In SFHA	Premium Reduction Outside SFHA
1	4,500+	45%	10%
2	4,000-4,499	40%	10%
3	3,500-3,999	35%	10%
4	3,000-3,499	30%	10%
5	2,500-2,999	25%	10%
6	2,000-2,499	20%	10%
7	1,500-1,999	15%	5%
8	1,000-1,499	10%	5%
9	500-999	5%	5%
10	0-499	0%	0%

Note: This table is a reproduction of Table 110-1, page 110-3 of the CRS Coordinator's Manual.

Credit points can be obtained through 19 different activities that fall into one of four categories: (1) public information activities, (2) mapping and regulations, (3) flood damage reduction activities, and (4) warning and response. The points associated with the activities vary. Within the public information category, communities can earn up to 350 points for outreach projects, the most points possible within this category. Activities generating the most points in the mapping and regulations category are open space preservation (up to 2,020 points) and higher regulatory standards (up to 2,042 points). For flood damage reduction activities, communities can earn the most points with acquisition and relocation (up to 2,250) and flood protection (up to 1,600). Finally, with warning and responses, communities can earn up to 395 points for flood warning and response.

The list of activities and associated points can be found in Table 4. As shown in the table, in 22016, some activities are more common than others. For example, more than 90 percent of communities receive public information activity credits for outreach projects and having elevation certificates. All communities receive mapping and regulation credits for having higher regulatory standards and 95 percent receive credits for flood data maintenance. The percentage of communities receiving credits in the other two categories is significantly lower. As it relates to flood damage activities, 64 percent receive credits for flood plain management and for warning and response, 35 percent receive credits for having dam failure maps. These are the most commonly awarded activities in these two categories.

Table 4. Activities and Credit Points

Activity	Maximum Possible Points	Maximum Points Earned	Average Points Earned	Percentage of Communities Credited
300 Public Information Activities				
310 Elevation Certificates	116	116	38	96%
320 Map Information Service	90	90	73	85%
330 Outreach Projects	350	350	87	93%
340 Hazard Disclosure	80	62	14	84%
350 Flood Protection Information	125	125	38	87%
360 Flood Protection Assistance	110	100	55	41%
370 Flood Insurance Promotion	110	110	39	4%
400 Mapping and Regulations				
410 Flood Hazard Mapping	802	576	60	55%
420 Open Space Preservation	2,020	1,603	509	89%
430 Higher Regulatory Standards	2,042	1,335	270	100%
440 Flood Data Maintenance	222	249	115	95%
450 Stormwater Management	755	605	132	87%
500 Flood Damage Reduction Activities				
510 Floodplain Mgmt. Planning	622	514	175	64%
520 Acquisition and Relocation	2,250	1,999	195	28%
530 Flood Protection	1,600	541	73	13%
540 Drainage System Maintenance	570	454	218	43%
600 Warning and Response				
610 Flood Warning and Response	395	365	254	20%
620 Levees	235	207	157	0.5%
630 Dams	160	99	35	35%

Note: This table is a reproduction of Table 110-2, page 110-6 of the CRS Coordinator's Manual.

The CRS Coordinator's Manual makes it clear that this is not an exhaustive list of activities. Specifically, it states communities may engage in other activities or have different approaches to the activities other than what is outlined in the manual. In such cases, the communities can submit

a request for credit to the ISO/CRS Specialist, which should include "documentation to support how the alternative approach or innovation meets the intent of, or is equivalent to, the prerequisite or the element and/or activity credited in the Coordinator's Manual" (Federal Emergency Management Agency, 2017). It should also be noted that in addition to earning a minimum of 500 points to receive discounts, communities must also adhere to requirements for specific classes. There are six prerequisites for communities to be considered Class 9 or better. Additional prerequisites are required to be considered Class 6 or better, Class 4 or better, and Class 1.[21]

An addendum to the CRS Coordinator's Manual was released in 2021.[22] It provides several new activities for which communities could earn credits. Within Floodplain Management Planning (Activity 510), credit is now available for creating a "a flood plain species assessment in addition to, or as an alternative to, a natural functions plan" as well as for establishing a plan to deal with properties that have sustained considerable damage. Credits are now also available related to flood warning and response (Activity 610) to communities that include in "their flood response operations plan specific measures for implementing substantial damage assessments after a flood." Finally, for activities related to flood insurance promotion (Activity 370), "the credit for a flood insurance coverage plan (element CP) is increased, as is that for providing technical assistance (element TA)" and several new activities have been added such that credits are available "for distributing flood insurance information (element FIB), for holding insurance-related town hall meetings (element FIM), and for a state requirement for continuing education for flood insurance agents (element SCE)." In addition to these new credit opportunities some additional prerequisites have been added for communities to achieve Class 9 or better and Class 8 or better status.

"As of April 2024, 1,752 communities participate in the CRS program, which represents approximately 6.6 percent of the total number of communities in the NFIP" and the average discount for CRS participating communities is 13.8 percent of total premiums (Horn and Webel, 2024). It is important to note that the NFIP subsidizes the CRS discount across all policies on a state basis. "To offset the CRS discounts, the NFIP applies a premium load across all policies in each state, in both CRS and non-CRS communities. When a community's CRS discount is lower than the average discount in that state, it could result in the CRS load being higher than the CRS discount being offered in that community. This situation would occur only in states with a high proportion of CRS-participating communities with high CRS discounts." (Horn and Weber, 2024).

2.9 Substantial Improvement and Substantial Damage

Within the NFIP, substantial improvement and substantial damage guidelines serve as a tool for existing structures to reduce potential flood damage. According to the NFIP's Substantial Damage

[21] For the full description of the prerequisites, see Section 211 of the *CRS Coordinator's Manual*.
[22] In October of 2023, the NFIP published *A Supplement to CRS Credit*. This did not make any changes to the CRS but was intended to be used as a references in situations in which the activities of a community did not align exactly with the activities outlined in the *CRS Coordinator's Manual* or the *Addendum to the 2017 CRS Coordinator's Manual*.

Desk Reference, “Local officials in communities that participate in the NFIP must determine whether proposed work qualifies as a substantial improvement or repair of substantial damage (referred to as an “SI/SD determination”). If work on buildings constitutes substantial improvement or substantial damage, then structures must be brought into compliance with NFIP requirements for new construction, including the requirement that lowest floors be elevated to or above the base flood elevation (BFE)” (Federal Emergency Management Agency, 2010).

FEMA defines substantial improvement as “any reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure (or smaller percentage if established by the community) before the ‘start of construction’ of the improvement. This term includes structures that have incurred ‘substantial damage,’ regardless of the actual repair work performed. Substantial damage is considered “damage of any origin sustained by a structure whereby the cost of restoring the structure to its before-damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred. Work on structures that are determined to be substantially damaged is considered to be substantial improvement, regardless of the actual repair work performed” (Federal Emergency Management Agency, 2010). A key component of the definitions of substantial improvement and substantial damage is the 50 percent rule. It is ultimately the responsibility of local officials to determine if a construction project (whether it be general improvements or repairs caused by substantial damage) costs more than 50 percent of the current market value (or the value before damages) of the building. If so, the owner of the building is subject to substantial improvement and substantial damage requirements.

Within CRS, points are available in the Higher Regulatory Standards category related to substantial improvement. First, a community can receive points for having a lower than required threshold. Specifically, if the threshold for the substantial improvement definition is lower than 50 percent (LSI), a community can receive up to 20 points. Alternatively, communities can receive 10 points if either: (1) the threshold is “no more than 25% of the square footage of the building’s lowest floor,” or (2) the threshold applies to improvements or repairs but not both. Second, a community can receive up to 90 points for using a cumulative substantial improvements provision. Th cumulative substantial improvements provision considers improvements over a set time period to such that it compares the aggregate improvements or repairs made over a certain number of years to guarantee that the total value of the improvements or repairs is not greater than 50 percent of the building value. The number of years considered is called the lookback period. Communities can receive 20 points for using a five-year lookback period and 40 points for using a 10-year lookback period. Additional points can be awarded “if the community adopts regulatory language that qualifies properties for Increased Cost of Compliance insurance coverage for repetitive losses” and if the community requires that additions to a property “be protected from damage from the base flood” (Federal Emergency Management Agency, 2021).

2.10 What Qualifies as Substantial Improvement?

Construction activities that may trigger substantial improvement and substantial damage requirements generally include the following: “rehabilitation or remodeling of a building with or without modifying its external dimensions, lateral additions that may or may not involve structural modifications of a building, vertical additions, repair of foundations including replacing or extending foundations, restoration or repair of damage of any origin that is necessary to restore a building to its pre-damaged condition, reconstruction of demolished or destroyed buildings on the same site or on the same foundation, work on post-Flood Insurance Rate Map (FIRM) buildings, work on existing buildings where flood zones or floodways are revised” (Federal Emergency Management Agency, 2010). Any new construction on an existing building in a flood zone can be a potential cause for substantial improvement or substantial damage concern. However, “routine maintenance” is not included in the list of potential activities that may qualify as substantial improvement or substantial damage. If construction requires a permit, it is safe to assume it will require approval from local officials to examine whether the construction qualifies as substantial improvement or substantial damage. Furthermore, there are four primary actions local officials must perform to administer substantial improvement and substantial damage requirements: “(1) determine costs, (2) determine market values, (3) make substantial improvement or substantial damage determinations, and (4) require owners to obtain permits to bring substantially improved or substantially damaged buildings into compliance with the flood plain management requirements” (Federal Emergency Management Agency, 2010).

Determining the costs of construction can be challenging. FEMA provides resources that include a detailed list of activities that should be included in the project cost calculation. A list of costs that should not count towards the cost calculation is also provided. This includes cleaning costs, removal of trash, fees associated with inspections and permits, minor primarily outdoors improvements, and “costs required for the minimum necessary work to correct existing violations of health, safety, and sanitary codes, plug-in appliances such as washing machines, dryers, and stoves” (Federal Emergency Management Agency, 2010).

After the cost of improvements and repairs has been determined, the next step is to calculate the market value of the building. In the case of improvements, the market value is the building’s value “before the ‘start of construction’ of the improvement.” In the case of repairs, the market value is the building’s value “before the damage occurred.” In determining market value, it is important to note that only the value of the building is relevant, and any value associated with the land or location of the building is not considered. There are several sources building owners can refer to for their market value estimate. The most reliable source is a local professional property appraiser. Owners can also utilize adjusted assessed values curated by state and local taxing authorities, or the actual cash value of replacing the same building on the same parcel minus depreciation.

When both the cost and market value have been determined, the next step is to make the substantial improvement or substantial damage. This is done by dividing the cost by the market value. If the amount is greater than or equal to 50 percent, then the work is considered substantial improvement or substantial damage, and the property owner is notified that "the building must be brought in compliance with the NFIP flood plain management requirements for new construction in SFHAs."[23]

As discussed above, NFIP regulations regarding substantial improvement or substantial damage give the power of review and decision making to local and state officials. These regulations emphasize review and approval of all permit applications, with an additional emphasis on the usage of available data to help minimize future damage. The NFIP's regulations also make it clear that residential and nonresidential buildings are required to adhere to substantial improvement or substantial damage guidelines, specifically those regarding minimum elevation requirements. The relevant Code of Regulations related to permits for new construction and substantial improvements can found in Appendix D.

3 Relevant Literature

An extensive review of existing literature was conducted to frame the current study, ensure the findings are in context with other work, and help properly specify the models in the student. A more complete version of the literature review presented in groupings related to the academic literature is included below. However, these are key themes found throughout the studies that help to shape the current project.

3.1 Summary of Findings from the Literature

3.1.1 Insurance, Flood Risk, and Housing Prices

- The demand for insurance increases with income, proximity to flood hazard, recent flood events, storm risk, mortgage requirements, and government mitigations efforts include shoreline armoring and prevention of erosion.
- Discounted prices of coastal property or houses in flood plains relative to other properties are at least partially attributable to the present value of future flood insurance premiums.
- Although no house price declines were observed immediately after a flood event, significant declines of 4 percent were observed one year later when federal flood insurance rates increased substantially.
- Studies find that price increases in premiums have a negative impact on housing prices in some cases ranging from 7 to 14 percent.

[23] It should be noted that there are a number of factors that can impact flood plain management including improvements completed in parts, multiple flood events, variances, the building type, and the building location. For a detailed discussion of these and other factors, see the "Substantial Improvement/Substantial Damage Desk Reference" (Federal Emergency Management Agency, 2010).

- It is important to consider the potentially adverse incentives due to moral hazard. This can range from result in policyholders preparing less for storms.
- Additionally, studies find evidence of adverse selection in flood insurance when, after controlling for the risk level of insureds, those with a higher likelihood of a loss choose lower deductibles.

3.1.2 Homeowner Characteristics and Buying Patterns, Flood Risk, and Housing Prices

- Consumers' response to flood risk can be at least partially explained by prior flood risk experience, age, race and ethnicity, and educational level. For example, individuals born in high-risk regions are more averse to flood risk than those born in moderate- or low-risk regions and more highly educated and wealthier individuals are less sensitive to flood risk.
- In terms of selecting locations relative to flood risk, Hispanics are more likely to locate in risky areas compared to blacks and whites. Additionally, low income and minority residents are more likely to live in high flood-risk areas.
- Overall, disasters result in a decrease in home ownership. With respect to responding to hurricane damage, low-income households responded primarily by moving into low-rent housing in areas that experienced heavy damage while middle income households moved away to avoid risk, and the wealthy remained.
- Most residents living in flood hazard areas do not believe they fully understand the consequences of buying property in a flood hazard area.
- In general, the value of the water amenity dominates flood risk in coastal areas. However, the capitalization of flood risk into house prices can be difficult to identify due to the high correlation with amenity value. For example, an estimated 15 percent higher sales price discount on properties located in flood-prone areas did not sufficiently offset the benefits of living near the coast, and properties still sold at a premium.
- Property values are connected to changes in flood zone mapping with locations within a NFIP flood zone lowers property values. Large price reductions are observed for properties drawn into flood zones per the new FEMA flood zone maps of 2012 and 2014.
- Depending on the sample of properties, types of flood risk, and other amenities in the home the impact of being in a flood zone has a price reduction of 4 to 12 percent.
- Location within a flood plain has a negative effect on property values and the negative effect is greater for lower-priced homes and weaker for higher-priced homes. Most local flood mitigation programs focus on higher-income neighborhoods.
- Residential properties with a high risk of flooding experience a price discount of 8.62 percent relative to those with a lower risk of flooding.
- After a flood event the impact on price varies based on the impact on the home. Some high-risk properties that are not damaged by a flood event have price declines following a flood. Substantially larger price discounts are observed for inundated flood plain properties relative to properties not inundated.

- Studies after major hurricanes consistently find price reductions in areas of storm surge and flooding and/or a willingness to pay a premium for areas not prone to flooding.
- Homeowners with hurricane exposure who believe mitigation measures will increase the home's market value are more willing to take adaptive measures, more likely to take these adaptive measures after the home is purchased, and more likely to have intentions to make future upgrades.
- When understanding the potential impacts of improvements to properties in areas of high flood risk, it is important to understand that different types of renovations impact home values differently. In addition, the age of the home, how it has been maintained, value of the home, and economic area the home is in all impact the value of the improvement on the home value.

3.1.3 Community Rating System and Mitigation

- The value placed on mitigation varies on a variety of factors, for example, individuals born in high-risk areas have higher value on mitigation as to college graduates.
- Consumers seem to place the greatest value on the disclosure of public information about flood risks.
- Characteristics of communities as wells the level of resources and priorities of leaders impacts mitigation levels. Mitigation is lower in communities with higher levels of crime and unemployment and higher in areas with increased local government tax revenue, higher household income, greater population density and larger portions of senior citizens.
- Flood disaster history has an impact on mitigation decisions with frequency of events potentially having a stronger impact than intensity in CRS policy adoption.
- Current level of CRS participation is influenced by prior CRS participation.
- CRS communities with higher property values are more likely to respond strategically to policy incentives for larger subsidies, whereas communities with more information-based flood management activities, lower property values, lower flood risk and lower population densities are more likely to respond strategically to smaller CRS subsidies.
- There are questions of unintended consequences related to poverty and income inequality in the CRS.

3.2 The Demand for Flood Insurance

There is a long insurance literature focused on the demand for insurance by individuals in both theoretical and empirical models from early work such as Smith (1968). Other studies such as research dating back to Mayers and Smith (1982) analyze the demand for insurance by business. Browne and Hoyt (2000) specifically analyze the demand for flood insurance. As expected, Browne and Hoyt (2000) find price and income both impact the decision to purchase flood insurance. In addition, they find that recent floods in a state also increase the purchase of flood

insurance in that state. These findings are echoed throughout literature related to the purchase of flood insurance. For example, Lindell and Hwang (2008) also find significant correlations between flood experience. They also note that purchase of flood insurance increases with hazard proximity.

Some authors acknowledge that incentives are likely to differ based on exposure to different types of flood risk. For example, Kriesel and Landry (2004) refine the work of Browne and Hoyt (2000) by focusing on coastal properties which are often purchased by wealthier buyers and potentially has second homes. In this populations, the values often exceeding the $250,000 claim limit of the NFIP. Another factor in coastal areas involves the protections on the shore provided for flood and/or efforts to prevent erosion. Like prior work, Kriesel and Landry (2004) find that demand for flood insurance is price inelastic and that flood insurance is a normal good. They also find that homes located further from the shoreline have a lower probability of purchasing flood insurance all else equal. With respect to improvements and efforts to reduce flood risk and/or erosion, the results suggest that the existence of shoreline armoring and/or beach nourishment are positively related to the purchase of flood insurance as these activities provide a signal of the risk of living on the shoreline to homeowners. Landry and Jahan-Parvar (2011) also look and flood insurance in coastal zones. They find that households facing higher erosion hazard demand greater insurance coverage. Their study does not find higher rates of flood insurance for mortgage holder but like other studies does find a positive association between flood insurance and income.

Several authors focus on flood insurance in Florida given the size of the market, for example, Michel-Kerjan and Kousky (2010) note that in 2005, 97 percent of customers chose deductible lower than the maximum and almost 80 percent chose the lowest deductible available. Zahran, Weiler, Brody, Lindell, and Highfield (2009) find a strong correlation between household insurance purchases with local government mitigation activities involved the CRS.

3.3 Moral Hazard in the Insurance and Real Estate Markets

The literature discussed below provides several interesting insights into the nature of the insurance market, the first being that insurance protection is seen as a natural setting for moral hazard. Moral hazard is defined as conditions where insurers cannot observe the state of nature but only whether a particular event has occurred. In this circumstance, the insurer is aware that the presence of insurance can affect the insured's incentive to take precautions. In other words, having some or all losses covered by insurance reduces the incentive to avoid loss. Thus, moral hazard in natural disaster settings such as hurricanes or flooding can result in policyholders preparing less.

Information asymmetry between the insurer and the insured may create moral hazard. This may result in an adverse selection problem such as those with a higher likelihood of losses choosing lower deductibles. An example in the NFIP may be the low compliance rate of properties required to have flood insurance where only 50 percent of homeowners in flood plains purchase flood insurance. Compounding the problem are properties with repetitive losses that file a

disproportionate number of claims (one percent of total policies account for 30 percent of total losses).

The likelihood of opportunistic fraud in the insurance market may also increase when incentives to prevent losses or to file fictious or exaggerated claims are reduced. For example, studies show that policyowners who have replacement coverage on their automobiles are more likely to file theft claims towards the end of the coverage period. Opportunistic fraud can also be viewed within a set of tradeoffs such as: is there a perception that fraud is commonplace or does the reward of a successful fraud outweigh the expected penalties.

3.3.1 Moral Hazard

Shavell (1979) explains that insurance protection is a natural setting for moral hazard and, according to Arnott and Stiglitz (1991), moral hazard exists "when risk-averse individuals obtain insurance and their accident-avoidance activities cannot be perfectly monitored" and since "individuals do not bear the full consequences of their actions, incentives for accident avoidance tend to be less than if they did". Also, as Winter (1992) states, moral hazard exists when actions of the insured individual can affect the insured risk and that these actions cannot be made costless in the insurance contract and/or enforced by the insurer. Further, Arnott (1992) explains that moral hazard exists when insurers cannot observe the state of nature or an individual's actions but only whether a particular event has occurred. The insurer cannot force the individual to reveal either the state of nature or any risk mitigation actions and the insurer is aware that the presence of insurance can affect the insured's incentive to take precautions.

As Molk (2018) explains, moral hazard depends on several factors, including substituting insurance payments for policyholder loss and the policyholder's economic rationality and ability to control possible loss. For homeowners, having some or all losses covered by insurance reduces the incentive to avoid loss. Thus, the policyholder might take fewer precautions and engage in riskier activity. As Molk (2018) further points out, even factors such as natural disasters, which are beyond control of the homeowner, may be exacerbated by the homeowner's increased willingness to live in risky areas.

Hudson, Botzen, Czajkowski, and Kreibich (2017) explain that moral hazard in natural disaster settings can result in policyholders preparing less, thereby increasing risk exposure. To examine this moral hazard risk, the authors compare disaster risk reduction and insurance coverage for two natural hazards. They find no moral hazard in that the purchase of flood insurance is not significant or is positively related to flood preparation by households and households that engaged in short- or long-term ex-ante property risk-reducing behavior were more likely to have homeowners or flood insurance.

3.3.2 Information Asymmetry and Adverse Selection

Moral hazard may result from information asymmetry between the insurer and the insured and, according to Anglin and Arnott (1991), this asymmetric information may be of two types: hidden

action (moral hazard where the principal is unable to fully observe the actions by the agent on his/her behalf) or hidden type (adverse selection where the principal is unable to judge the agent's skills and/or knowledge of the market). As Kriesel and Landry (2004) and Kousky and Michel-Kerjan (2012) point out, an adverse selection problem is created with the NFIP due to low compliance of properties required to have flood insurance, with only 50 percent of these property owners purchasing policies. Also, additional problems are created by properties with repetitive losses filing a disproportionate number of claims, where these claims are one percent of total policies but account for 30 percent of total losses (Eastman 2015).

Several studies test for the presence of moral hazard and adverse selection in an insurance setting. Examples include Chiappori and Salanie (2000) who examine the French auto insurance market and Gao, Powers, and Wang (2017) who examine the Chinese auto insurance market. Dumm, Eckles, and Halek (2013) examine residential properties in Florida and find that information asymmetry produces an adverse selection problem such that, after controlling for the risk level of insureds, those with a higher likelihood of a loss choose lower deductibles. Likewise, Aarbu (2017) finds information asymmetry in homeowners' insurance contracts in Norwegian residential markets.[24]

Picard (2013) discusses the economic implications of insurance fraud. His analysis documents the costs of claims verification, the costs to policyholders of building up claims, and the consequences of anti-fraud policies. His recommendations include structuring contracts with some degree of coinsurance to minimize the possibility of policyholders manipulating or falsifying claims, establishing cooperation among insurance companies such as building sharable databases, and structuring contracts between insurers and third parties (such as commission agents) to discourage fraudulent behavior. Dionne and Wang (2013) find that insurance fraud is cyclical and, according to Derrig (2002), property liability insurance fraud costs the industry somewhere between $18 billion and $96 billion annually.

3.4 Household Sorting and Disaster Risk

Understanding the impact of natural disasters on the housing market and how consumers respond is important from a public policy and planning perspective. As climate change progresses and the frequency and severity of natural disasters increases, it is important to understand consumers' behavior toward housing consumption. As Smith et al. (2022) explain, individuals can react to natural disaster risk several ways: by moving out of harm's way, self-protecting, or purchasing insurance.

[24] There is a body of literature that discusses moral hazard in various areas of real estate such as real estate brokerage (Miceli (1989), Carroll (1989), and Anglin and Arnott (1991)); home equity conversion (Shiller and Weiss (2000), Horne and Rosenblatt (1996), and Gwin and Maxam (2002)); landlords and tenants (Benjamin et al. (1995) and Benjamin et al. (1998)); and REITs (Solt and Miller (1985)).

Fan and Deavlasheridze (2016) examine household response to flood risk and produce several significant findings. First, consumers' response to flood risk can be at least partially explained by prior flood risk experience, age, race and ethnicity, and educational level. Second, individuals born in high-risk regions are more averse to flood risk than those born in moderate- or low-risk regions and Hispanics are more likely to locate in risky areas compared to blacks and whites. Third, more highly educated and wealthier individuals are less sensitive to flood risk, attributed to their ability to self-insure and willingness to pay for improved local public services. Finally, the authors also find a proportionate decline in regional population along the hurricane-prone coasts.

Fan and Deavlasheridze (2016) also examine the value of local floodplain management activities credited by the CRS program. The authors find that college graduates place the most value on CRS programs and individuals born in high-risk regions tend to place higher value on community-level flood mitigation activities. The authors also find that individuals value overall community safety and reduced flood insurance premiums resulting from flood mitigation activities, as reflected by the CRS credit points earned by their communities. Consumers seem to place the greatest value on the disclosure of public information about flood risks.

Wing et al. (2022) show that annual losses resulting from flooding are borne disproportionately by impoverished communities with a proportionally larger White population but that the expected increase in flood risk in the future will affect Black communities more. Bakkensen and Ma (2020) find that low income and minority residents are more likely to live in high flood-risk areas and this is the case even though high income, white residents tend to be concentrated in high-risk coastal zones. They also show that individuals are willing to pay to avoid flood risk, with homes located just inside a high-risk flood zone selling at a 6.3 percent discount relative to those just outside. Smith et al (2022), examining how consumers reacted to Hurricane Andrew, show that the household's economic ability to adjust explains how a given demographic group reacts to hurricane damage. Low-income households respond primarily by moving into low-rent housing in areas that experienced heavy damage. Middle income households move away to avoid risk, and the wealthy, who can most easily afford insurance and self-protection, remain.

Sheldon and Zhan (2022) find that natural disasters result in a decrease in home ownership. The authors find that households who move to a location that experienced a natural disaster two years prior are between 3 and 5 percentage points less likely to own a home one year after relocating. The authors find the greatest effects for coastal disasters, significant effects for flood and rain, and no significant effects for wind or winter disasters.

3.5 House Prices and the Capitalization of Flood Insurance Premiums

The capitalization of risk in house prices and consumers' willingness to pay for risk reduction has been a topic of interest in insurance research. In practice, one might expect increases in insurance premiums to have an adverse effect on housing prices. This is borne out by studies that show the cost of flood insurance premiums is capitalized into house values. These studies are discussed below. For example, one study shows that an increase of NFIP premiums by 50 percent was

followed by a decrease in property values of 8.8 percent. Also, another study shows that no decrease in house prices were observed immediately after a flood event but that significant house price declines were observed a year later when federal flood insurance rates increased substantially.

Some studies examine this issue by estimating the capitalization of flood insurance premiums in house prices. Skantz and Strickland (1987) examine the effect of major flooding on previously unflooded properties and find no decrease in house prices immediately after the flood event. The authors contribute these findings to homeowners' avoidance of flood risk through low-cost flood insurance. However, significant house price declines of 4 percent were observed one year later when federal flood insurance rates increased substantially.

Using properties located within a flood-risk zone, MacDonald, Murdoch, and White (1987) examine homeowners' willingness-to-pay for a marginal reduction in the probability of occurrence of an undesirable outcome. Using house price data for Monroe, Louisiana, the authors compare estimated sales price differentials to calculated changes in insurance costs and find that a discount rate slightly less than 3 percent would equalize the estimated differential with the cost change. A later paper by Macdonald, White, Taube, and Huth (1990) also estimates consumers' willingness-to-pay for a specific risk (a reduction in the probability of flooding hazard) and finds that the sales price differential equals the change in insurance costs at a discount rate of 2.47 percent to 3.78 percent.

Nyce (1999) develops a theoretical model to evaluate the impact of property insurance premiums on property prices following a natural disaster. He uses data from the American Housing Survey and finds some empirical support for the notion that increases in insurance premiums have an adverse effect on housing prices with an implied discount of 8.33 percent. Also, Donnelly (1989) finds that being located within a flood plain produces a house price discount of slightly more than 12 percent.

Shilling, Sirmans, and Benjamin (1989) examine the possible transfers of wealth created by redistribution effects of the NFIP for homeowners located within a flood plain. Using Baton Rouge, Louisiana data, the authors find that the cost of flood insurance premiums is capitalized into house values at a discount rate of 4 percent. Speyrer and Ragas (1991) examine the impact of flood risk and mandatory flood insurance on house prices in New Orleans and find that location in a flood plain reduces house prices by about four percent. The authors, finding that unexpected flooding increases the insurance cost capitalization while repeated flooding does not, attribute this to mandatory flood insurance coverage.

Nyce, Dumm, Smersh, and Sirmans (2015) find that the risk of potential hurricane losses is conveyed to homeowners through wind zone maps and that insurance premiums have a negative effect on house prices. Results show that increases in premiums are negatively capitalized into house prices with a range of 7 to 14 percent. As Colby and Zipp (2021) discuss, community planning and NFIP (NFIP) rules should strive to balance solvency with social consequences. The authors calculate that, for a county in Pennsylvania, the presence of flood subsidies results in 8.1

percent more houses than would otherwise exist. The authors also show that, when NFIP premiums rise by 50 percent to cover expected damages, property values decrease by 8.8 percent, with about half of this loss (4.7 percent) recuperated in the long run. Georgic and Klaiber (2022) argue that the negative effect of premium rate increases by the National Flood Program could reduce equity for homeowners, reduce tax revenues for local governments, and create re-location disincentives for homeowners. The authors estimate the capitalization of flood insurance premium subsidies and find a nationwide an average capitalization of subsidy to be $12,352 and that the capitalization varies significantly across municipalities.

3.6 Property Values and Flood Risk

Many studies have examined the relationship between property values and flood risk. This research has been varied and has focused on several areas of interest such as flood map disclosure, location within a flood plain, the presence of flood insurance, climate change effects, and hurricane effects. These areas will be discussed in this section.

3.6.1 Flooding and Flood Plains

A main research focus in climate research has been on weather-related events such as flood risk and living in a flood plain. A flood plain is defined by FEMA as any land area susceptible to being flooded by water from any source.[25] FEMA provides flood plain maps to assess flood risk and provide guidance in community planning and flood mitigation. Flood zone designations include 100-year flood plain, areas with a 1 percent chance of flooding in any given year, and areas with temporary increases in flood risk. The NFIP provides flood insurance for flood plain areas. Housing research generally shows that location within a flood plain has a negative effect on house prices.

Choosing to live in a flood plain is shown to be behavior-related and a function of information (or a lack thereof). Chivers and Flores (2002) survey buyers of property in flood hazard zones and find that most residents living in flood hazard areas did not believe they fully understood the consequences of buying property in a flood hazard area. Morgan (2007) suggests that purchasers sometimes decide that the benefits of living in areas prone to flooding offset the additional risk. The author's estimated 15 percent higher sales price discount on properties located in flood-prone areas did not sufficiently offset the benefits of living near the coast, and properties still sold at a premium when compared to homes not located in a flood-prone area. Also, Atreya and Czajkowski (2019) report a price premium for coastal housing market properties in the highest-risk flood area nearly a quarter of a mile from the coastline.

As Zhang (2016) explains, theoretically the difference between the market value of a house located within a flood plain and the value of an equivalent house located outside a flood plain should be equal to the present value of future flood insurance premiums, although in practice deviation may exist. Harrison, Smersh, and Schwartz (2001) find that housing property characteristics for houses

[25] See https://www.google.com/search?client=firefox-b-1-d&q=fema+definition+of+flood plain.

located within a flood plain are priced less than characteristics of properties located outside a flood plain with the price differential being less than the present value of future flood insurance premiums. A 2002 paper by Dei-Tutu finds six percent lower prices for homes located within a flood plain and, in contrast to Harrison et al. (2001), he finds the price differential to be greater than the present value of future flood insurance premiums. After adjusting for coastal amenities, Bin, Kruse, and Landry (2008) find that discounts on the prices of coastal properties are approximately equal to the capitalized cost of future flood insurance premiums.

3.6.2 Flood Maps and Property Values

McCluskey and Rausser (2003) show that, without definitive risk measurement and assessment, property appreciation rates for environmentally affected properties are difficult to determine and are generally not significantly different from those of non-affected properties. Using digital flood maps and home sales in North Carolina, Bin and Kruse (2006) find, on average, property values to be 5 to 10 percent lower if located within a flood zone that is not subject to wave action. Votis and Perrels (2016) show that access to high-resolution flood maps is useful and results in significant house price reductions for several Finland cities and that price movements were sensitive to the frequency or probability of flooding.

Belanger and Bourdeau-Brien (2017) find a decrease in property values following publication of detailed flood maps and introduction of risk-based pricing of flood insurance in England in 2004-2005. The price discount is shown to be 1.5 percent and is substantially larger for waterfront properties. Indaco, Ortega, and Taspinar (2019) find no significant difference in sales activity across properties inside and outside designated flood plains, but the authors do find large price reductions for properties that were drawn into flood zones per the new FEMA flood zone maps of 2012 and 2014. With an estimated increase in insurance premiums of $3,500, house prices are shown to decrease by about $64,000.

Chiang-Hsieh (2021) finds a negative effect of flood map disclosure on house prices in Taiwan, however, any identified variation in flood risk after map disclosure had no effect on house prices. Shu, Porter, Wilson, Bauer, and Pope (2022) show that property values are connected to changes in flood zone mapping and argue that in many communities where flood maps do not exist, or where the maps need to be updated, properties are likely to be overvalued.[26]

3.6.3 Flood Zones and Property Values

Several studies have examined price effects of being located inside a flood zone. Bin et al. (2008) find that location within a NFIP flood zone lowers property values for coastal properties in North Carolina and that the price differentials for higher flood risk areas are significantly larger than those for lower risk areas. They also find that the price differentials for flood risk and the

[26] As Carbone et al. (2006) point out, there are important distinctions between the catastrophic risk of flood and catastrophic windstorm risk. Flood risk has definitive flood plain maps which are the risk signal and set the basis for insurance premiums. With catastrophic windstorm risk, the lack of maps or map disclosure results in the windstorm risk premium (rather than the map) becoming the signal of the risk exposure.

capitalized value of flood insurance premiums are roughly equivalent. Posey and Rogers (2010) find an 8.6 percent price reduction for houses located in a designated special flood hazard area. Hino and Burke (2020) identify a small flood zone effect of 1 to 2 percent on house prices. Shr and Zipp (2019) show that house values decrease by more than 11 percent when a property is designated to be in a flood zone and that property values do not rebound when the flood zone designation is removed.

Zhang (2016) finds that location within a flood plain has a negative effect on property values and that the negative effect is greater for lower-priced homes and weaker for higher-priced homes. Zhang and Leonard (2019) show that price discounts vary both temporally and spatially for properties located in the 100-year flood plain such that, for the year following a flood event, price discounts increased by 13 percent. Also, the price discount for flood plain properties relative to properties 1000-1500 feet from the flood plain was 8.6 percent higher than the discount for flood plain properties relative to properties just outside the flood plain.

3.6.4 Flood Risk, Flood Insurance, and Property Values

Kriesel and Landry (2004) show that flood insurance demand for coastal properties is price inelastic and enrollment in flood insurance is a function of storm risk, proximity to shoreline, community response to erosion, and mortgage lender requirements. Volkman-Wise (2015), examining how probability estimation influences the demand for insurance for high-loss, low-probability events, shows that individual's overweight recent evidence. In the absence of a recent catastrophe, probabilities of a disaster next period are underestimated and demand for catastrophe insurance is lowered. After a recent event, individuals overweight this evidence to increase the probability of a disaster, thus tending to over insure.

Tesselaar, Botzen, Robinson, Aerts, Zhou (2022) discuss the private flood insurance market's challenge of the existence of unconditional disaster aid by the government, which may crowd out demand for private coverage and produce charity hazard. This declining uptake in coverage decreases the insurance companies' ability to spread risk across policyholders while this implicit government liability creates uncertainty regarding future expenditures. The authors find that government compensation crowding out insurance demand is most prevalent when compensation is certain but partial. Although politically infeasible, the authors suggest that the charity hazard and the insurance protection gap could be improved by governments abstaining from providing financial aid. When a flooding event occurs, the authors recommend an alternative to be governments providing low-interest loans, which are found to not interfere with the demand for flood insurance. Zhang et al. (2022) propose a strategy of using a voucher program to set insurance premium rates that would account for issues such as climate change, affordability, and risk mitigation. Compared with static rates for all properties in an area, this strategy is shown to reduce NFIP losses by half for the observed community.

The issue of flood-risk price effects has been extensively examined. Kousky, Kunreuther, LaCour-Little, and Wachter (2020) provide a synthesized analysis of existing research on flood risks, flood

insurance, and housing markets. The authors discuss the nature of flood risk (coastal, fluvial, and pluvial), how flood risk insurance is provided (the nature of take-ups), and the impact of flood risk on the housing market (especially house prices). Their research shows that housing markets capitalize flood risk into house prices, although the impact can be difficult to identify due to the high correlation with amenity value. Turnbull et al. (2013) show that flood risk is capitalized into both house prices and liquidity (time on the market) with a pattern of weaker price capitalization in weak markets and stronger capitalization of both price and selling time in strong markets. Endah Saptutyningsih and Nursetiawan (2024) find that property prices decrease as flood inundation levels increase for residential properties in Indonesia.

Zhang (2016) finds that flood hazards have a greater impact on lower-priced homes although most local flood mitigation programs focus on higher-income neighborhoods. Using meta-analysis, Daniel, Florax, and Rietveld (2009) and Beltrán et al. (2018) find a weak empirical relationship between current flood risk and coastal housing prices. Wei and Zhao (2022) show that residential properties with a high risk of flooding experience a price discount of 8.62 percent relative to those with a lower risk of flooding. These results are shown to be valid whether the price is determined by the government or the market.

Gourevitch, Kousky, Liao, Nolte, Pollack, Porter, and Weill (2023) examine the magnitude and distribution of unpriced flood risk and overvaluation. Segmenting by demographic groups, the authors find that widespread overvaluation among low-income households puts them especially at risk of future price reductions and loss of home equity. They find that residential properties subject to flood risk are overvalued by US$121–US$237 billion, depending on the discount rate.

Gruhl, Brehm, Ghosh, Breidenback, and aus dem Moore (2023), examining the effects of fluvial flooding on house prices, find that effects vary depending on the distance to the flood and a region's level of belief in climate change. The authors show that flood-prone areas in proximity to the flood or with higher climate change beliefs experience house price declines with no significant price effects in other flood risk zones or, on average, across the country. Blantis (2024) finds a significant decrease in house prices after the November 2009 flood but no significant effect on prices for the January 2005 or the December 2015 floods that occurred in the Cumbria, England area. The author shows that the discount varies across property type and price range.

Focusing on after-event analysis, several studies show high-risk properties that are not damaged by a flood event have price declines following a flood (Hallstrom and Smith (2005); Kousky (2010); Bin and Landry (2013); Ortega and Taspinar (2018); Gibson and Mullins (2020)), but prices eventually return to pre-flood levels over several years (Bin and Landry (2013); Atreya, Ferreia, and Kriesel (2013); Gallagher (2014)). For properties damaged in a flood event, Atreya and Ferreira (2015) find substantially larger price discounts for inundated flood plain properties relative to properties not inundated, suggesting that homeowners "respond better to what they have visualized". McCoy and Zhao (2018) find that, post-flooding, the presence of flood insurance is a significant factor in whether investment is made in damaged structures in flood hazard areas.

Yi and Choi (2020) find no pre-flood price effect for properties located in the 100-year flood plain but that unexpected inundation during the flood results in price discounts. The authors also find a significant price rebounding effect for properties in the flood plain that were not inundated, with no change in prices for properties in the flood plain that were inundated. Bui, Wen, and Sharp (2024), using Vietnam data, estimate the effect of pluvial (versus fluvial) flooding on house prices and find a price discount of 9 percent after a large flood event.

Most flood plain studies examine the effect on residential properties. However, Eichholtz, Steiner, and Yonder (2019), using Costar office data for New York, Boston, and Chicago over 2001-2017, show that commercial real estate properties exposed to a flood event experience lower price appreciation than unexposed properties and this is driven not by physical damage or pricing trends but by higher risk premiums. The authors also show that this price impact does not dissipate with time.

3.6.5 Flood Risk, Climate Change, and House Prices

Some studies have linked flood risk to climate change. Bakkensen and Barrage (2017) suggest that differences in capitalization of climate risk in house prices across studies may be explained by agents updating their beliefs after the realization of flood risk. Surveying households in coastal housing markets in Rhode Island, they find that the choice of at-risk flooding homes is affected by lower risk perception; inland residents are more likely to be worried about the flood risk of living on the coast, while a high percentage of island residents are unconcerned. Households decide whether to buy a noncoastal home or a coastal home at respective prices or rent a home inland; the coastal home price depends on the amenities, resale value, and the belief of current flood risk. The flood premium corresponds to the present flood risk and the present value of the future risk based on the mix of "optimists" and "realists" buying coastal homes. The authors estimate coastal housing prices are 6 to 13 percent higher than suggested by the fundamentals.

Zhou et al. (2023), in a literature review of natural disasters and climate change risks on the financial sector, show the effects to include reduced underwriting capacity of the insurance companies due to large losses, increased demand for insurance with increased perception of future risk, and decreased demand for insurance with raised premiums and/or perception of generous government relief.

Contat et al. (2024) provide a recent review of the literature on climate research with a focus on residential properties in the U.S. Among their conclusions are: (1) mortgage performance suffers after a catastrophic event and, although the impact on mortgage performance may be short-lived due to insurance and disaster aid, minorities and borrowers of less creditworthiness are projected to bear a disproportionate amount of the climate risk burden; (2) availability of insurance influences how quickly climate change is capitalized into real estate prices and rising insurance costs can have a negative effect on house prices; and (3) chronic risks such as drought and storm activity may negatively impact house prices.

Dennis (2022), in a discussion of climate change and financial policy, concludes that much of uncertainty with climate change is not quantifiable, which he terms radical uncertainty. This uncertainty creates an options value for waiting to see how things resolve, given that there are sunk costs associated with actions taken now. However, there are also sunk benefits of avoiding environmental catastrophes such as flooding through mitigation measures. Understanding that it is impossible to determine whether the cost or the benefit is greater, there is a strong insurance value of acting now. Also, because of the uncertainty, medium or long-range quantitative models are likely to be of little use and should instead be best thought of as parables or consistency checks on current thinking. The author concludes that there is mixed evidence of whether markets are efficient regarding climate information (insurance rates have been responsive while borrowing costs have not). Reasons to doubt efficiency include opaqueness of local knowledge, spotty availability of relevant climate predictions, obscure flow of risk between financial entities, and the degree to which economic participants proactively work to circumvent risks. Surveys of investors and fund managers indicate that they subjectively feel that asset prices do not fully incorporate climate risks.

3.6.6 Flood Risk, Climate Change, and Commercial Property Values

A review of the literature on climate change impacts on commercial real estate prices by Clayton, Devaney, Sayce, Van de Wetering (2021) provides several insights: (1) property price declines after climate events have historically been modest and short-lived, especially in areas of strong awareness and high experience with extreme weather events; (2) some events lead to long-term price declines and less market liquidity, especially in locations that historically have had less exposure to extreme climate events; and (3) commercial real estate investors in some areas tend to assign a higher risk premium to all properties regardless of whether an individual property has been directly affected by a climate event.

Ling et al. (2023) examine the effect of local climate shocks on returns of listed REITs and find (1) significant declines in REIT returns for three quarters following a climate event, (2) cross-sectional differences in REIT returns are explained by area differences in media coverage or demand for climate information, (3) trading patterns of retail and institutional investors where retail investors tend to sell REIT shares and institutional investors do not, and (4) REIT returns that are more sensitive to consumer sentiment experience greater price declines after a climate shock.

3.6.7 Flood Risk, Sea Level Rise, and House Prices

Some studies have linked coastal flooding with sea level rise. As Nichols and Cazenave (2010) discuss, the two main contributors of sea level rise (thermal expansion of sea water due to ocean warming and water mass input from land ice melt and land water reservoirs) result in two major impacts: submergence and increased flooding of coastal land and saltwater intrusion. Sriver, Urban, Olson, and Keller (2012) examine the uncertainties of thermal expansion on sea level rise and show that small increases in upper bound estimates of sea level rise can increase local flooding

risks by approximately three orders of magnitude. Likewise, Strauss, Ziemlinski, Weiss, and Overpeck (2012) examine topographic vulnerability of the coastal contiguous U.S. to sea level rise and flooding and estimate that 3.7 million people live within one vertical meter of their local high tide line, with some 2150 towns and cities with some degree of risk exposure.

Fuerst and Warren-Myers (2021), estimating price effects of current flood risk and future sea level rise, find a price discount for properties in known flooded areas while sea level rise has no detectable effect on price. The authors explain that the lack of a sea level rise discount may be due to several factors: the absence of comprehensive information on sea level rise available to home buyers, myopic buyer behavior, relatively affordable insurance premiums in areas not yet affected, and no concrete plans for requiring buyers and owners to contribute to community or dwelling adaptation costs. The authors also find that buildings located in current flood zones and areas that are likely to be under water when sea levels rise tend to be in significantly worse states of maintenance and repair.

As Smith, McNamara, Williams, Gopalakrishnan, and Landry (2023) point out, some studies show that property prices do not fully reflect the risks from sea level rise and that properties vulnerable to flooding have inflated prices relative to market fundamentals, while other studies show that discounted prices for properties vulnerable to sea level rise indicate that buyers are considering climate risks. A recent study by Iliyasu, Sanusi, Mamman (2023) finds that sea level rise is capitalized in prices of coastal homes. Their results show that beachfront homes sell at a 5.2 percent premium for every kilometer closer to the coastline but that properties exposed to sea level rise sell at a 0.5 percent discount relative to unexposed properties.

3.6.8 Flood Risk, Hurricanes, and House Prices

Bender, Knutson, Teleya, Sirutis, Vecchi, Garner, Held (2010) examine the influence of future global warming on Atlantic hurricanes and project that the frequency of category 4 and 5 storms will double by the end of the 21st century, with the largest increase projected for the Western Atlantic. Ellis, Sylvester, and Trepanier (2015) find that extreme hurricanes along the Florida and Atlantic coasts cluster in time (decades); however, they find no evidence of temporal clustering of hurricanes in the Gulf of Mexico, and they also conclude it is unlikely that an extreme hurricane would impact multiple cities.

Bin and Polasky (2004) find lower market values for houses located within a flood plain and significantly greater price discounts after Hurricane Floyd. Carbone, Hallstrom, and Smith (2006) examine house price responses before and after Hurricane Andrew. Using repeat sales data for Lee County and Dade County, Florida, the authors find a reduced rate of price increase for both counties after the storm with a 23 to 26 percent reduction for Lee County and a 40 to 60 percent reduction for Dade County.

McKenzie and Levendis (2010) report that purchasers in New Orleans were willing to pay significantly more to avoid the risk of flooding after Katrina than before. The authors find a 4.6

percent price premium per foot of elevation for flooded areas after Hurricane Katrina. Fang, Li, and Yavas (2023) find several effects of a faraway hurricane (with no direct impact on properties located in a flood plain): a 4 percent price reduction for properties during active hurricane periods, a 4 to 6 percent price premium in quiet hurricane periods, and an increased but short-term perception of flood risk.

Robinson and McIntosh (2022) show that evidence from research on flood risk from Hurricane Sandy suggests that increases in investors' perceptions of flood risk have a significant negative impact on waterfront property valuations and that house prices are negatively affected when residential properties are located in flood risk areas. Ellen and Meltzer (2024) find that prices for one to three-family homes in high surge areas of New York City experienced a 16 percent decline in value over the first year after Hurricane Sandy and persistent 12 percent lower prices six years after the storm. Interestingly, the authors find that price declines were mostly concentrated in areas outside FEMA flood zones (with nearly full price recovery in FEMA flood zones) and that prices in high income neighborhoods rebounded faster than prices in low-income areas.

Kijewski-Correa, Javeline, Kakenmaster, and Chesler (2023) find that homeowners with hurricane exposure who believe mitigation measures will increase the home's market value are: more willing to take adaptive measures, more likely to take these adaptive measures after the home is purchased, and more likely to have intentions to make future upgrades. Interestingly, affordability does not play a role and the effect on market value is a stronger driving force than loss prevention in decisions to make climate adaptation measures.

3.6.9 Flood Risk, Hurricanes, and Commercial Property Prices

Rehse et al. (2019) find, before Hurricane Sandy made landfall, REITs with portfolio allocations of 10 percent in the evacuation zone of New York City had a 16 to 31 percent lower trading volume than REITs with no portfolio allocations in the evacuation zone.

Using individual property data for commercial real estate impacted by a hurricane from NCREIF for the U.S. over 1989-2019, Fisher and Rutledge (2021) find a significant effect on both value and return, after accounting for expenditures for repairs. Examining office, retail, apartment, industrial, and hotel properties, the authors find that the effect varies by property type and persists for several years after impact. Addoum, Eichholtz, Steiner, and Yonder (2024), using office data for New York, Boston, and Chicago over 2003-2017, examine the effect of Hurricane Sandy on real estate prices. Their results show that 1-mile increase in proximity to the coast resulted in a 21.6 percent slower rate of appreciation in New York. In comparison, less affected was Boston, which had a 9.5 percent slower appreciation rate, while Chicago, a control group, had a statistically insignificant price change. Flood risk exposure continued for five years after Sandy, resulting in higher capitalization rates and risk premia.

3.7 Renovations and House Prices

There is a body of literature that examines the relationship between home renovations and house prices. Generally, the research shows a price premium for both aesthetic and energy efficient renovations, although energy efficient renovations seem to be a lower priority to homeowners. The research also shows that better-maintained homes have lower value depreciation rates over time and the cost of repairs is generally capitalized into house prices. Additionally, research shows a positive spillover price effect from exterior housing renovations for neighboring properties.

3.7.1 Renovations and Price Premiums

Gyourko and Saiz (2004) examine investment and consumption motivations for homeowners. Calculating an average ratio of value-to-construction cost for each property, the authors find a negative impact on housing reinvestment for properties with ratios less than one. Homeowners with property ratios less than one were observed to spend up to 50 percent less on renovation than owners of similar homes with ratios greater than one. McMillen and Thorsnes (2006) estimate the nominal price appreciation of single-family homes in Chicago over the period 1993 to 2002. The authors show that omitting observations with building permits reduces the mean and median-based estimates by 4.4 and 1.6 percentage points and that quality improvements account for much of the rapid increase in house prices. Mamre (2024), examining renovation premiums in Norwegian urban housing markets, find a positive renovation premium of 5 to 7 percent for renovated dwellings and a negative premium of 9 to10 percent for unmaintained/neglected dwellings. The author cautions, however, that these averages mask the significant variability of these premiums over time.

3.7.2 Energy Efficient Renovations

Mclean et al. (2013) examine whether prices in a large block of housing in Hungary that underwent major energy-efficient renovation differ from prices in comparable, nearby properties. Their results show 9.42 percent higher prices for renovated properties. Considering the cost of renovation and the yearly energy savings, the authors conclude that outside subsidies may be required to make the investment worthwhile. Shahbandian (2019) shows that both aesthetic renovation and deep renovation increase home values, although energy renovation does not seem to be a priority for homeowners and aesthetic renovation (including kitchen and bathroom remodeling) seems to be more important. The author finds that homeowners with older homes for sale prefer aesthetic maintenance to increase the selling price.

3.7.3 Maintenance, Repairs, and Price Indices

Knight and Sirmans (1996) examine the effect of maintenance and improvements on the depreciation rate for housing and on house price indices. The authors find that well-maintained homes have the lowest depreciation rates, followed by homes with average maintenance and, finally, by poorly maintained homes with the highest depreciation rates. The authors also find that omitting maintenance from their models has little impact on their estimated price indices, but that omitting house age introduces a significant downward bias to the indices. Knight, Miceli, and

Sirmans (2000) examine the impact of repair expenses on house selling price and the extent to which major repairs are written into sales contracts. The authors find, in most cases, homes are restored to their normally maintained states with each sale and the cost of the repairs is capitalized into the selling price.

Gyourko and Tracy (2006) examine the degree to which homeowners moderate home maintenance decisions relative to income fluctuations to smooth consumption. The authors find a positive elasticity of maintenance expenditures to transitory income changes, although this adjustment in home maintenance expenditures is a minor part of any overall consumption smoothing strategy. Nikola (2011) examines pipe repair effects on house prices in Finland. Results show that prices start to depreciate six years before the repair, but the price discount is always smaller than the discounted value of future pipe repair costs. The results also show that the amount of overpricing is negatively correlated with both the time span from the last repair and the market value of the property.

Wilhelmsson, M. (2008) shows that house price depreciation rates are significantly different for maintained versus non-maintained properties. Results show that the price difference between a 40-year-old property (built in 1960) and maintained both indoors and outdoors and a property of the same age that is not maintained is about 13 percent (−10 percent compared to −23 percent in total age effect). Interestingly, the absence of outdoor maintenance has more impact on price depreciation rates. Bogin and Doerner (2019), examining property renovation bias in repeat-sales house price indices across a multitude of U.S. geographies, find that omitting information on property improvements can bias index estimates and distort valuations by as much as 15 percent, especially in the central districts of large cities.

3.7.4 Urban renewal and Spillover Effects

Helms (2003) examines housing renovations that accompany gentrification in Chicago and finds, contrary to conventional wisdom that most neighborhood amenities and structural attributes are insignificant as to whether renovation occurs, Results show that the price difference between a 40-year-old property (built in 1960) and maintained both indoors and outdoors and a property of the same age that is not maintained is about 13 percent Liang, Lee, and Yong (2020) examine the effect of urban renewal on neighborhood house prices and find the presence of expectation-related psychological effects, such that during and after the promotion/review phase of renewal, neighborhood house prices increased by 7.52 percent within 800 m from the urban renewal. Holmstrom (2022) finds a spillover effect from exterior housing renovations in Helsinki. Results show that an exterior renovation increases house prices by approximately three percent for houses within 250-meter proximity from the renovated house.

3.8 Evaluation of the Community Rating System

There have been a variety of studies related to evaluating the CRS (e.g. Brody, Zahran, Highfield, Bernhardt, and Vedlitz, 2009; Fan and Davlasheridze, 2016; Frimpong, A Reilly and Niemeier, 2023; Li and Landry, 2018; and Noonan and Sadiq, 2018; Sadiq and Noonan, 2015; Tyler et al,,

2021; Zahran et al., Vedlitz 2010; and Zahran et. al, 2009). There is variation in the value placed on the CRS and mitigation activities by homeowners and communities. Fin and Davlasheridze (2016) note that individuals with college degrees place more value on the CRS. Additionally, they find that those born in high-risk areas also place higher value on community-level flood mitigation activities. Fin and Davlasheridze (2016) find individuals place the greatest value on activities related to public information about floods and that in general the value of the water amenity dominates flood risk in coastal areas.

There are also differences in the characteristics of communities that impact hazard mitigation. Li and Landry (2018) find CRS credit points are higher in communities with higher median household income and higher population densities. Additionally, their study finds that availability of resources and competing priorities impact flood mitigation. Mitigation is lower in communities with higher levels of crime and unemployment and higher in areas with increased local government tax revenue, higher household income, greater population density and larger portions of senior citizens (Li and Landry, 2018).

Following a flood event, communities have a window of opportunity to increase focus on flood-mitigation (Li and Landry, 2018). Brody et al (2009) also suggests that flood disaster history has an impact on mitigation decisions with frequency of events potentially having a stronger impact than intensity in CRS policy adoption. Frimpong et al., (2023) note the current level of CRS participation is influenced by prior CRS participation. Tyler, Sadiq, and Noonan (2019) synthesize lessons from prior literature. One of their key lessons is that communities who are not already participating in the CRS program should carefully weigh the cost and benefits before participating. They echo Highfield and Brody (2013) suggesting participating communities should consider the three CRS activities shown to result in the greatest reduction in flood damages. These include freeboard requirements, protecting open space, and engaging in flood protection activities like retrofitting structure or improving storm sewage systems.

Sadiq and Noonan (2015) find that communities do appear to act strategically in their choices. CRS communities with higher property values are more likely to respond strategically to policy incentives for larger subsidies, whereas communities with more information-based flood management activities, lower property values, lower flood risk and lower population densities are more likely to respond strategically to smaller CRS subsidies (Sadiq and Noonan, 2015). It is important to recognize the differing incentives in communities with respect to participation in CRS related mitigation efforts. A survey of flood plain managers echoed this concept finding that communities participating the CRS as well as communities with a higher level of flood concern and lower poverty levels make better flood management decisions (Tyler et al, 2021).

CRS is not without critics. Noonan and Sadiq (2018) raise questions of unintended consequences related to poverty and income inequality in the CRS. They encourage stakeholders to take a holistic approach to evaluating the costs and benefits of the CRS.

4 Identifying Lookback Periods

There is no central database of lookback periods that have been established by communities in the NFIP's CRS Program. We used three approaches to compile this information for the communities in Florida. First, we collected all community ordinances and identified which communities specified a lookback period for property improvements. Finally, we used the data available from the CRS community file that indicates whether a community receives credit for a lookback period. Finally, we cross-referenced this information with the responses to our survey of flood plain managers in which we asked if their community had a lookback period.

We note some communities have a lookback period specified in their statutes, but the community is not receiving credit for the lookback period. One reason for this discrepancy may be that the community is not providing additional evidence required for the credits, e.g., how they are tracking building permits. Figure 2 provides an excerpt from the NFIP CRS Coordinators Manual that explains the requirements that must be met in order to earn credit.

Figure 2. Excerpt from CRS Coordinators Manual

431.d. Activity Documentation Provided by the Community

Most elements in this activity have the same documentation needs at the verification visit:

(1) The state or local law or ordinance language that adopts the regulatory standard that is being enforced in the community. See also Sections 231.b and 231.c on documenting regulatory language.

(2) The impact adjustment map. See Section 431.c.

(3) [For credit for regulating flood-prone areas outside the SFHA] Documentation that shows that regulations are in effect outside the SFHA (i.e., the regulatory flood plain).

(4) Development plans and/or permit records that document how the regulation has been applied.

The ISO/CRS Specialist may visit a sample of sites in the field to verify that the land has been developed and/or buildings have been constructed in accordance with the approved plans.

Documentation for CSI Provided by the Community

(1) The activity documentation requirements in Section 431.d must be met.
(2) At each verification visit,

(a) A list of all permits for building improvements or repairs in the regulatory flood plain that have been issued since the last visit. The list must include both substantial improvements and permitted projects that were not substantial improvements.

The ISO/CRS Specialist will review permit records that document how the regulation has been applied. The records need to track permits by parcel number or address, so that the history of improvements or repairs to a particular structure is checked before the next permit is issued.

In our analysis, we distinguish between communities that have implemented a lookback period from communities *receiving lookback credits*. The latter group is especially relevant for our analysis of how CRS credit points and premium discounts are affected by a change in lookback periods. Furthermore, it is important to recognize that the analysis is performed on several different samples. The differences across the samples are discussed in the next sections.

4.1 Lookback Periods Stated in Ordinances

The lookback periods for the relevant communities identified in this study were obtained by searching the online Florida code of municipal ordinances provided by the Municipal Code Corporation (Municode).[27] 406 communities out of the sample of 468 communities listed their ordinances with Municode and we were able to find the lookback period-relevant ordinances using this online source. Sixty-two communities out of the 468 sample, however, did not have their ordinances listed with Municode. The next step was to visit each community website, and this process yielded 31 lookback period-relevant ordinances. The remaining 31 missing ordinances were classified as unknown and coded as having no specified lookback period.

To find the relevant lookback period ordinances, the key terms "substantial improvement" and "substantial damage" were searched since these terms were identified by FEMA as key definitions.[28] The majority of the lookback period-relevant ordinances were located within the Definitions sections of the Land Use Code or Floodplain Management sections of each city's ordinances. If, within these ordinances, there was no specific mention of a lookback period the ordinance was coded as "None specified."[29] If a specific lookback period was mentioned within

[27] https://library.municode.com/fl

[28] FEMA P-758, "Substantial Improvement/Substantial Damage" Desk Reference §5.7.3 (May 2010).

[29] For example, the City of Palatka ordinance states: "*Substantial improvement.* Any repair, reconstruction, rehabilitation, addition, or other improvement of a building or structure, the cost of which equals or exceeds 50 percent of the market value of the building or structure before the improvement or repair is started. If the structure has incurred "substantial damage," any repairs are considered substantial improvement regardless of the actual repair work performed."

the ordinance this was identified and coded for the specific length of time listed as a lookback period.[30]

4.2 Credits for Lookback Periods Noted in CRS File

The NFIP's CRS community file contains comprehensive records and documentation related to a community's participation in the CRS program. The file includes evidence of activities undertaken by the community to reduce flood risk, improve flood plain management, and educate residents about flood hazards. Key components of the file are the documentation of credits for activities such as public information campaigns, mapping and regulations, flood damage reduction, and flood preparedness. These activities determine the community's CRS class, which impacts the level of flood insurance premium discounts provided to its residents. Additionally, the file may include correspondence between the community and FEMA, annual recertification reports, and any required audits or verifications to maintain the community's CRS status.

Another crucial element in the CRS community file is the detailed reporting of flood mitigation efforts and outcomes, including maps, ordinances, outreach materials, and engineering studies. It outlines how the community meets CRS requirements, such as adopting stricter building codes, maintaining open space in flood-prone areas, and implementing stormwater management systems. The file also tracks progress toward goals outlined in the community's flood plain management plan. By maintaining this file, FEMA and the community can ensure transparency, accountability, and continuous improvement in flood risk reduction initiatives.

The file lists the specific credits earned by communities that have established lookback periods of at least 5 (20) or at least 10 (40) years. We used this information to cross-reference the ordinances to ensure that our list of communities with lookback periods is complete.

4.3 Lookback Period Information Obtained from Survey Responses and Interviews

Our survey of flood plain managers included a series of questions pertaining to the existence of lookback periods. We also used this information to cross-reference our list of communities identified as having lookback periods through the search of ordinances and credits noted in the CRS file.

In addition to collecting data via surveys, we also conducted phone interviews with several other stakeholders. Below is some information we learned from these interviews:

[30] For example, the City of Palm Bay ordinance states: "*SUBSTANTIAL IMPROVEMENT.* Any combination of repair, reconstruction, rehabilitation, addition or improvement of a building or structure taking place during a five (5)–year period, the cumulative cost of which equals or exceeds fifty percent (50%) of the market value of the structure before the improvement or repair is started. For each building or structure, the five (5)–year period begins on the date of the first improvement or repair of that building or structure subsequent to the effective date of this ordinance."

- In general, it is not easy to enforce or track substantial improvement and likely is not being consistently applied both within counties and across counties.
- There are other ways of earning mitigation credits in the CRS that may be easier than lookback periods.
- Technology can be utilized to simplify much of what is done and needs to be implemented.
- Clarification is needed on the distinction between general maintenance and substantial improvement.
- While flood damage to a property will soon be required on sellers' disclosure, there is no seller disclosure on substantial improvements done that may limit future improvements to the property for the new owner.

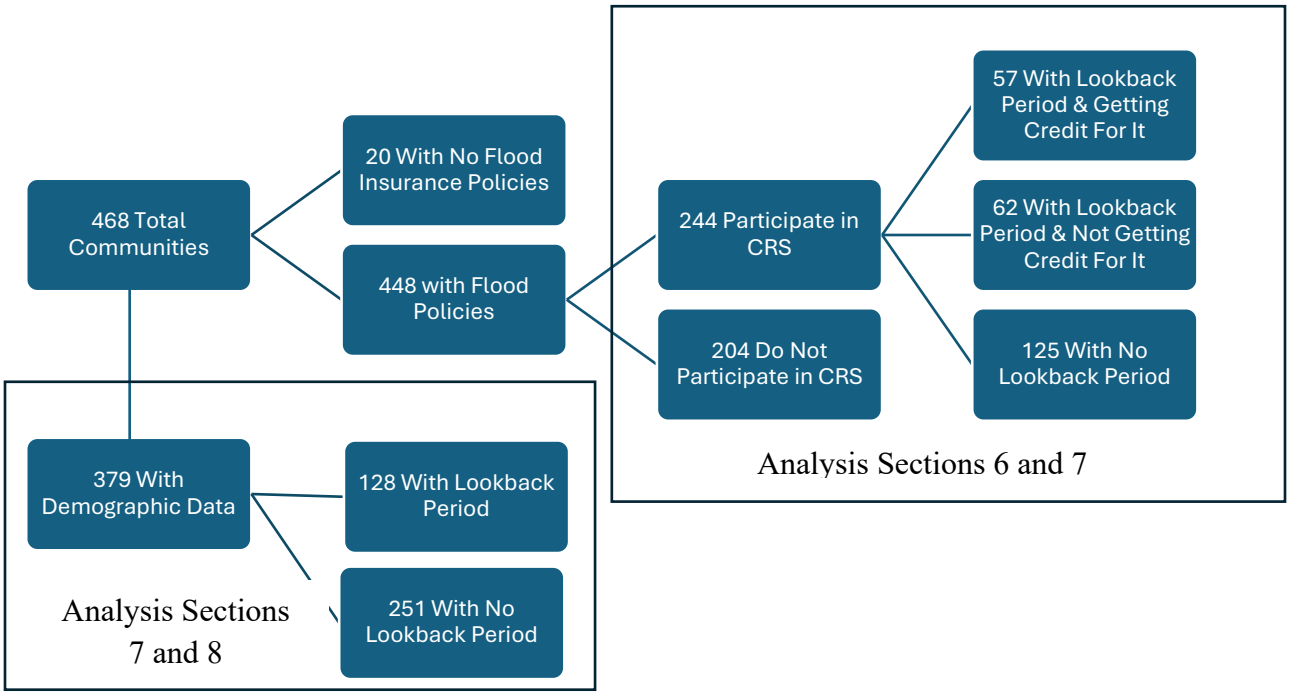
Table E-1 in Appendix E contains the list of the lookback periods for all Florida communities identified through our three primary sources discussed above.

5 Quantitative Analysis of Lookback Periods

In our analysis, we distinguish between communities that have implemented a lookback period from communities receiving lookback credits. The latter group is especially relevant for our analysis of how CRS credit points and premium discounts are affected by a change in lookback periods. Furthermore, it is important to recognize that the analysis is performed on several different samples. The differences across the samples are discussed in the next sections.

While each section below contains a description of the data and statistical summaries, the number of communities may differ due to the availability of information about the community, the characteristics of the community, or both. For example, if there are no demographic characteristics available for a community, it has been dropped from analysis that evaluates community demographics. Figure 3 illustrates how the sample of all Florida communities is broken down in our analysis.

Figure 3. Community Characteristics



The analysis in the next sections address three main research questions:

1. What is the relationship between the credits for lookback periods and premium discounts?
2. What is the relationship between lookback periods and take-up rate for flood insurance coverage? Also, what is the relationship between lookback periods and flood insurance premiums?
3. How are home values in a community affected by the existence of, and length of a lookback period?

We discuss additional details about the sample construction, including the sources of all data and any limitations for our analysis in Appendix F. Tables F-1 and F-2 contain summary statistics for the community samples used in Sections 7 and 8 below. Table F-3 contains summary statistics for all communities. Tables containing regression analysis are provided in Appendix G.

6 Analysis of CRS credit points and Premium Discounts

In this section, we address the question, "What is the relationship between the credits for lookback periods and premium discounts?" We analyze CRS communities to assess how substantial improvement lookback requirements contribute to communities' CRS scores and premium

discounts. The data include CRS communities in the state of Florida in year 2023. The CRS community data are publicly available.[31]

6.1 Background on CRS scores

Communities can accumulate CRS credit points by engaging in activities that the NFIP believes would reduce flood risk. Communities are classified on these points, and their classification can translate into premium discounts for policyholders in the community. Communities can earn credit points by maintaining a lookback period for substantial improvements (including modifications and additions). Communities qualify for a 40-point credit if they maintain a 10-year lookback or a 20-point credit for a 5-year lookback.[32] They can receive additional credit for maintaining lookbacks on reconstruction and repairs to damaged buildings, but the focus of this analysis is exclusively on lookbacks for home improvements.

Table 4. shows CRS credit points and the associated premium discounts. Each CRS Class category represents 500 credit points and moving from one class to the next changes the CRS premium discount by 5 percentage points. CRS Class categories range from 1 to 10 with lower values reflecting more CRS credit points and higher premium discounts (i.e., CRS Class 1 has the most points and receives the largest discount). For example, communities with CRS credit points between 4,000 and 4,999 are considered CRS Class 2 and receive a 40 percent discount.

Removing the home improvement lookback would only reduce the community's CRS premium discount if it caused the community to change CRS Class categories. Because each CRS Class category ranges 500 points, the community may remain in the same CRS Class category despite removing a lookback. For example, a CRS Class 2 community with CRS credit points of 4,220 that is receiving 20 points for a 5-year lookback would remain a Class 2 community if it reduced its CRS credit points to 4,200 by removing the lookback. The removal of a substantial improvement lookback could at most change a community's CRA class by one category so could at most change the CRS premium discount by 5 percentage points.

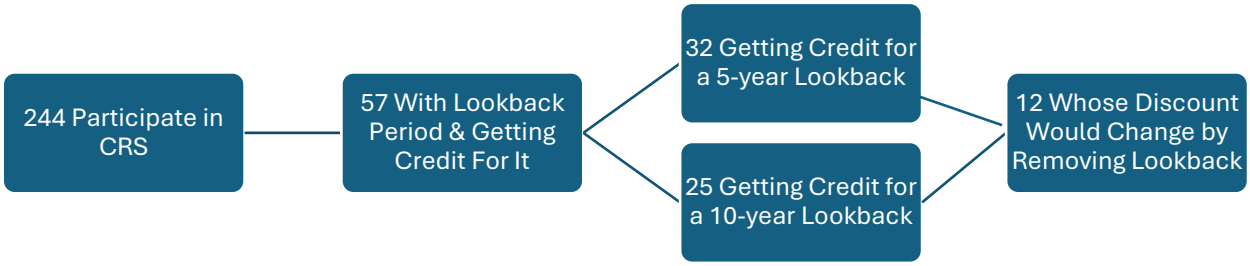
[31] The CRS community data are available here: https://www.fema.gov/openfema-data-page/nfip-community-status-book-v1. A summary of points earned by Florida communities participating in CRS is included in Appendix A, table A1.

[32] The discussion here assumes a multiplicative adjustment factor of one. The CRS Coordinator's Manual indicates that a maximum of 90 points are available for cumulative substantial improvement (20 points for 5-year, 40 points for 10-year) for improvements modifications and additions, there is another 20 points (40 points) if the regulations require that reconstruction and repairs to damaged buildings are counted cumulative as well. Finally, 20 points is available if the community adopts regulatory language that qualifies properties for increased cost of compliance insurance coverage for repetitive losses, with the total points capped at 90. There is a multiplicative adjustment factor that can be greater or less than one (max 1.5) depending on what percentage of the SFHA is covered by the ordinances. If the entire SFHA is covered the factor is one. If the regulation applies to the entire SFHA and areas outside the SFHA, the factor can be greater than one.

Florida has 468 communities with varying degrees of participation in CRS. Of these, 244 are receiving CRS credit points (Classes 1-9) while the remainder are in Class 10. Overall, credit points range from 505 to 4,334 across CRS communities with an average of 1,988. **The average CRS community receives an 18** percent **discount.**

Figure 4 presents a breakdown of the participation and point totals across the state. We refer to communities that participate in CRS as "CRS communities." The figure provides an initial assessment of how lookbacks on substantial improvements, modifications, or additions affect a community's CRS premium discount. Among CRS communities, 77 percent receive no credit for a substantial improvement lookback, 13 percent receive 20 points (indicating a 5-year lookback), and 10 percent receive 40 points (indicating a 10-year lookback).

Figure 4. Florida CRS Sample Breakdown



The figure also indicates that about 79 percent of the CRS communities now receiving credit for a substantial improvement lookback would NOT experience a change in their CRS Class or their premium discount if they removed the lookback requirement. For example, consider the towns of Redington Shores and Indian Shores in Pinellas County. Redington Shores is a CRS Class 6 community with 2,047 credit points, including 20 points for maintaining a substantial improvement lookback requirement. Indian Shores is also a CRS Class 6 community with 2,392 credit points. It receives 40 points for maintaining a 10-year substantial improvement lookback. Removal of the lookback would not alter the premium discount in either Redington Shores or Indian Shores because both would remain above the 2,000-point threshold for a CRS Class 6 community.

We find that 12 communities would experience a change in their CRS premium discount if they removed their substantial improvement lookback requirements. Doing so would reduce their CRS discount by 5 percentage points. These 12 communities represent 21 percent of the 57 CRS communities receiving credit for a substantial improvement lookback. The 12 communities are Bay County, City of Dania Beach, Leon County, Orange County, Town of Juno Beach, Village of

Palm Springs, Village of Estero, City of Lake Mary, City of Hialeah, City of Bonita Springs, City of Hollywood, and the Pensacola Beach-Santa Rosa Island Authority. These 12 communities reflect a small number of the 244 CRS communities (5 percent).

For example, the City of Hollywood receives total CRS Credit Points 2,011, which translates into CRS Class 6 and a CRS discount of 20 percent. It receives 20 points for maintaining a 5-year substantial improvement lookback. Removing this lookback would reduce its CRS Credit points to 1,991, increasing its CRS Class to 7 and reducing its CRS discount from 20 percent to 15 percent. As we describe below, for policyholders in Hollywood in year 2023, the average premium was $737, and removal of the substantial improvement lookback credit would have increased premiums by an average of about $38 for that year.

6.2 NFIP Policy and Premium Analysis

In this section, we analyze NFIP policies in force to assess how the removal of a community's substantial improvement lookback credit would affect policyholder premiums. The data include all NFIP single-family home policies in the state of Florida with an effective date (the policy start date) during 2023. NFIP policy data are publicly available.[33]

The NFIP establishes premiums based on a property's flood risk, determined by factors such as location within a flood zone, elevation, and building characteristics. Rates are increasingly moving toward risk-based pricing under Risk Rating 2.0, which aims to more accurately reflect each property's individual flood risk. The NFIP applies the following premium formula:

Premium = (Full Risk Premium x (1 – CRS Discount) + Policy Fees) x 1.21

Where:

- Full Risk Premium – the NFIP's assessment of the insurance contract's expected loss given the property-level risk, and the coverage amounts and deductibles selected by the policyholder
- CRS Discount – takes a value between 0 and 0.35 in our sample
- Policy Fees – includes a Homeowner Flood Insurance Affordability (HFIAA) Surcharge ($25 for primary residences, $250 for non-primary residences) and a federal policy fee ($47)
- 1.21 – reflects additional charges, including for the NFIP's Reserve Fund Assessment (18 percent).

[33] The NFIP policy data are available here: https://www.fema.gov/openfema-data-page/fima-nfip-redacted-policies-v2 (last accessed 11/12/2024).

This description is based on FEMA (2023) "Community Rating System Discount Guide."[34] Following the above discussion, removal of the substantial improvement lookback credit can change the CRS Discount by up to 5 percentage points. A 5-percentage point change in the CRS Discount reduces premiums by around 5 percent, but the reduction in the premium varies across policyholders because it is applied before adding the policy fees.

Table 5 provides statistics on the number of policies in the State of Florida and across various subsamples of communities in Florida. Table 6 provides premium information.

Table 5. Summary of NFIP Policies: Total for Florida

Statistic	Number	Percent
Policies	892,073	
Policies in CRS communities	865,311	97%
Policies in CRS communities with substantial improvement lookback credit	196,256	22%
Policies in CRS communities whose discount would change by removing substantial improvement lookback (total)	44,713	5%

Table 6. Analysis of Premium Change in Communities whose discount would change by removing substantial improvement lookbacks

Statistic	Number
Premiums in CRS communities whose discount would change by removing substantial improvement lookback (total)	$31,173,229
Premium increase if lookback removed (total)	$1,627,224
Average premium	$697
Average premium increase (total) if lookback removed	$36
Average premium increase (percent) if lookback removed	4.7%

Table 5 shows that in 2023, residents in Florida held almost 900,000 policies, paying total premiums of $818 million. About 97 percent of these policies are in community with a CRS score. Only 22 percent are in a community with a substantial improvement lookback credit in the CRS. Around 5 percent of policyholders live in a community whose premium discount would change if the lookback were removed. Table 6 provides statistics on premiums in these communities. In total, these policyholders pay about $31 million and would pay an additional $1.6 million in premiums

[34] This Guide is available here: https://agents.floodsmart.gov/sites/default/files/fema-nfip-crs-guide-2023.pdf. The formula above represents a slight modification to that presented in FEMA (2023). The modification improves our ability to replicate the observed premiums in the policy data, allowing us to replicate 99.7 percent of policyholders within 1 percent of their observed premium in the NFIP policy data.

if the lookback credit were removed. The average policyholder in these communities pays $697 in premiums. Removal of the lookback credit would increase their premiums by $36 on average, a 4.7 percent increase.

Table 7 reports statistics for each of the 12 communities whose discounts would be affected by removal of the lookback credit. The first three columns show the total number of policies, premiums, and premium increase if the lookback credit were removed. The remaining columns shows average premiums in each community and the amount by which they would change. While in all of these communities, the removal of the lookback credit increases premiums by around 4-5 percent, the difference in dollars varies. The community with the smallest premiums is the city of Hialeah: its current average premium is $403, and premiums would increase by $16 on average. The largest effect is in Pensacola Beach, Santa Rosa Island: the current average premium is $1,542, and the average increase would be $89.[35]

Table 7. CRS Communities Where Removing the Lookback Credit Would Increase Premiums

	Community Level			Policy Level		
Community	Policies	Premium (sum, $)	Premium difference (sum, $)	Premium (average, $)	Premium difference (average, $)	Premium difference (%)
Pensacola Beach/ Santa Rosa Island	1,049	1,617,075	93,073	1,542	89	4.9%
Bonita Spring	5,872	7,501,757	443,035	1,278	75	5.5%
Estero	2,379	1,984,943	103,601	834	44	5.0%
Hollywood	8,627	6,359,005	330,181	737	38	4.9%
Dania Beach	1,306	917,273	46,271	702	35	4.7%
Bay County	6,135	4,207,967	218,908	686	36	4.7%
Juno Beach	176	109,104	5,398	620	31	4.4%
Leon County	1,184	712,339	36,510	602	31	4.9%
Lake Mary	195	92,509	4,799	474	25	5.0%
Orange County	7,763	3,624,479	182,551	467	24	4.9%
Palm Springs	278	116,763	4,678	420	17	3.7%
Hialeah	9,749	3,930,013	158,219	403	16	3.9%

[35] Around 10 percent of policyholders in Pensacola Beach, Santa Rosa Island would experience an annual premium increase of at least $250 if the substantial improvement lookback were removed. These are high-risk policyholders who paid average premiums of $5,056 in 2023.

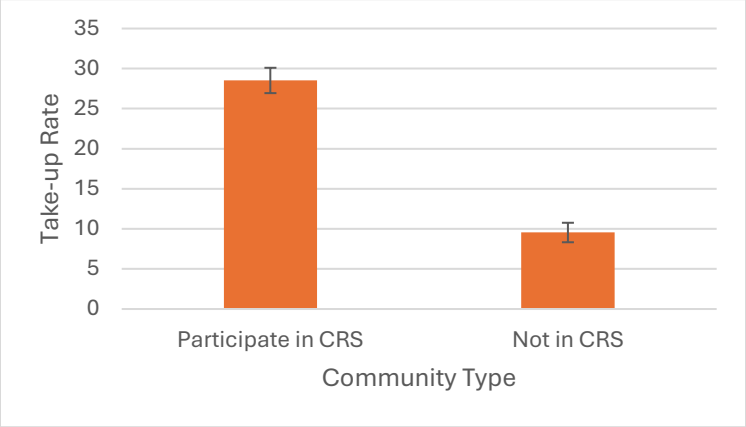
7 Analysis of Flood Insurance Take-up Rates and Premiums

In this section, we address the questions, "What is the relationship between lookback periods and take-up rate for flood insurance coverage?" and "What is the relationship between lookback periods and flood insurance premiums?" As shown in the previous section, residents in some Florida communities receive a discount on their flood insurance premiums because their community (1) participates in CRS or (2) participates in CRS *and* has established a lookback period for substantial improvement. Community participation in CRS suggests a variety of available ways (mentioned in the previous section) to obtain discounted premiums, one of which is establishing a lookback period. Lower premiums may incentivize individuals to purchase coverage. We explore these relationships through several statistical comparisons below.

7.1 Analysis of Take-up Rates for Flood Insurance

First, we perform a basic two-sample statistical comparison of the take-up rates in communities that participate in the CRS versus those that do not.[36] Figure 5 shows that the take-up rate is higher in communities that participate in CRS. The figure shows the mean values and the 95 percent confidence intervals for each group, indicating that the comparison is statistically significant.

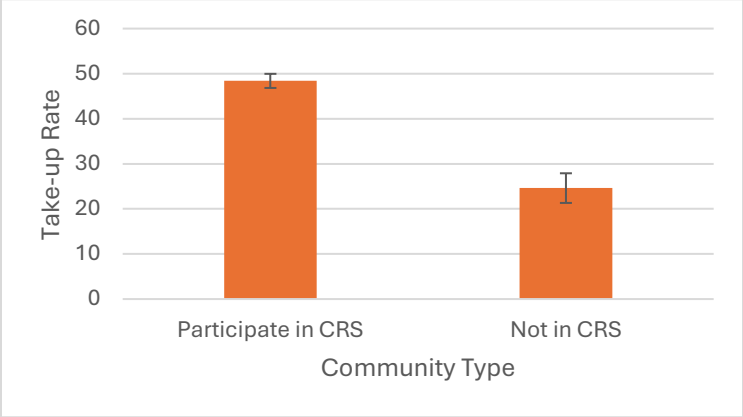
Figure 5. Two-sample T-test Results for Comparison of Take-up Rates by Participation in CRS: All Florida Communities (N=448)



Next, we perform a comparison of the take-up rates for coverage specifically in special flood hazard areas, in communities that participate in CRS and those that do not. The take-up rate is significantly higher in communities that participate in CRS. Again, the mean values and the 95 percent confidence intervals for each group indicate that the comparisons are statistically significant.

[36] We examine flood insurance take-up rate for single-family residences (SFRs) in a community, calculated as the number of flood insurance policies for SFRs divided by the number of SFRs in the community.

Figure 6. Two-sample T-test Results for Comparison of Take-up Rates for Properties in Special Flood Hazard Areas: All Florida Communities (N=448)



It is important to note that this comparison, and those that follow, do not incorporate specific characteristics of individual communities. Consequently, the analysis provides a generalized view of differences across communities, which may vary in many ways.

7.1.1 Analysis of Take-up Rates – A First Look

We estimate several equations to get a deeper sense of the relationships tested above. First, we estimate whether the community's CRS Class (1-10) is related to the take-up rate. Table 3 above shows that the discounts for flood insurance coverage increase as the Class decreases, so we expect to find a negative relationship between CRS Class and the take-up rate. Table G-1 in Appendix G provides the results of our preliminary analysis in which we estimate the take-up rate as a function of the CRS Class for all communities (448) and for our sample of CRS communities. We show, in the first column, that the CRS Class is statistically and significantly related to the take-up rate. The estimated coefficient suggests that as the class level increases (decreases) the take-up rate decreases (increases) by about 4.2 percentage points.

In the second column of Table G-1, we add a variable to indicate whether the community has a lookback period. We find that this variable is not significantly related to the take-up rate in our model while CRS Class remains statistically significant.

In the last two columns of Table G-1, we estimate these two models again using the sample of CRS communities only. Our results indicate that CRS Class and the existence of a lookback period are both unrelated to the take-up rate in these models. Our findings suggest that the biggest driver of take-up rates is participation in CRS, not the particular Class level or the existence of a lookback period.

Many other community characteristics influence the take-up of flood coverage and may affect the relationships estimated above. In order to evaluate the role of these characteristics, we merge in

data from additional sources, including the Federal Emergency Management Agency (FEMA), the Florida Department of Revenue (for housing data), and the American Community Survey (ACS). This results in a slightly smaller sample (379 v. 448 – see Figure 1) due to the availability of comparable data at the appropriate community level. The construction of this sample is described in more detail in Appendix F and the sample statistics are in Table F-1.

Using the sample of communities with community characteristics, we conduct a multivariate analysis of how lookback periods relate to flood insurance take-up rate. We also evaluated the relationship between lookback periods and flood insurance premiums.

7.1.2 Regression Analysis: CRS credit points and Flood Insurance Take-Up Rates

We begin by assessing how CRS credit points relate to insurance participation among communities. We create categorical variables to capture three groups of communities. Our first group contains communities with CRS credit points that put them into Classes 1-5. The second group contains communities with CRS credit points that put them into Classes 6-9. The final group is in Class 10 which has no credits. We create indicator variables for each group and include the first two in the analysis. This approach allows us to differentiate between the effects on flood insurance take-up rates for communities with some flood mitigation activities (Classes 1-5 and Classes 6-9) versus those with none (Class 10).

We employed a set of OLS regression models as follows:

$$\begin{aligned} Take-up\ Rate_i &= Class1\_5_i + Class6\_9_{\ i} \\ &+ Risk\ Factors_i + Demographic\ Characteristics_i \\ &+ Economic\ Characteristics_i \\ &+ Housing\ Market\ Characteristics_i \end{aligned} \tag{3}$$

The dependent variable, $Takeup\ Rate_i$, represents the flood insurance take-up rate for single-family residences (SFRs) in community i. It is calculated as the number of flood insurance policies for SFRs divided by the number of SFRs in the community. We calculate it in three ways: take-up rates for all SFRs, take-up rates within Special Flood Hazard Areas (SFHA), and those outside SFHA. The goal is to capture potential differences in insurance behavior based on flood risk exposure. $Class1\_5_i\ and\ Class6\_9_i$ are binary indicators defined above. The predictor variables, representing key characteristics expected to influence the flood insurance take-up rate. These include risk factors, demographic factors, economic indicators, housing characteristics specific to each community. We employ robust standard errors to account for potential heteroscedasticity in the model.

First, the risk-related variables are essential for understanding the extent to which physical exposure to flood hazards and proximity to the coast influence a community's likelihood of

adopting a lookback period. Two variables are included as proxies for risk exposure specific to each community. The first, % SFR in SFHA, represents the percentage of single-family residences (SFR) located within Special Flood Hazard Areas (SFHA). This variable is calculated as the ratio of single-family homes in SFHAs to the total single-family residences within the community, providing insight into the degree of flood risk faced by homeowners. The second variable, Distance to Coast (log), is the natural logarithm of the distance to the nearest coastline, measured in miles. This distance serves as a proxy for potential exposure to coastal risks, such as hurricanes and flooding events, with closer proximity to the coast generally associated with higher risk levels.

The *Demographic Characteristics* include population size and population density, both log-transformed to provide scaled measures of overall and concentrated population size. Average household size (log) further provides insight into typical household structures, while percentage of the population aged 65 or above measures the proportion of senior residents. Percentage White represents the ratio of the White, non-Hispanic population, percentage married measures the portion of married individuals, and percentage with a college education captures educational attainment.

The *Economic Characteristics* highlight community economic health and disparity. Median household income (log) reflects the typical household income level, while unemployment rate serves as an indicator of labor market health. Gini index captures income inequality, with higher values indicating greater disparity. Percentage below the poverty line and percentage with health insurance further measure economic hardship and access to health resources, respectively.

The *Housing Market Characteristics* complete the profile. Percentage owner-occupied and percentage vacant show housing occupancy patterns, while median house age reflects the general vintage of the housing stock. Median house value (log) and median gross rent (log) provide scaled measures of property and rental values, respectively. Percentage mortgage represents the prevalence of mortgage reliance, and percentage owner costs measures affordability by comparing monthly owner costs to household income.

Together, these predictor variables provide a comprehensive profile of each community's demographic, economic, and housing characteristics, forming a robust framework to identify factors associated with the flood insurance take-up rate.

Table G-2 presents the relationship between CRS credit points and flood insurance take-up rates across different types of single-family residences (SFRs). Models (1) and (2) assess the relationship between CRS credit points and the overall take-up rate across all SFRs, while Models (3) and (4) focus specifically on homes within Special Flood Hazard Areas (SFHAs), and Models (5) and (6) examine take-up rates for homes outside SFHAs.

The main take-away from the table is that CRS credit points are associated with higher take-up rates of flood insurance policies. The positive and statistically significant coefficients on the $Class1\_5_i$ *and* $Class6\_9_i$ variables in models 1 and 2 indicate that, relative to receiving no CRS credit premium discount, communities that receive discounts have higher flood take-up dates. As shown in models 3 and 4, the correlation between the presence of premium discounts and take-up rates remains in SFHA specific areas. Models 5 indicates higher levels of take-up in communities receiving premium discounts, but this relationship is not statistically significant when controls are included.

7.1.3 Regression Analysis: Lookback Periods and Flood Insurance Take-Up Rates

Next, we assess whether the presence of a lookback period influences insurance participation among communities. Following this, we narrow our focus to communities with established lookback periods to determine whether the duration of these periods—i.e., a longer or shorter lookback period—affects flood insurance take-up rates within these communities. This approach allows us to differentiate between the effects of simply having a lookback period and the additional impact of its length.

We employed a set of OLS regression models as follows:

$$\begin{aligned} Takeup\ Rate_i = {} & Lookback\ Period\ Indicator_i \\ & + Risk\ Factors_i + Demographic\ Characteristics_i \\ & + Economic\ Characteristics_i \\ & + Housing\ Market\ Characteristics_i \end{aligned} \tag{3}$$

The goal is to capture potential differences in insurance behavior based on the presence of a lookback period. In this model, the dependent variable, $Takeup\ Rate_i$, is the same as in the previous section. $Lookback\ Period\ Indicator_i$ is a binary indicator where a value of 1 signifies that a community has implemented a lookback period, and 0 otherwise.[37] Other predictor variables are consistent with those used in the previous table, covering demographic, economic, housing, and risk-related factors. We employ robust standard errors to account for potential heteroscedasticity in the model.

Table G-3 presents the relationship between the presence of a lookback period and flood insurance take-up rates across different types of single-family residences (SFRs). Models (1) and (2) assess the impact of lookback periods on the overall take-up rate across all SFRs, while Models (3) and (4) focus specifically on homes within Special Flood Hazard Areas (SFHAs), and Models (5) and (6) examine take-up rates for homes outside SFHAs.

The results indicate a significant positive association between the presence of a lookback period and the overall take-up rate for flood insurance in Model (1). Specifically, the Lookback Period

[37] Here, we assign a lookback period to a community if any of the following criteria are met: 1) the local ordinance specified a lookback period, 2) the community is receiving CRS credit for a lookback period, or 3) the flood plain manager survey indicated the presence of a lookback period.

Indicator shows a coefficient of 0.11 ($p < 0.01$), suggesting that communities with lookback periods tend to have a higher flood insurance participation rate among SFRs. This effect, however, diminishes in Model (2) once additional community and housing controls are added, indicating that other factors may mediate the relationship between lookback periods and flood insurance take-up rates across the board.

In SFHA areas, the presence of a lookback period is positively associated with flood insurance take-up rates in Model (3), with a coefficient of 0.15 ($p < 0.01$). This result suggests that lookback periods may play a role in encouraging insurance uptake within flood-prone areas. However, in Model (4), which includes additional controls, the effect of the Lookback Period Indicator loses significance, hinting that risk exposure and demographic factors may have a stronger impact on take-up rates within SFHAs than the presence of a lookback period alone.

For homes located outside SFHAs, the Lookback Period Indicator shows a smaller and insignificant effect on flood insurance take-up rates in both Models (5) and (6). This finding implies that lookback periods may be less influential in driving insurance uptake among homes in lower-risk areas, where the perceived need for flood insurance is lower.

The percentage of SFRs in SFHAs (% SFR in SFHA) consistently shows a positive and highly significant association with take-up rates across all models, emphasizing the importance of flood risk exposure in influencing insurance participation. Distance to Coast also has a significant impact in Models (4) and (6), but with differing signs depending on the model, suggesting that coastal proximity may affect take-up behavior variably across different community types. Additionally, certain socioeconomic characteristics, such as Density (log), Gini Index, and Median House Value (log), display significant associations in some models, pointing to the complex role of community and economic factors in shaping flood insurance behavior.

Overall, the findings in Table G3 indicate that while lookback periods appear to encourage flood insurance take-up, especially within SFHAs, the effect may be moderated by other community and housing characteristics, particularly in areas of higher flood risk.

To further investigate the relationship between the length of lookback periods and flood insurance take-up rates, we employ the following OLS model:

$$\begin{aligned} Takeup\ Rate_i = {} & Indicators\ of\ Lookback\ Period\ Lengths_i \\ & + Risk\ Factors_i + Demographic\ Characteristics_i \\ & + Economic\ Characteristics_i \\ & + Housing\ Market\ Characteristics_i \end{aligned} \tag{4}$$

In this model, the dependent variable, $Takeup\ Rate_i$, is the same as in the previous section. The take-up rate is examined overall and separately for SFRs within Special Flood Hazard Areas (SFHAs) and those outside SFHAs, allowing us to capture how lookback period length may affect flood insurance participation differently across risk levels.

The key predictor variable in this model, $Indicators\ of\ Lookback\ Period\ Lengths_i$, is a set of categorical indicators representing different lengths of lookback periods.[38] These indicators allow us to capture whether longer lookback periods correlate with higher flood insurance take-up rates, reflecting a community's commitment to risk management over extended time horizons. Appendix F defines the lookback versions.

These versions enable us to analyze how progressively longer lookback periods influence flood insurance take-up rates across communities. By separating communities into three and four categories, respectively, we gain a finer understanding of whether incremental increases in lookback period duration correlate with greater flood insurance participation, both within and outside of SFHAs. These indicators capture a range of regulatory stringency levels, providing insights into whether more extensive historical review requirements encourage or deter households from purchasing flood insurance.

Again, we control for the same risk factors, demographic, economic, and housing market characteristics as in previous models, with robust standard errors to account for heteroskedasticity.

The results in Tables G-4 and G-5 examine the relationship between the length of lookback periods and flood insurance take-up rates across communities with existing lookback policies. These analyses are split into overall take-up rates (Table G-4) and segmented take-up rates within SFHAs and non-SFHAs (Table G-5). The models in Table G-4 and G-5 utilize two categorizations, Versions 3 and 4, of lookback period lengths, allowing us to explore how different durations influence overall insurance participation.

In Table G-4, we find that longer lookback periods are generally associated with lower flood insurance take-up rates for all SFRs. In particular, Lookback Period of More than 5 Years is negatively associated with the overall take-up rate in Models 1 and 3, showing coefficients of -0.19 and -0.17, respectively, and is statistically significant at the 1percent level. This indicates that longer lookback periods may deter insurance participation across all single-family residences. Lookback Periods of 6-10 Years and More than 10 Years both exhibit negative associations with overall take-up rates in Model 4. Notably, the effect is stronger for the longest duration category (more than 10 years), with a coefficient of -0.23, significant at the 1percent level. However, when examining this variable with controls in Model 4, Lookback Periods of More than 10 Years yield a slight positive association (0.05), which is weakly significant at the 10 percent level, suggesting some nuanced responses depending on community characteristics.

Table G-5 provides a more detailed analysis by splitting the sample into take-up rates within and outside SFHAs. Within SFHAs (Models 1-4), a Lookback Period of More than 5 Years is significantly associated with a lower take-up rate, with coefficients of -0.22 and -0.21 in Models 1

[38] Note that the only way we were able to consistently and accurately identify the length of a lookback period was through review of local ordinances. Therefore, when we examine the length of the lookback period, it is only based on the language of the ordinances, and not the CRS credit file or flood plain manager survey.

and 3, respectively, both significant at the 1percent level. This consistent pattern implies that longer lookback periods may dampen insurance demand in higher-risk areas, likely reflecting concerns about policy restrictions and market flexibility. In non-SFHA areas (Models 5-8), similar trends appear, though the magnitude of association with longer lookback periods is generally smaller. Lookback Periods of More than 5 Years show a significant negative relationship, with coefficients of -0.10 and -0.11 in Models 5 and 7, respectively, though significance levels are weaker.

These results suggest that longer lookback periods tend to correlate with reduced insurance take-up rates, particularly in high-risk (SFHA) areas. This inverse relationship between lookback period length and insurance participation may reflect a community's desire to maintain market flexibility, as longer periods might impose additional costs or regulatory burdens that deter insurance uptake, even in risk-prone areas. The mixed results in non-SFHA areas suggest that while lookback periods still influence insurance behavior, the impact is less pronounced in regions outside designated flood zones.

7.2 Analysis of Flood Insurance Premiums

The purpose of this analysis is to examine the impact of lookback periods on flood insurance premiums. We start by investigating how the CRS credit points relate to average premium costs across communities. After establishing this baseline, we focus on communities with lookback periods in place to explore whether the duration of these periods—shorter versus longer lookback periods—affects flood insurance premiums within these communities. This approach enables us to distinguish between the effect of having a lookback period and the further impact of its length on the relative cost of flood insurance.

7.2.1 Regression Analysis: CRS credit points and Flood Insurance Premiums

To investigate the impact of lookback periods on flood insurance premiums, we employ the following OLS regression model:

$$\begin{aligned} Premium_i = {} & CRScategories_{\ i} \\ & + Risk\ Factors_i + Demographic\ Characteristics_i \\ & + Economic\ Characteristics_i \\ & + Housing\ Market\ Characteristics_i \end{aligned} \tag{5}$$

The dependent variable, $Premium_i$, represents the average insurance premium for single-family residences (SFRs) across all zones, normalized by average SFR prices. SFR prices are aggregated from parcel-level data derived from the Name–Address–Legal (NAL) files, which provide property assessment information at the parcel level. This ratio of average premium to SFR price reflects the relative cost of flood insurance across different community characteristics. Again, to provide a more nuanced view, we conduct separate analyses for properties located within SFHAs and those outside SFHAs, allowing us to observe whether the influence of lookback periods on flood insurance premiums differs by risk exposure zone. $Lookback\ Period\ Indicator_i$ is a binary indicator where a value of 1 signifies that a community has implemented a lookback period, and 0

otherwise. Other predictor variables are consistent with those used in the previous tables, covering demographic, economic, housing, and risk-related factors. We employ robust standard errors to account for potential heteroscedasticity in the model.

The results of this analysis are given in Table G-6. As given in columns 1 and 3 of the table, we find some evidence of a negative and statistically significant relationship between the presence of CRS credit points and premiums. However, this results largely disappears when we add the set of control variables or consider non-SFHA policies, as shown in columns 2, 4, 5 and 6.

7.2.2 Regression Analysis: Lookback Periods and Flood Insurance Premiums

Next, we explore whether the presence of a lookback period influences average premium costs across communities. After establishing this baseline, we focus on communities with lookback periods in place to explore whether the duration of these periods—shorter versus longer lookback periods—affects flood insurance premiums within these communities. This approach enables us to distinguish between the effect of having a lookback period and the further impact of its length on the relative cost of flood insurance.

To investigate the impact of lookback periods on flood insurance premiums, we employ the following OLS regression model:

$$\begin{aligned} Premium_i = {} & Lookback\ Period\ Indicator_i \\ & + Risk\ Factors_i + Demographic\ Characteristics_i \\ & + Economic\ Characteristics_i \\ & + Housing\ Market\ Characteristics_i \end{aligned} \tag{5}$$

The dependent variable, $Premium_i$,. $Lookback\ Period\ Indicator_i$, and the other predictor variables are defined in prior sections. We employ robust standard errors to account for potential heteroscedasticity in the model.

The results in Table G-7 present the relationship between the presence of a lookback period and flood insurance premiums as a percentage of house values. The dependent variable is the log of the premium-to-house value ratio, measured across all single-family residences (SFRs) in Models 1 and 2, SFRs within Special Flood Hazard Areas (SFHA) in Models 3 and 4, and SFRs outside SFHA in Models 5 and 6.

In Models 1 and 3, the presence of a lookback period shows a significant negative association with premium-to-house value ratios across all SFRs and within SFHAs. Specifically, in Model 1, the coefficient on the Lookback Period Indicator is -0.18 ($p < 0.01$), indicating that the presence of a lookback period is associated with a lower premium-to-value ratio. This effect is more pronounced within SFHAs, as seen in Model 3, where the coefficient is -0.54 ($p < 0.01$). These results suggest that lookback periods may help to moderate insurance premium costs relative to property values in higher-risk areas.

However, when additional controls are included in Models 2, 4, and 6, the impact of the lookback period indicator is generally reduced and becomes insignificant. This indicates that other community characteristics—such as % SFR in SFHA, distance to the coast, vacancy rates, and mortgage prevalence—might explain much of the premium variation across communities.

Overall, these results suggest that while the presence of a lookback period can lower premium costs in SFHAs, the effect diminishes when controlling for broader economic, demographic, and housing characteristics. This finding implies that community characteristics and specific flood risk exposures play a critical role in determining the relative premium costs across properties.

Similar to the previous analysis of take-up rate, we next assess the relationship between the length of the lookback period and flood insurance premiums. We utilize the following OLS model:

$$\begin{aligned} Premium_i = {} & Indicators\ of\ Lookback\ Period\ Lengths_i \\ & + Risk\ Factors_i + Demographic\ Characteristics_i \\ & + Economic\ Characteristics_i \\ & + Housing\ Market\ Characteristics_i \end{aligned} \tag{6}$$

The key independent variables, $Indicators\ of\ Lookback\ Period\ Lengths_i$, represent different categorizations of lookback period durations, Version 3 and Version 4.

By differentiating communities based on these categorizations, we aim to assess whether the length of a lookback period correlates with premium-to-value ratios across different risk zones, allowing for a nuanced understanding of how extended lookback periods might influence insurance premiums. Robust standard errors are used to account for potential heteroscedasticity in the data.

The results in Tables G-8 and G-9 analyze the relationship between the length of the lookback period and flood insurance premiums relative to house values for single-family residences (SFRs) across different risk zones. Specifically, these tables assess whether extended lookback periods influence flood insurance premiums for all SFRs, and then separately for homes located within Special Flood Hazard Areas (SFHA) and those outside SFHA.

Table G-8 presents results from OLS regressions that examine the impact of varying lookback period lengths on flood insurance premiums as a proportion of house values. For all SFRs (Models 1 and 3), the coefficient for "Lookback Period: 2-5 Years" is negative but not statistically significant in most specifications, implying a limited effect of shorter lookback periods on insurance premiums for the overall sample. Similarly, for lookback periods classified as "More than 5 Years" or "More than 10 Years," the coefficients are largely insignificant, suggesting no consistent impact on premium-to-value ratios when lookback periods extend beyond five years.

Table G-9 provides a more nuanced view by separating the analysis for SFRs located within SFHAs and those outside SFHAs. In SFHAs (Models 1-4), longer lookback periods somewhat correlate with higher premiums relative to house values. For example, in Model 1, Lookback

Period: More than 5 Years has a positive and significant coefficient (0.77, $p < 0.05$), indicating that communities with extended lookback periods tend to have higher premium-to-value ratios within high-risk flood zones. However, this trend does not hold across all specifications. For SFRs located outside SFHAs (Models 5-8), the relationship between lookback period length and premiums is not statistically significant.

8 Analysis of Housing Values

In this section, we address the question, "How are home values in a community affected by the existence of, and length of a lookback period?" We describe the analysis performed to estimate the relationship between lookback periods and various housing characteristics. The data sources and a discussion of how the data was assembled is provided in Appendix F. The discussion in Appendix F includes a detailed explanation of how houses are mapped to flood zones and to communities.

8.1 Determinants of Lookback Period

In this section of analysis, we focus on the determinants of lookback periods across the Florida communities. The purpose of this analysis is to identify statistically significant predictors of the presence of a lookback period, thus highlighting community features that correlate with lookback periods. We employed a set of logistic regression models as follows:

$$\begin{aligned} Lookback\ Period\ Indicator_i & \\ &= Risk\ Factors_i + Demographic\ Characteristics_i \\ &+ Economic\ Characteristics_i + Housing\ Characteristics_i \end{aligned} \quad (1)$$

These models allow for the examination of various risk factors, demographic, economic, and housing market characteristics to determine their association with the likelihood that a community implements a lookback period. The dependent variable, $Lookback\ Period\ Indicator_i$, is a binary indicator, where a community i with a lookback period are coded as 1 and those without as 0.

Table G-10 presents the results from a series of logistic regressions examining the presence of a lookback period in various communities. The dependent variable is a binary indicator where a value of 1 signifies that a community has implemented a lookback period, and 0 otherwise.

We first run a serious of baseline models without risk factors. In Model 1, we examine the impact of demographic characteristics, including population (log), density (log), and educational attainment (% College), on the likelihood of adopting a lookback period. Model 2 focuses on economic characteristics, including median household income, unemployment rate, income inequality (Gini Index), poverty rate, and health insurance coverage. Model 3 incorporates housing characteristics, such as the percentage of owner-occupied housing, vacancy rate, median house age, median house value (log), median gross rent (log), percentage of homeowners with a

mortgage, and monthly housing costs relative to income (% Owner Costs). Model 4 combines all three categories of controls—demographic, economic, and housing characteristics—to create a comprehensive model.

In Model 1, Population (log) positively and significantly affects the likelihood of a lookback period (0.38, $p < 0.01$), suggesting that communities with larger populations are more likely to adopt a lookback period. Educational attainment (% College) is also positive and significant (1.26, $p < 0.05$), indicating that communities with a higher percentage of college-educated residents are more likely to implement such policies. In Model 2, the Gini Index, which measures income inequality, shows a strong positive association with the adoption of a lookback period (6.02, $p < 0.01$), suggesting that communities with greater income disparity are more likely to be correlated with this policy. Other economic indicators do not exhibit statistically significant relationships in this model. In Model 3, median house value (log) has a positive and significant association (0.64, $p < 0.05$), indicating that higher property values may correlate with the likelihood of a lookback period. The percentage of owner-occupied housing is negatively associated with the adoption of a lookback period (-1.70, $p < 0.05$), suggesting that communities with higher homeownership rates are less likely to have lookback policies. Lastly, results in Model 4 suggest that, when all controls are included, several variables remain significant. Population (log) continues to have a positive association (0.49, $p < 0.01$), and median house value remains positively associated with lookback period adoption, albeit at a reduced significance level.

Next, we investigate a series of risk-specific models. Model 5 isolates the effect of the percentage of single-family residences (SFRs) in Special Flood Hazard Areas (SFHA), a proxy for flood risk, on the likelihood of a lookback period. Model 6 includes both % SFR in SFHA and all controls, providing a more comprehensive assessment. Model 7 examines the influence of proximity to the coast (Distance to Coast in Miles, log) as an independent risk factor. Model 8 adds controls to the analysis of Distance to Coast, offering insight into how proximity to coastal areas impacts the likelihood of a lookback period while accounting for other community characteristics.

In Model 5, % SFR in SFHA shows a positive and significant association with the likelihood of a lookback period (1.05, $p < 0.01$), indicating that communities with a higher proportion of homes in flood-prone areas are more likely to adopt this policy. When controls are added in Model 6, % SFR in SFHA maintains a positive association (1.00, $p < 0.10$), though its significance level decreases, suggesting that flood risk remains an important factor even when accounting for other community characteristics. In Model 7, Distance to Coast has a negative and highly significant effect (-0.39, $p < 0.01$), suggesting that communities closer to the coast are more likely to adopt a lookback period. With controls included in Model 8, the effect of Distance to Coast remains negative (-0.29, $p < 0.05$), confirming that proximity to coastal areas influences the likelihood of a lookback period even after adjusting for other variables.

Overall, these findings highlight that both general community characteristics and specific risk factors influence the adoption of lookback periods, suggesting that communities at higher risk or with greater capacity to implement policies are more likely to have lookback periods. The risk-specific variables—% SFR in SFHA and Distance to Coast—are crucial factors. The positive association of % SFR in SFHA with lookback period adoption implies that flood-prone areas are more inclined toward these policies. Similarly, the negative association of Distance to Coast reinforces the notion that communities closer to the coast, likely due to heightened risk perceptions, are more likely to adopt lookback periods. Importantly, these two variables remain statistically significant even with the full set of demographic, economic, and housing market controls. Other census characteristics, such as population size and density, also contribute to the likelihood that a community adopts a lookback period.

8.2 The Length of Lookback Period

In this section, we focus on Version 1 and Version 2 categorizations (see Appendix F) as we employ logistic regressions to compare communities with longer lookback periods against those with shorter ones. In subsequent analyses, we will incorporate Versions 3 and 4, which offer more granular categorizations, to explore the impact of lookback period length on housing values.

We run the following logit model:

$$\begin{aligned} Indicator\ for\ A\ Longer\ Lookback\ Period_i \\ = Risk\ Factors_i + Demographic\ Characteristics_i \\ + Economic\ Characteristics_i \\ + Housing\ Market\ Characteristics_i \end{aligned} \tag{2}$$

The dependent variable, $Indicator\ for\ A\ Longer\ Lookback\ Period_i$, is a binary indicator based on either Version 1 or Version 2 categorization discussed above. The predictor variables are the same as in G-11. We employ robust standard errors to account for potential heteroscedasticity in the model.

The results presented in G-11 examine the likelihood of a community having a longer lookback period under two categorization schemes: Models 1-2 and 5-6 are based on Version 1 for communities with a lookback period of 5 years or less versus those with more than 5 years, and Models 3-4 and 7-8 are based on Version 2 categorizing communities into those with less than 5 years versus 5 years or more. Similar to the previous table (i.e., Table 2), we include various socio-economic, housing, and risk-related variables, either individually or in combination, to determine which factors are most strongly associated with extended lookback periods.

Our results are largely consistent in using either Version 1 or Version 2. The percentage of single-family residences (SFR) located within Special Flood Hazard Areas (SFHA) is significantly negative, suggesting that communities with a higher proportion of properties in SFHAs are less

likely to adopt longer lookback periods. This effect diminishes with the inclusion of control variables in Models 2 and 4, although it remains directionally consistent. Distance to Coast is significantly positive in all models. Communities further from the coast are more likely to implement longer lookback periods. This might suggest that inland communities, while less directly exposed to coastal flood risks, still prioritize extended lookback periods.

Economic factors also play a pivotal role. Median Household Income (log) and % with Health Insurance both show positive associations with longer lookback periods, suggesting that wealthier, more stable communities with greater resource availability may be more inclined toward sustained, long-term planning. Conversely, Unemployment Rate has a significant negative relationship. Housing characteristics further shape these policy choices. For instance, % Vacant and Median House Value (log) both exhibit negative associations with the length of lookback periods. Higher vacancy rates and greater property values might correspond with less stable or more dynamic housing markets, discouraging long-term policy commitments. Additionally, % Mortgage is negatively associated with longer lookback durations, suggesting that higher mortgage rates may lead communities to favor shorter, more flexible policies.

Together, these results collectively highlight that, once a lookback policy is in place, the decision to extend its duration is influenced by both economic stability and risk management strategies. Communities with economic resources and stable housing characteristics are more inclined to adopt extended lookback periods, while those with higher exposure to immediate risks or economic constraints tend to favor shorter durations.

This preliminary evidence from G-11 sets the stage for our deeper investigation into how lookback period restrictions affect house values. The strong negative correlation between house values and lookback period length, combined with the observation that wealthier communities tend to implement longer lookback periods (positive coefficient on median household income), suggests a complex relationship between these policies and housing markets that warrants further investigation. Our subsequent analysis will build on these patterns to examine how variations in lookback period length causally impact house values, with particular attention to potential mechanisms through which these effects might operate.

8.3 Lookback Period and House Prices

This analysis examines the impact of lookback periods on house prices, specifically focusing on whether the presence and length of lookback periods affect property values. We first assess if the mere existence of a lookback period in a community influences house prices for single-family residences (SFRs). Next, we narrow our analysis to communities that have lookback period restrictions, investigating whether longer lookback periods correlate with higher or lower property values within these communities. This two-step approach allows us to distinguish between the overall effect of implementing a lookback period and the incremental impact of its duration.

For the first part of the analysis, we examine whether having a lookback period affects house prices across all SFRs. Our regression model is as follows:

$$\begin{aligned} House\ Prices_i & \\ &= Lookback\ Period\ Indicator_i \\ &+ Risk\ Factors_i + Demographic\ Characteristics_i \\ &+ Economic\ Characteristics_i \\ &+ Housing\ Market\ Characteristics_i \end{aligned} \tag{7}$$

The dependent variable, $House\ Prices_i$, is calculated as the natural logarithm of the "just value" of properties, aggregated from parcel-level data in the Name–Address–Legal (NAL) files provided by the Florida Department of Revenue. We conduct this analysis across three groups: all SFRs, those located within Special Flood Hazard Areas (SFHA), and those outside SFHA. $Lookback\ Period\ Indicator_i$ is a binary indicator where a value of 1 signifies that a community has implemented a lookback period, and 0 otherwise. Other predictor variables are consistent with those used in the previous tables, covering demographic, economic, housing, and risk-related factors. We employ robust standard errors to account for potential heteroscedasticity in the model.

The results in G-12 examine the relationship between the presence of a lookback period and house prices, measured as the natural logarithm of assessed market value (just value) across single-family residences (SFRs). The analysis considers three categories: all SFRs, SFRs within Special Flood Hazard Areas (SFHA), and those outside SFHA.

In columns (1) and (2), which analyze the impact of lookback periods on all SFRs, the Lookback Period Indicator shows a significant positive association in the simple model (0.46, $p < 0.01$), indicating that communities with lookback periods tend to have higher average house values. However, when controls are introduced in column (2), this effect becomes insignificant. Among the control variables, % SFR in SFHA, Gini Index, Median Household Income (log), and Median House Value (log) show significant positive effects on house prices, suggesting that communities with higher income levels, property values, and income inequality tend to have higher house values.

For SFRs within SFHA, shown in columns (3) and (4), the Lookback Period Indicator remains positively significant in the base model (1.35, $p < 0.01$), indicating that lookback periods are linked to higher house values in flood-prone areas. However, this effect diminishes to insignificance when additional controls are included. Key control variables with significant positive impacts on house values within SFHA include % SFR in SFHA and Median Household Income (log), indicating that these factors may drive higher property values in flood-prone areas. The variable % Below Poverty

Line exhibits a negative association (-3.79, $p < 0.1$), suggesting that areas with higher poverty levels within SFHA tend to have lower property values.

For SFRs outside SFHA, displayed in columns (5) and (6), the Lookback Period Indicator is insignificant in both models, suggesting no direct effect of lookback periods on property values in non-flood-prone areas. Instead, factors like Population (log), % Owner Occupied, and Median Household Income (log) are significant and positively associated with house prices, while % Vacant and % Mortgage show strong negative associations with property values. This pattern suggests that market characteristics and socio-economic factors play a greater role in determining house prices outside SFHA than the presence of a lookback period.

In summary, the presence of a lookback period appears to correlate positively with house prices in SFHA but shows limited influence on house values outside flood-prone areas. This pattern indicates that lookback periods may contribute to value preservation in higher-risk areas, although socio-economic factors remain influential across all regions.

In the second part of the analysis, we focus on communities with established lookback periods to explore if longer durations are associated with differences in house prices. The OLS model is specified as:

$$\begin{aligned} House\ Prices_i &= Indicators\ of\ Lookback\ Period\ Lengths_i \\ &+ Risk\ Factors_i + Demographic\ Characteristics_i \\ &+ Economic\ Characteristics_i \\ &+ Housing\ Market\ Characteristics_i \end{aligned} \tag{8}$$

The dependent variable, $House\ Prices_i$, is the same as the previous equation and represents the average flood insurance premium as a percentage of house values across different groups: all single-family residences (SFRs), those within SFHAs, and those outside SFHAs. The key independent variables, $Indicators\ of\ Lookback\ Period\ Lengths_i$, Versions 3 and 4, defined in Appendix F.

These categorizations allow us to evaluate the potential incremental effects of various lookback period lengths on property values, accounting for a comprehensive set of risk, demographic, economic, and housing market characteristics. Robust standard errors are used to account for potential heteroscedasticity in the data.

In Table G-13, the analysis examines how the length of the lookback period influences house values across all single-family residences (SFRs) in communities with established lookback policies. The results indicate that longer lookback periods are generally associated with lower

house values, suggesting that extended lookback requirements may be perceived as imposing regulatory burdens that could deter prospective buyers or limit property appreciation.

In Models (1) and (2), lookback periods of 2-5 years show a significant negative association with house values. Specifically, the coefficient for a 2-5 year lookback period is -0.51 in Model (1) ($p < 0.1$) and -0.13 in Model (2) ($p < 0.05$), indicating that these moderately extended lookback periods are linked to a reduction in house values. The effect becomes even more pronounced for lookback periods longer than 5 years, with a coefficient of -0.63 in Model (1) ($p < 0.05$) and -0.18 in Model (2) ($p < 0.05$). These findings highlight that as the length of the lookback period increases, the impact on house values becomes more negative, potentially due to concerns about regulatory restrictions on properties over a longer timeframe.

Further breakdown in Models (3) and (4) supports this trend. For lookback periods of 6-10 years, the coefficient remains negative and significant in Model (4) (-0.13, $p < 0.05$). For lookback periods exceeding 10 years, the effect on house values is even more substantial, with a coefficient of -0.80 in Model (3) ($p < 0.01$) and -0.17 in Model (4) ($p < 0.05$). These results suggest that longer lookback periods, particularly those of 10 years or more, are consistently associated with reduced house values in communities with such policies.

Table G-14 further explores the effects of lookback period length on house prices by comparing SFRs within and outside SFHA. For properties in SFHAs, the coefficients in Model (1) indicate a monotonic decline in house values as the length of the lookback period increases. Compared to communities with a lookback period of 1 year or less, properties in communities with a 2–5 year lookback period exhibit lower house values (-1.08, $p < 0.05$). For lookback periods greater than 5 years, the reduction in house values is even more evident, with coefficients of -1.74 in, highly significant ($p < 0.01$). This pattern holds in Model 3 for 6-10 year and more than 10 year lookback periods, indicating a strong, consistent negative impact on house prices as the lookback period lengthens within SFHA communities. However, in Models 2-4, the statistical significance reduces when we add the full set of controls.

In contrast, for properties outside SFHAs, the effect of lookback periods becomes statistically significant only after additional controls are introduced in Models 6 and 8. In communities with lookback periods of 6–10 years or more than 10 years, house values exhibit significant declines. For example, results in Model 6 suggest that the decline reaches 1.1 for a 2–5 year lookback period and 1.37 for lookback periods of more than 5 years after controlling for demographic, economic, and housing market characteristics. Results in Model 8 are consistent. This suggests that longer lookback periods can still negatively affect property values outside SFHAs when accounting for other factors.

In sum, the analysis underscores a robust and monotonic relationship between longer lookback periods and declining house values. This pattern likely reflects the increased costs and constraints associated with compliance under FEMA's 50 percent rule in high-risk areas. Extended regulatory timeframes may pose greater perceived risks to property values in areas with higher flood exposure, likely due to anticipated restrictions on renovation, resale, or compliance with evolving flood management standards.

9 Analysis of Lookback Period and House Prices at the Parcel-level

The analysis of the determinants of lookback period adoption suggests that communities with and without lookback periods are inherently different. Additionally, our community-level analysis indicates that significant results emerge only when we restrict the analysis to these communities. This section focuses exclusively on communities with lookback periods. By concentrating on the effect of lookback period length within this subset, we aim to provide a more precise and meaningful assessment of its impact on house prices.

9.1 Parcel Level Regression Analysis: Housing Prices and Lookback Period Lengths

We run the following OLS model:

$$\begin{aligned} House\ Prices_{ji} &= Indicators\ of\ Lookback\ Period\ Lengths_i + Risk\ Factors_i \\ &+ House\ Characteristics_j + Demographic\ Characteristics_i \\ &+ Economic\ Characteristics_i \\ &+ Housing\ Market\ Characteristics_i \end{aligned} \tag{9}$$

The dependent variable, $House\ Prices_{ji}$, is the log of just value of house j in community i. The key independent variables, $Indicators\ of\ Lookback\ Period\ Lengths_i$, represent different categorizations of lookback period durations, building upon our previous categorizations from the determinants analysis. Similar to the previous analysis at the community level, we use the Version 3 and Version 4 variables for lookback period lengths, as described in Appendix F.

In this analysis, we incorporate more granular, house-level characteristics, including property age, land and living area sizes, improvement quality, and homestead exemption status. By controlling for these property-specific factors, we aim to isolate the effect of lookback period length on house values while accounting for variations in housing attributes that may independently influence valuation. Again, our model includes the same set of risk, demographic, economic, and housing

market characteristics. Robust standard errors are used to account for potential heteroscedasticity in the data.

Table G-15 provides detailed evidence on the relationship between lookback periods and house prices at the parcel level, controlling for a comprehensive set of property-specific and community-level characteristics. The results reveal a consistent and statistically significant negative relationship between the length of lookback periods and house prices, indicating that longer lookback periods are associated with lower property values.

Results in column (1) suggest that, compared to properties in communities with lookback period of 1 year or less, those in communities with a 2–5-year lookback period have house values that are, on average, 4.2 percent lower. For communities with lookback periods exceeding five years, house prices are 5.7 percent lower. Model (2) introduces further granularity by dividing longer lookback periods into four categories. The results show a monotonic pattern where longer lookback periods correspond to larger reductions in house prices. Specifically, properties in communities with a 6–10-year lookback period exhibit a 6.7 percent reduction in value compared to those with a lookback period of less than two years. For lookback periods exceeding 10 years, the reduction is smaller but still significant at 2.4 percent. This consistent and robust pattern suggests that the length of a community's lookback period imposes a clear and measurable impact on property values, with the steepest declines occurring for longer-term lookback periods (6–10 years).

The parcel-level control variables have the expected signs. Properties with mid- and high-quality improvements have significantly higher values, with increases of 12.3 percent and 23.5 percent, respectively, relative to low-quality properties. House prices decrease with age but exhibit a non-linear pattern, as evidenced by the positive and significant squared age term. Both land and living area positively affect house values, but their squared terms suggest diminishing returns. Properties with homestead exemptions are 9.3 percent more valuable, reflecting the tax benefits associated with these exemptions.

The community-level characteristics also play a significant role. Larger populations and higher population densities are associated with higher property values, as are higher proportions of white residents. Conversely, communities with a greater share of older adults, lower educational attainment, and higher poverty levels tend to have lower property values. Median household income and access to health insurance positively impact property values, while higher unemployment rates and income inequality (Gini index) reduce them. Proximity to the coast positively influences property values, as does living in areas with higher median gross rents and higher owner costs.

In summary, the parcel-level analysis reinforces findings from the community-level analysis while offering a more granular perspective. The results underscore that longer lookback periods are

associated with reductions in property values, consistent with earlier findings. The detailed controls at the parcel level also highlight the significant influence of property-specific characteristics, emphasizing the importance of localized factors in shaping housing market outcomes.

9.2 Lookback Period and Renovations

In this section, we examine renovations over the past 1 year, 3 years, and 5 years to capture both short-term and medium-term renovation activities. This approach provides a nuanced understanding of how lookback periods influence renovation likelihood across different time horizons. Renovations within the past year reflect immediate homeowner responses, while those within the past 3 and 5 years allow us to observe longer-term trends and the cumulative impact of policy constraints, such as FEMA's 50 percent rule and its interaction with the duration of lookback periods. This temporal breakdown is critical for identifying both immediate and sustained effects of lookback periods on property improvements.

9.2.1 Parcel-level Regression Analysis: Lookback Period Length and Renovations

We run the following OLS model:

$$\begin{aligned} Renovation_{ji} = {} & Indicators\ of\ Lookback\ Period\ Lengths_i + Risk\ Factors_i \\ & + House\ Characteristics_j + Demographic\ Characteristics_i \\ & + Economic\ Characteristics_i \\ & + Housing\ Market\ Characteristics_i \end{aligned} \tag{9}$$

The dependent variable, $Renovation_{ji}$, is an indicator variable that equals one house j in community i renovated in the past.

The key independent variables, $Indicators\ of\ Lookback\ Period\ Lengths_i$, and control variables are the same as the previous analysis. Robust standard errors are used to account for potential heteroscedasticity in the data.

The findings in G-16 provide critical insights into a potential mechanism explaining why lookback periods reduce house prices: their impact on renovation activity. Renovations are a key avenue for homeowners to increase property values, yet lookback periods, as part of FEMA's 50 percent rule, impose cumulative cost constraints over time. These constraints limit homeowners' ability to undertake significant improvements, particularly in communities with longer lookback periods.

The results demonstrate that the length of lookback periods significantly reduce the likelihood of renovations. For example, compared with homes in communities with a lookback period of less than 2 years, homes in communities with a 2–5-year lookback period are 0.2 percentage points less likely to have undergone renovations in the past year, 0.3 percentage points less likely to have

undergone renovations in the past three years, and 2.4 percentage points less likely over five years. The effects are even stronger for communities with a lookback period longer than five years. These homes are 1.1 percentage points less likely to have been renovated in the past year, 0.8 percentage points less likely over three years, and 2.7 percentage points less likely over five years.

When categorizing lookback periods into finer durations (e.g., 6–10 years and more than 10 years), the results confirm the monotonic relationship: the longer the lookback period, the greater the reduction in renovation activity. For example, homes in communities with 6–10-year lookback periods are 1.0, 0.6, and 2.7 percentage points less likely to have been renovated in the past 1, 3, and 5 years, respectively. Communities with lookback periods exceeding 10 years show even larger declines, particularly in short-term renovations, with a 1.5 percentage point reduction in the likelihood of renovations in the past year.

The suppression of renovation activity due to cumulative cost restrictions aligns with the observed reductions in house prices in communities with lookback periods. Renovations typically increase property appeal, functionality, and market value. By limiting homeowners' ability to undertake substantial improvements, lookback periods reduce the potential for housing appreciation. This effect compounds over time in communities with longer lookback periods, further driving down property values.

The results hold even after controlling for extensive property-specific and community-level factors. Parcel-level coefficient estimates suggest that newer properties and properties with higher improvement quality are less likely to be renovated, likely reflecting fewer immediate needs for improvement.

Community-level coefficient estimates suggest that renovation likelihood consistently increases with population density, percentage of elderly residents, percentage of white residents, percentage of college graduates, and percentage of residents with mortgages. Communities with higher unemployment rates and poverty levels also show consistently higher renovation probabilities. Housing market conditions matter as well - both higher median house values and higher median rents are positively associated with renovation activity. Conversely, renovation probability consistently decreases with the percentage of married households, median household income, percentage of residents with health insurance, and owner costs. The negative association with household income, coupled with positive effects of unemployment and poverty rates, suggests that renovation activities might be more prevalent in economically diverse or transitioning neighborhoods rather than uniformly wealthy areas.

Some factors show varying or opposing effects across different time horizons, particularly the percentage of owner-occupied housing and vacant properties, which shift from positive to negative associations as the time window extends. This suggests that these housing market characteristics

might have different implications for short-term versus long-term renovation decisions. These patterns collectively suggest that renovation activities are more common in densely populated, demographically diverse areas with active housing markets, rather than in homogeneous, high-income communities. The positive association with both poverty and housing values might indicate that renovations are driven by both property improvement in prospering areas and necessary maintenance in economically challenged neighborhoods.

In conclusion, the evidence supports the hypothesis that lookback periods constrain renovation activity, thereby reducing the potential for house price appreciation. This mechanism is particularly pronounced in communities with longer lookback periods, where cumulative cost constraints severely limit homeowners' ability to maintain or enhance their properties. These findings provide a crucial link between regulatory policies and housing market dynamics, emphasizing the broader economic implications of lookback periods.

9.3 Lookback Period and Building Permits

In this section, we explore the relationship between lookback period and building permit activities, using the Builty dataset which was described in our discussion of our data and sample construction. Consistent with previous analysis, we focus on communities with established lookback periods.

As described in the Appendix F, the match between jurisdiction and community ID is not perfect because of noise and inconsistencies in the data. This necessitated using both jurisdiction and city names to perform fuzzy matching, improving the likelihood of successful matches.

Before performing the matches, all text fields were normalized to ensure consistency in comparison. Normalization involved converting text to lowercase and removing extra whitespace, reducing errors caused by formatting inconsistencies (e.g., differences in capitalization or spacing). The matching algorithm used was based on string containment logic. For each city or jurisdiction, the algorithm checked if it appeared as a substring in any community name. The first matching community name was selected as the corresponding entry. If no match was found, the entry was marked as unmatched. To address noisy data, both city and jurisdiction names were used independently in the matching process. This redundancy increased the likelihood of finding suitable matches despite inconsistencies in the datasets.

The matching process successfully identified 114 communities out of the 379 communities in the final sample. These 114 communities collectively account for 912,974 building permits, representing 78.7 percent of the full sample. This outcome suggests that the matching was highly effective, enabling us to identify approximately 79 percent of building permits. Among these 114 communities, 74 communities (out of 115 with a specified lookback period in the final sample)

have a defined lookback period. These 74 communities will be the focus of our subsequent analysis.

Table G-17 presents the regression results examining the relationship between lookback periods and the log of building permits scaled by population. The key finding across all specifications is that longer lookback periods deter building permit activity, aligning with our earlier findings on renovations and house prices. Column (1) shows that communities with lookback periods of more than five years exhibit a negative but statistically insignificant relationship with building permit activity. In Column (2), where lookback periods are reclassified as "five years or more," the negative coefficient becomes statistically significant at the 10 percent level, indicating that building permit activity decreases by approximately 1.01percent for every unit increase in the length of the lookback period. Columns (3) and (4) provide more granular categorizations, distinguishing between communities with 2–5 years, 6–10 years, and more than 10 years of lookback periods. The results consistently show that longer lookback periods are associated with lower building permit activity, though the coefficients are not statistically significant.

In conclusion, while the statistical insignificance in some models underscores the data limitations inherent in this analysis, the results consistently suggest that longer lookback periods deter building activity. This finding underscores the importance of addressing data quality and reporting consistency for future research and policy evaluation.

In Appendix H, we provide more detailed discussion of estimates regarding how lookback periods affect housing prices and tax revenue.

10 Qualitative Analysis of Lookback Periods

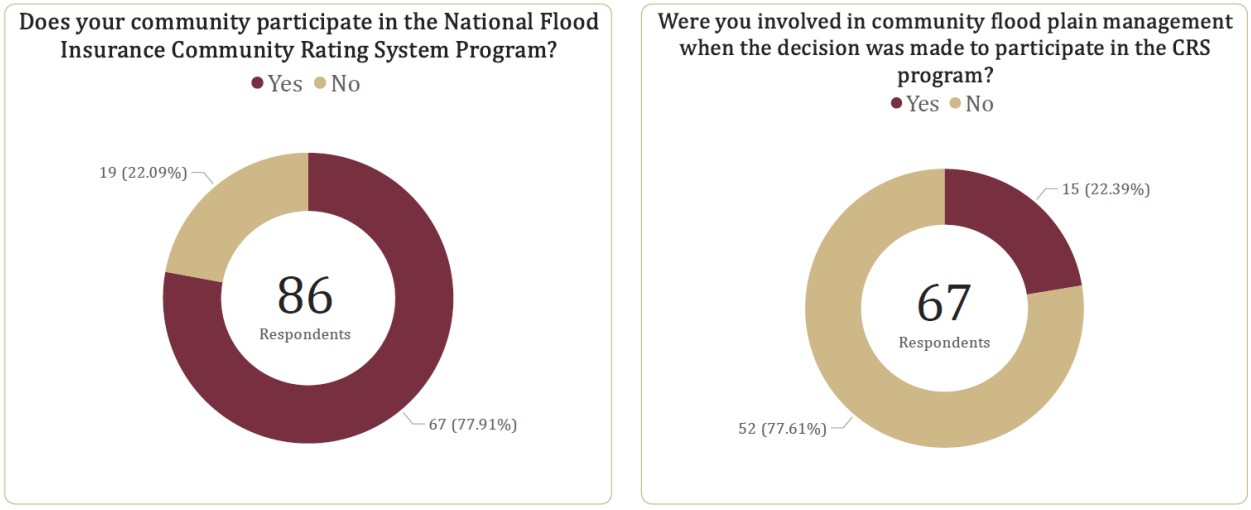
The quantitative portions of this study used available sources of data to analyze the costs and benefits of the lookback periods to a variety of stakeholders. In this section, we evaluate responses obtained from two specific stakeholder groups: the flood plain managers and Florida residents.

10.1 Survey of Flood Plain Managers

This section specifically surveys flood plain managers in the state of Florida to better understand the frameworks used to set lookback or cumulative substantial review periods as well as to gain their perspective on the logistics and impact of the enforcement of these periods. A copy of the full survey instrument is included in Appendix I. We provide more detailed statistics in Appendix J.

Figure 7. Community Involvement in CRS Programs shows that, of the respondents,78 percent of the communities participate in the NFIP CRS Program. Further, 22 percent of the respondents indicate that they were involved in community flood plain management when the decision was made to participate in the CRS.

Figure 7. Community Involvement in CRS Program



Of the communities participating in the CRS, 66 percent of the communities surveyed have a lookback period for substantial improvements for properties in a flood plain. Of those 45 percent are getting a credit. This compares on average to the 28 percent of communities overall with a lookback period for communities in the CRS program.

Figure 8. Presence of Lookback Period and Associated Credits

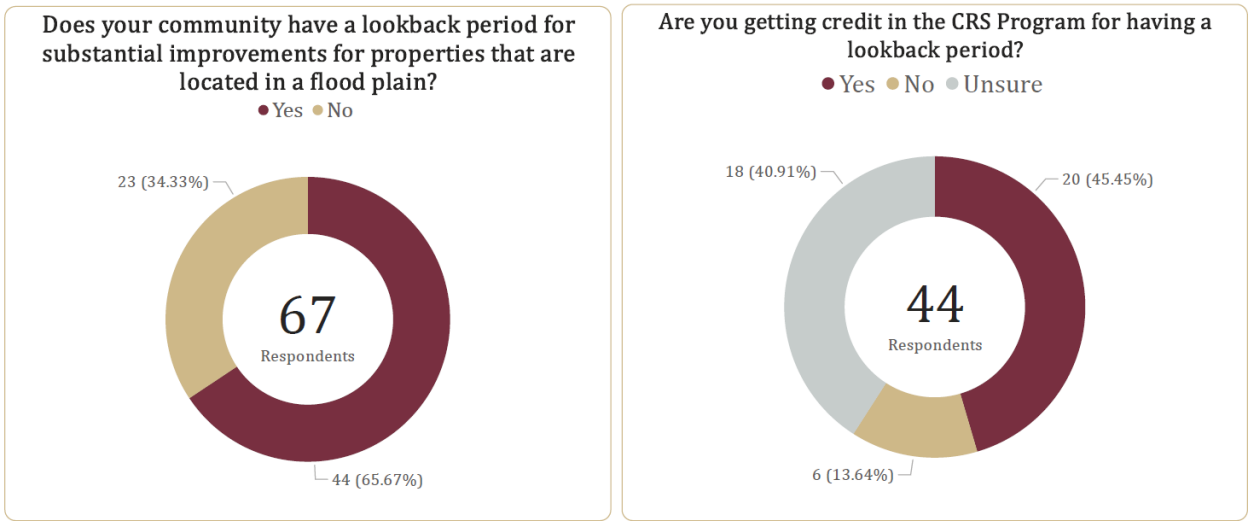
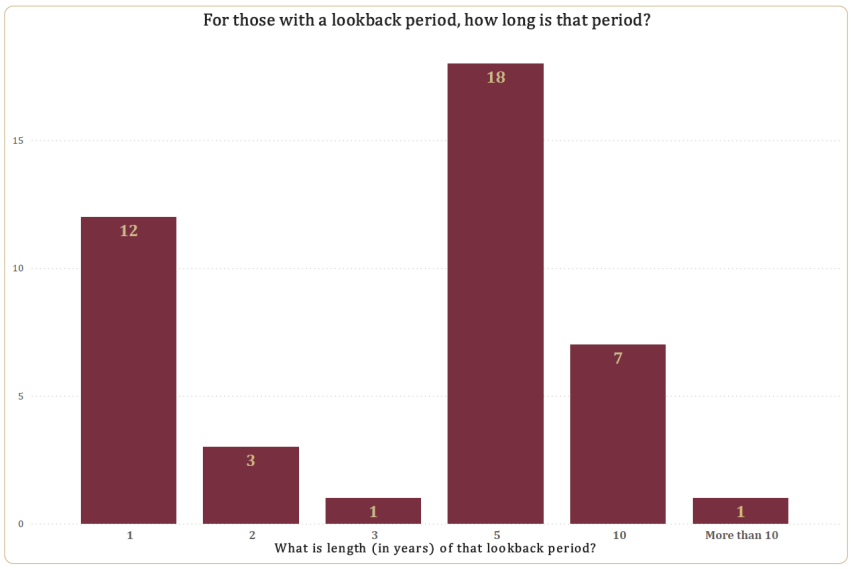


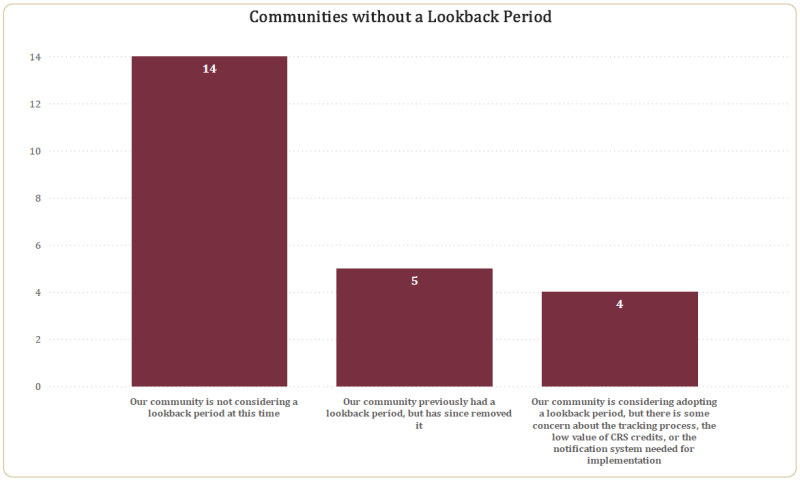
Figure 9. shows the distribution of lookback period lengths in our sample.

Figure 9. Distribution of Lookback Periods



Based on the results of our survey of communities without lookback periods five of the 23 respondents state that their community had removed the lookback period. One stated that it was done because property owners with limited incomes were unwilling to make any improvements due to fear they would trigger the 50 percent rule. Another commented on challenges for new property owners being negatively impacted by the improvements of the previous owner. Four in the sample are considering the adoption of a lookback but have not adopted due to concerns related to tracking permits over time, the low value of CRS credit points related to the lookback periods, and challenges with the timing and notification of implementing a potential change. Most of the respondents say their community is not considering the change or has removed the lookback periods (14 of 23 respondents). Figure 9 provides a graphical summary of these responses.

Figure 10. Communities without a Lookback Period



Communities vary in their handling of who is responsible for compliance with flood related building codes. The most common groups charged with review were building department/officials followed by flood plain managers community development or planning offices, followed by permit offices. In many cases, multiple offices are involved in the process. In part, this varies due to the organization of communities where in some cases these officials or offices overlap.

Figure 11. Tracking Property Improvements provides an indication of the administrative burden involved in enforcing lookback periods. Over 70 percent of respondents indicated that property improvements were easily tracked.

Figure 11. Tracking Property Improvements

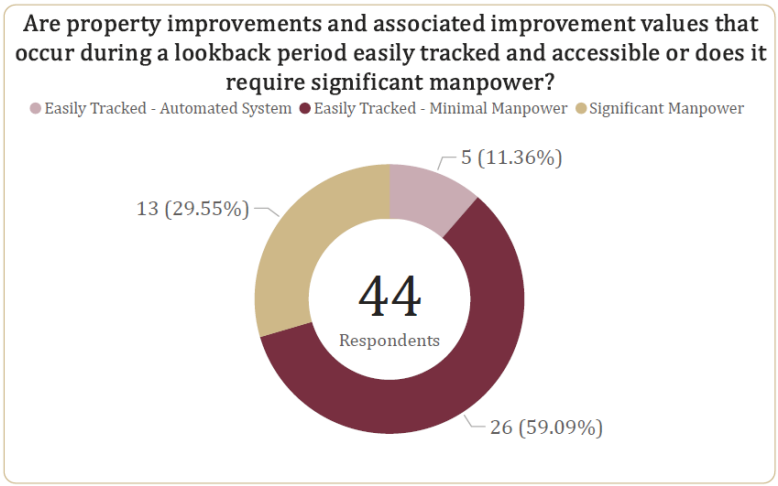
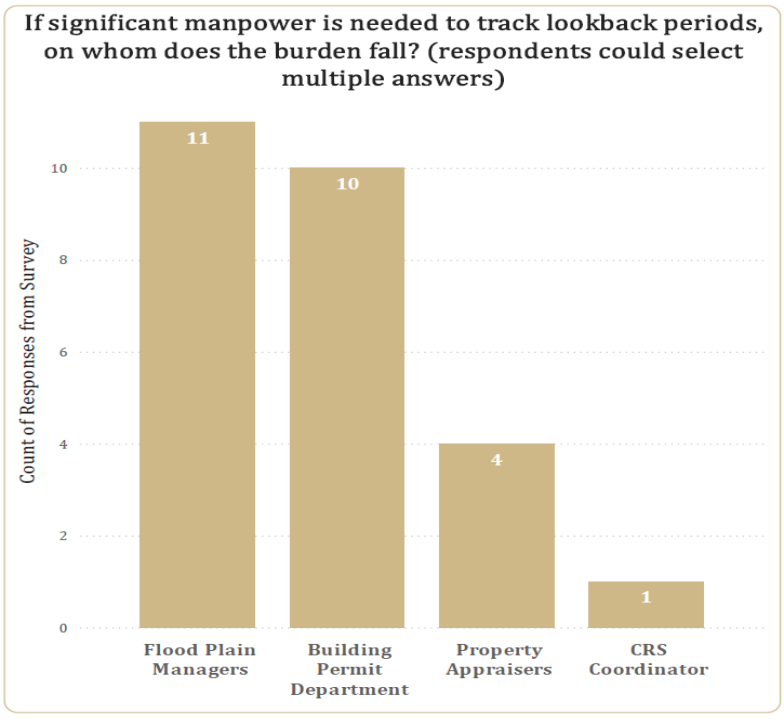


Figure 12. shows the distribution of individuals/departments reportedly responsible for tracking substantial improvements over lookback periods. Since substantial improvements can trigger requirements for properties to comply with updated flood plain regulations (such as elevation or floodproofing), flood plain managers are best positioned to assess these changes and enforce compliance. Their expertise ensures that the cumulative improvements are properly documented for regulatory purposes. We show in Figure 13 a similar breakdown for the parties reported to be responsible for ensuring compliance.

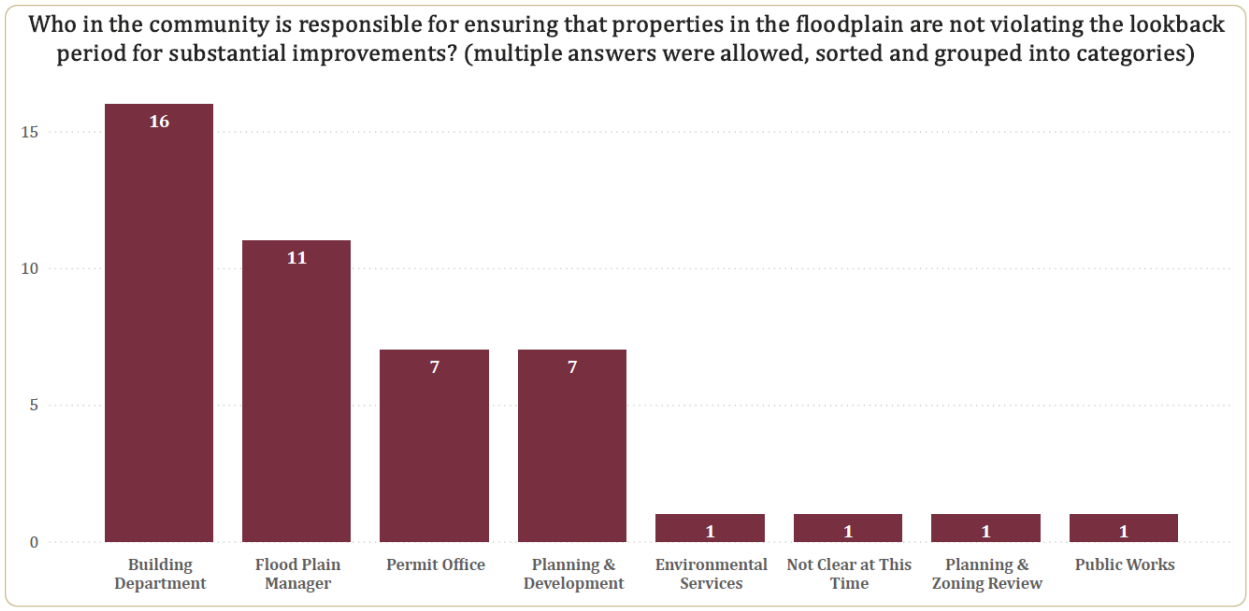
Figure 12. Parties Responsible for Tracking Substantial Improvements



In the Table J-5, we also break down the responses by the length of the lookback period and find that as you would expect, many of the communities that discuss more difficulty in tracking have longer lookback periods.

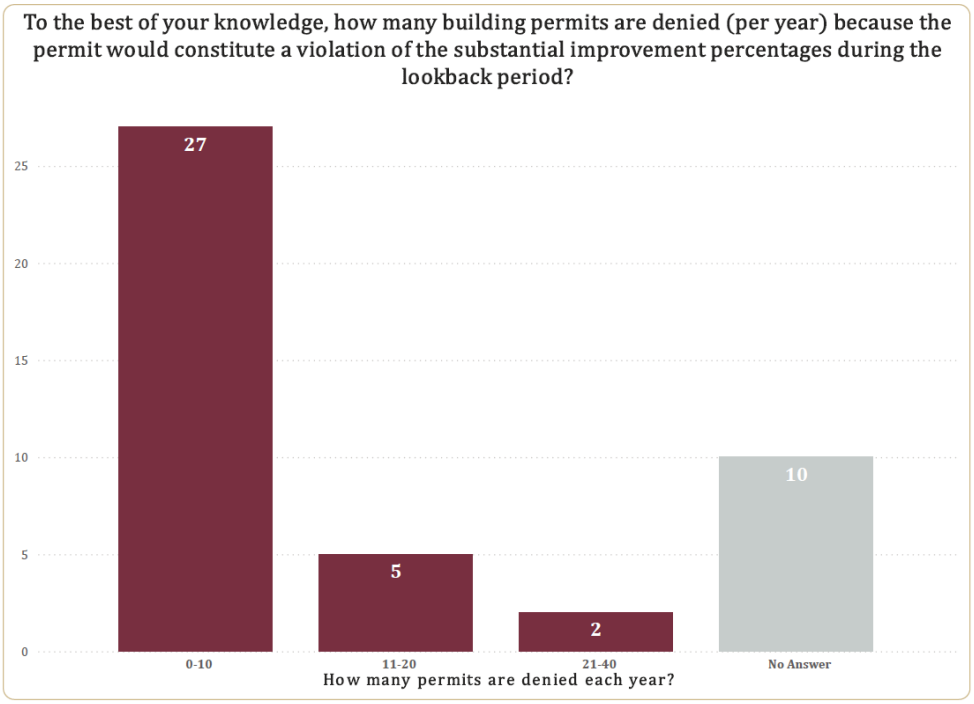
While some communities describe the process as easily tracked and accessible with minimal manpower others find there is a need for significant manpower to track property and value. This may be in part due to the size of the community and number of permits. As with other processes, the burden of which individual or office is tasked with this varies, however flood plain managers and building permit departments seem to be the most common. We also found that in many cases either due to overlaps in structure of organizations or processes put in place the flood plain managers are involved in the building permitting policy.

Figure 13. Parties Responsible for Ensuring Compliance



To better understand the potential impact of cumulative substantial improvement on property development we asked a series of questions. First, related to how many permits are denied a year based on the violation of substantial improvement percentages during the lookback periods. Figure 14 provides a summary:

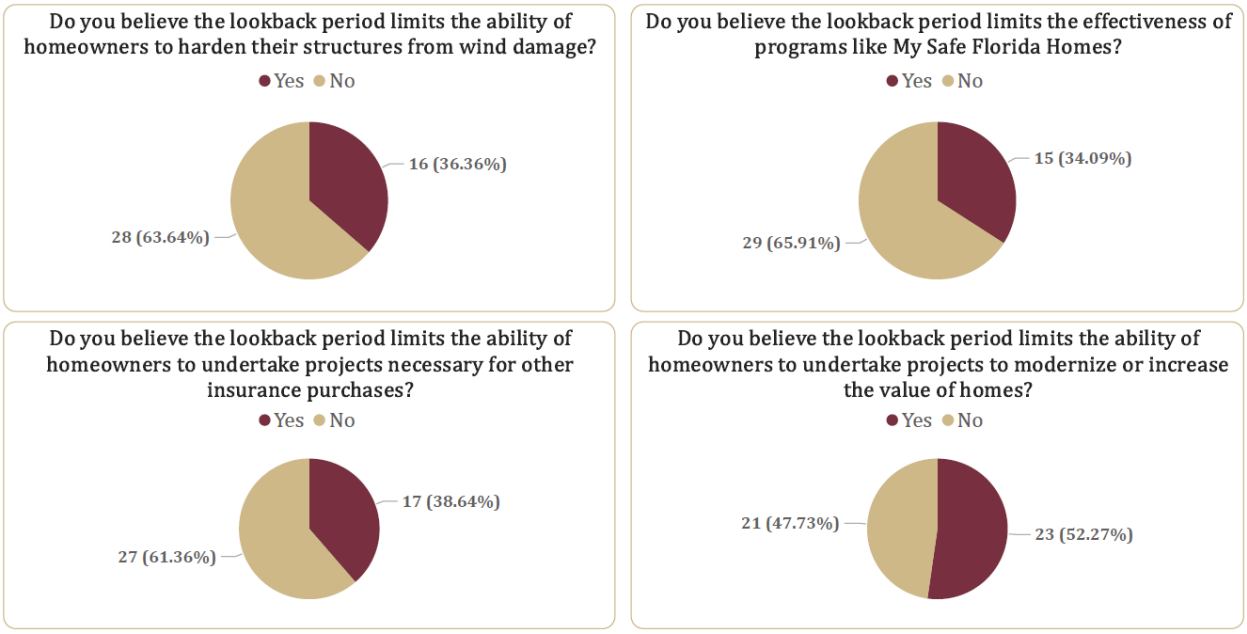
Figure 14. Building Permits Denied Due to Lookback Period



We asked the respondents their opinion on four potential consequences of lookback periods. Their responses are summarized in Figure 15.

In general, 36 percent of the respondents felt that the lookback period limits incentives for residents to harden their structures from wind damage. Similarly, 34 think it limits the effectiveness of programs like My Safe Florida Homes and 39 percent think it limits homeowners from undertaking projects that are necessary for other insurance purchases (e.g., the HO insurer wants a new roof for HO insurance). Finally, 52 percent of respondents think it limits homeowners from undertaking upgrades to modernize houses and increase home values overall. Insert summary of open-ended comments here.

Figure 15. Opinions of Potential Consequences of Lookback Periods



While many of the communities did not think they would be adjusting aspects related to cumulative substantial improvement periods, may did say they were looking at other forms of credits. For example, changes to master watershed plans, stormwater storage / improvements, increased freeboard, and improved community outreach were the most common.

10.2 Survey of Florida Homeowners

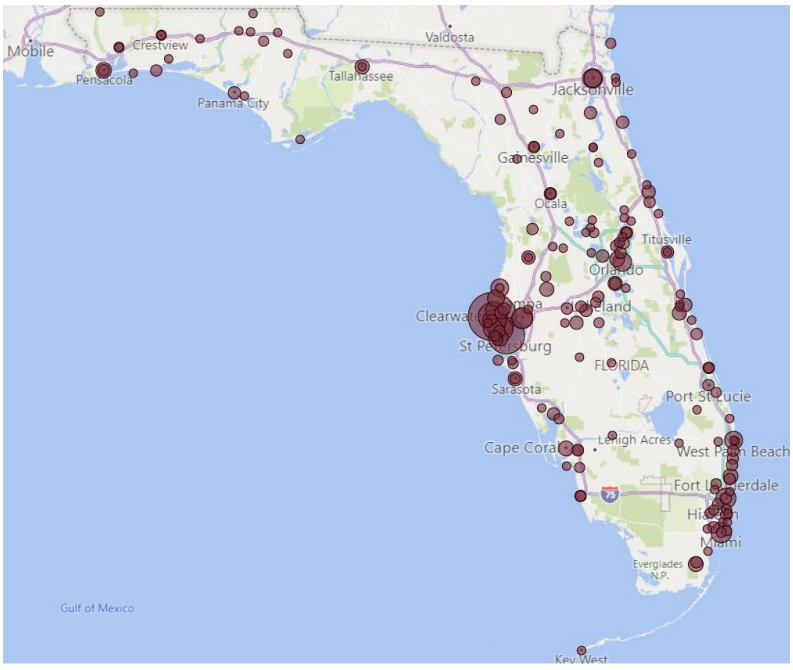
Understanding what homeowners in Florida know about the lookback periods for substantial improvements to property is important for several reasons, particularly in the context of property regulations, insurance, and disaster mitigation. The better homeowners understand their community's requirements, the more likely they avoid unexpected compliance issues. Homeowners who are unaware of lookback periods might inadvertently face increased insurance costs or ineligibility. By understanding lookback periods, homeowners can plan property

improvements in a way that enhances safety while managing costs. It is important to ensure homeowners make informed decisions about renovations, compliance, and financial planning while improving safety and property value in a state vulnerable to extreme weather events.

To better understand Florida residents' awareness of the CRS program and lookback periods, we conducted a survey of 800 Florida homeowners. The sample population was obtained through Centiment, a market research company that distributes surveys to target audiences. Responses were obtained over a period of two weeks in early November. The survey instrument is provided in Appendix K.

Our survey of homeowners sought to gain some firsthand insight into the potential impact of flood risk on their homes and their flood insurance purchase decisions.[39] We also inquired about their knowledge of the CRS Program and lookback periods as well as any experience they have with the permitting process as it relates to improving their homes. The survey contained a sample of 803 complete and usable responses. We specifically oversampled the Pinellas area given the number of properties in flood hazard areas within the county and the recent damages caused by Hurricanes Helene and Milton. Figure 16 shows the distribution of survey respondents across the state. The number of the responses by county is provided in Table L-1.

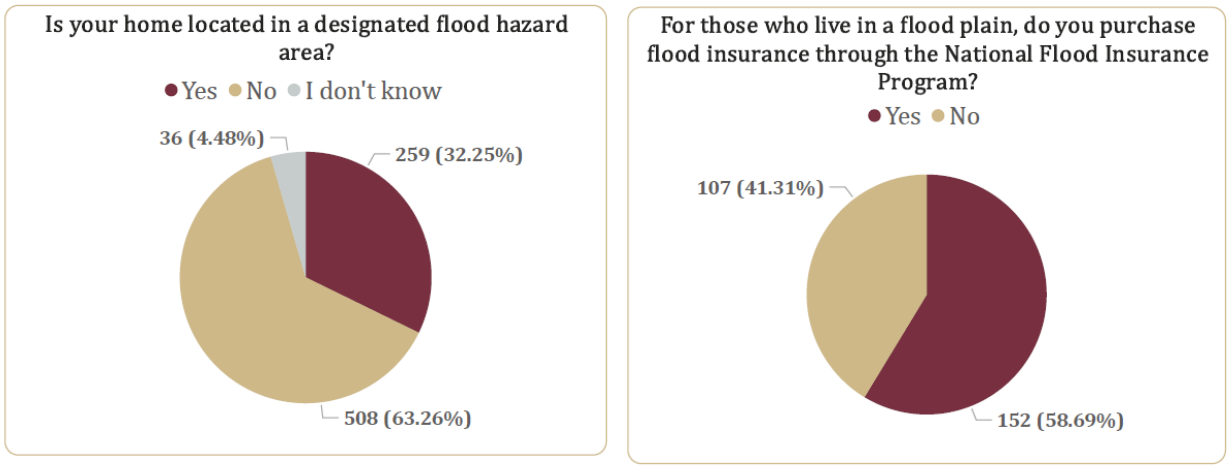
Figure 16. Distribution of Responses to Florida Homeowners Survey



[39] While the survey was administered at the CSR level, due to the large number of communities and the survey sample size, key summary statistics are provided at the county level. We do include specific information on key communities where sample size allows.

Figure 17 below shows that approximately 32 percent the respondents indicate they are in a flood hazard area (FHA) and 63 percent say they are not.[40] A small percentage, less than five percent, say they do not know. Of those that are in a flood hazard area, 59 percent indicate that they purchase flood insurance through the NFIP.[41]

Figure 17. Homeowners in Flood Hazard Areas

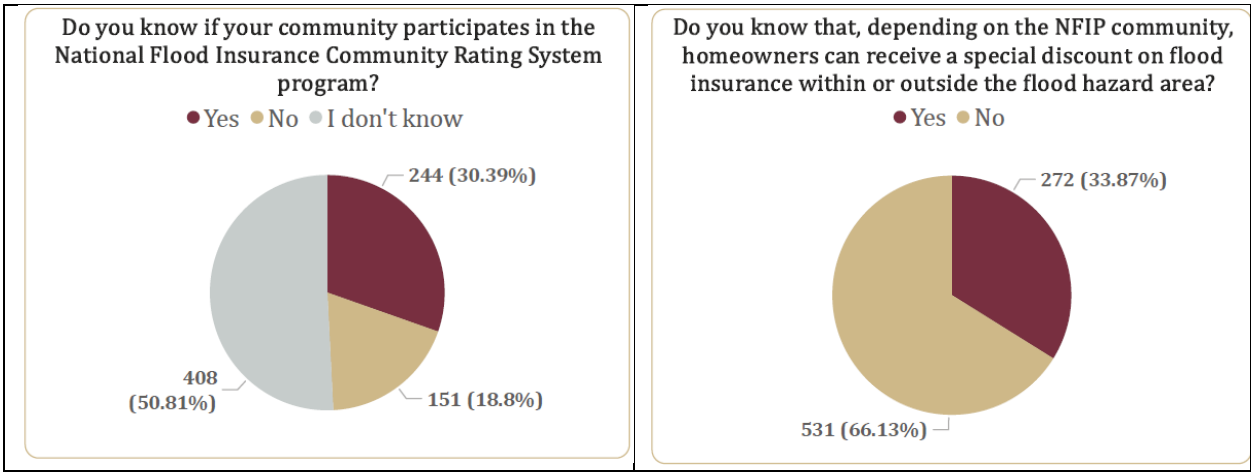


Next, we asked some questions designed to gauge homeowners' knowledge about the CRS Program and lookback periods.[42] The responses are summarized in the charts below. Figure 18 presents a breakdown of how the respondents indicated if they knew if their community participated in the NFIP's CRS Program. Interestingly, approximately half of the respondents did not know. Of the remaining population, about 30 percent of respondents indicated 'Yes.'

We also asked if they were aware that depending on the NFIP community, some homeowners can receive a discount on flood insurance within or outside the special flood hazard area. Figure 18 shows that over 66 percent of the sample responded "No". As in the prior question, these results suggest that a large percentage of homeowners are not knowledgeable about the CRS Program and/or flood insurance discounts.

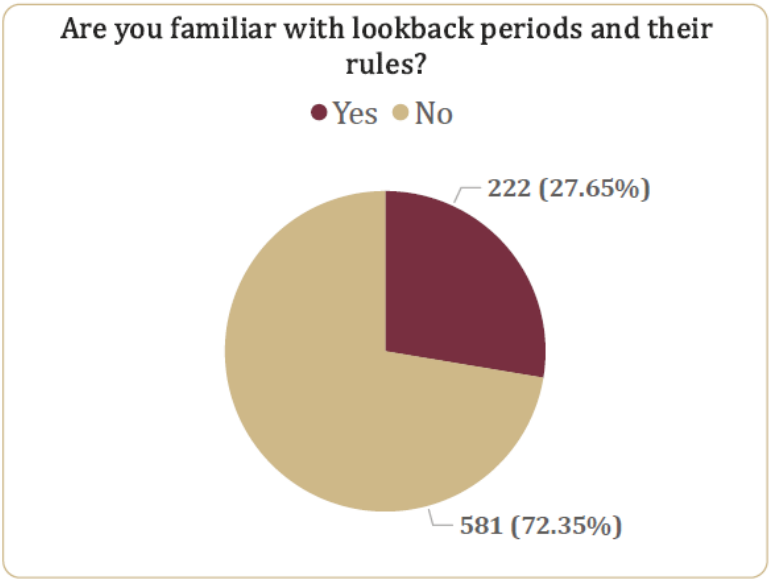
[40] We do not have the ability to confirm that a respondent's home is actually in an FHA. Nonetheless, for the purposes of our analysis, we use their responses to this question when we compare responses across different groups.
[41] As shown in Table L2, the take-up rates vary significantly across the counties represented, ranging from zero to 100 percent.
[42] Responses by county to these questions can be found in Table L-3.

Figure 18. Homeowners Awareness of CRS Program



The last question related to homeowners' knowledge asked about their familiarity with lookback periods. Figure 19 shows that more than 70 percent of the sample was unfamiliar with lookback periods. This percentage is higher than those that did not know about the CRS program and related credits in general. The difference may be due to the fact that only a small number of communities in Florida have lookback periods.

Figure 19. Homeowners Awareness of Lookback Periods



Homeowners in flood hazard areas are more likely to have knowledge of the NFIP for several key reasons. First, if they have federally backed mortgages, they are required to have flood insurance. As part of the mortgage approval process, lenders inform homeowners about NFIP requirements

and how the program works. More generally, living in a flood-prone area may prompt residents to seek information about how to manage or mitigate these risks. This often includes learning about flood insurance options and NFIP-related resources. Homeowners in areas that participate in the CRS program should be more informed if their community actively promotes flood insurance and NFIP benefits.

It is possible, however, that homeowners only learn of the CRS program when they need to engage with local government permitting offices for renovations or repairs, where NFIP rules and regulations (like substantial improvement thresholds and lookback periods) are frequently discussed.

Recognizing these factors that might influence awareness of flood-related programs, we reevaluated these responses to our awareness questions to determine responses differ based on whether or not the participant indicated that they live in a flood hazard area. As shown in Table 8, we find that more than twice the percentage homeowners located in flood hazard areas know whether their communities participate in the CSR Program compared to those not located in flood hazard areas. We also find the percentage of homeowners who do not know about the CRS program is much higher for respondents not in a flood zone indicating that communities in flood prone areas are doing a better job communicating these issues and/or homeowners are more invested in obtaining the knowledge. Similar differences are observed when examining responses to the question about knowledge of premium discounts for those living in NFIP communities.

Table 8. Awareness of Program by FHA (N=803)

		Do you know if your community participates in the NFIP CRS program?				Do you know that, depending on the NFIP community, that homeowners can receive a special discount?		
		Yes	No	I Don't Know	%Yes	Yes	No	%Yes
Is your home located in a designated flood hazard area?	Yes (32%)	**127** (16%)	**30** (4%)	**102** (13%)	**49%**	**116** (14%)	**143** (18%)	**45%**
	No (63%)	**114** (14%)	**112** (14%)	**282** (35%)	**22%**	**148** (18%)	**360** (45%)	**29%**
	I Don't Know (5%)	**3** (<1%)	**9** (1%)	**24** (3%)	**8%**	**8** (1%)	**28** (3%)	**22%**

Additionally, we observe differences when examining responses to the lookback period question. As reported in Table 9, we find that while 44 percent of homeowners living in flood hazard areas were familiar with lookback periods, only 20 percent of those not living in flood hazard areas were familiar with this concept. These results generally suggest that those located in flood plain areas

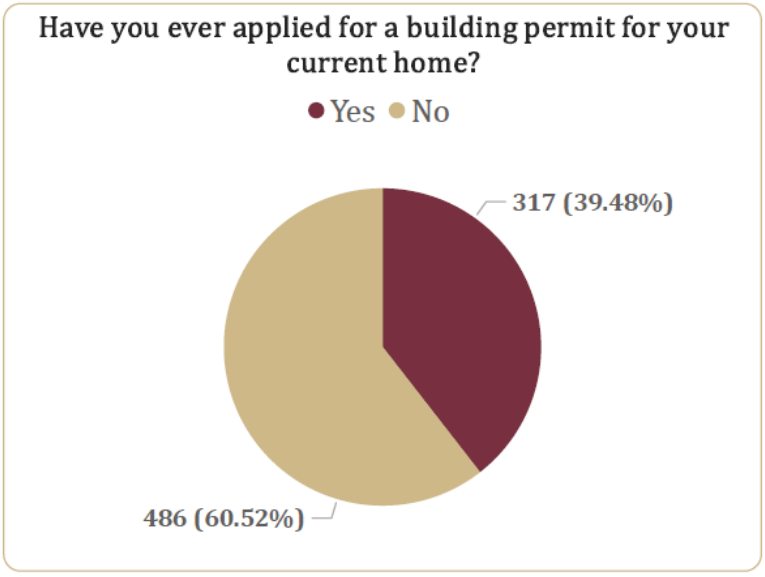
have a greater knowledge of the CRS Program and how it may impact homeowners relative to those that do not.

Table 9. Awareness of Lookback Periods, by FHA (N=803)

		Are you familiar with lookback periods and their rules?		
		Yes	No	%Yes
Is your home located in a designated flood hazard area?	Yes (32%)	**115** (14%)	**144** (18%)	**44%**
	No (63%)	**101** (13%)	**407** (51%)	**20%**
	I Don't Know (5%)	**6** (1%)	**30** (4%)	**17%**

Next, we asked homeowners about their experiences with building permits. Figure 20 shows that about 39 percent of respondents had applied for a building permit on their current home.[43] We also asked how many years it had been since the respondent applied for a building permit. While only a small percent had applied for permits in 2024, when we consider the past five years, this accounted for nearly 63 percent of the most recent permit applications.

Figure 20. Homeowner Applications for Building Permits



We also examined building permit applications by flood hazard location. As shown in Table 10, while more homeowners not located in flood hazard areas applied for permits, when we consider

[43] Building permits requested by county are reported in Table L-5.

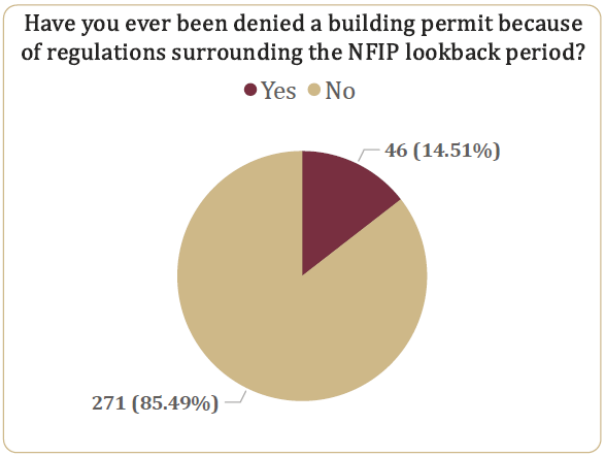
this on a percentage basis, we find that a greater percentage of homeowners living in flood hazard areas have applied for building permits.

Table 10. Building Permit Applications by FHA (N=803)

		Have you ever applied for a building permit for your current home?		
		Yes	No	%Yes
Is your home located in a designated flood hazard area?	Yes (32%)	**129** (16%)	**130** (16%)	**50%**
	No (63%)	**185** (23%)	**323** (40%)	**36%**
	I Don't Know (5%)	**2** (<1%)	**34** (4%)	**6%**

Additionally, we inquired whether homeowners had been impacted by lookback periods.[44] When asked if they had ever been denied a building permit because of regulations surrounding lookback periods, approximately 15 percent indicated that they had. This is shown in Figure 21.

Figure 21. Building Permits Denied Due to Lookback Period



When we examine responses based on location, as reported in Table 11, we find a much higher percentage of respondents in flood hazard areas indicate they had been denied permits (27 percent compared to six percent) because of lookback period rules. Similar differences are observed when

[44] Responses related to whether or not homeowners had been impacted by lookback periods by county can be found in Tables L-6 and L-7.

we consider homeowners that had delayed/foregone improvements (18 percent compared to three percent).

Table 11. Building Permit Denials and Renovations Delayed/Foregone Due to Lookback Period by FHA

		Have you ever been denied a building permit because of regulations surrounding the NFIP lookback period? (N=317)			Have you ever delayed or foregone improvements because of regulations surrounding the NFIP lookback period? (N=803)			
		Yes	No	%Yes	Yes	No	Not Applicable	%Yes
Is your home located in a designated flood hazard area?	Yes (32%)	**35** (11%)	**95** (30%)	**27%**	**47** (6%)	**83** (10%)	**129** (16%)	**18%**
	No (63%)	**11** (3%)	**174** (55%)	**6%**	**17** (2%)	**168** (21%)	**323** (40%)	**3%**
	I Don't Know (5%)	~	**2** (<1%)	**0%**	~	**2** (<1%)	**34** (4%)	**0%**

Finally, we inquired of the homeowners that had not applied for a building permit if it was because of concern related to lookback period rules. Only about seven percent indicated that this was the case. It should be noted that these results vary considerably by county. Specifically, we find affirmative responses in only 13 of the counties represented in the survey.[45]

10.2.1 Pinellas Community Analysis

Of the 803 observations, 346 (or 43 percent) of the responding homeowners reside in Pinellas County. This provides us with a sufficient number of observations with which to conduct some analysis at the community level. As shown in Table 12, the majority of these homeowners live in the Clearwater, Pinellas County, and St. Petersburg communities. Additionally, 53 percent of the communities participate in the CRS Program and all of the CRS Program communities represented in the sample have lookback periods.

[45] To review results by county, see Table L-8.

Table 12. Responses to Florida Homeowners Survey

Community	Total	% of Total
Belleair, Town of *	2	0.6%
Clearwater, City of *	36	10.4%
Dunedin, City of *	12	3.5%
Gulfport, City of	9	2.6%
Indian Rocks Beach, City of	1	0.3%
Kenneth City, Town of	3	0.9%
Largo, City of *	23	6.6%
Oldsmar, City of *	4	1.2%
Pinellas County *	127	36.7%
Pinellas Park, City of	26	7.5%
Safety Harbor, City of *	5	1.4%
Seminole, City of	14	4.0%
South Pasadena, City of *	2	0.6%
St. Pete Beach, City of *	2	0.6%
St. Petersburg, City of	68	19.7%
Tarpon Springs, City of	10	2.9%
Treasure Island, City of	2	0.6%

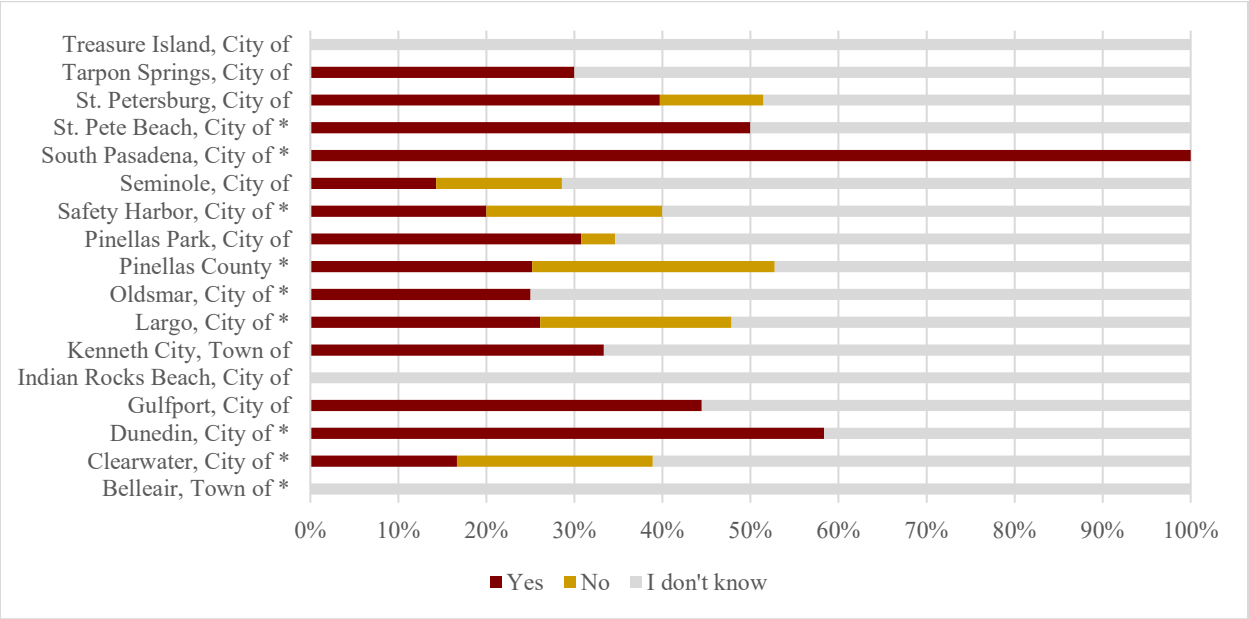
* Indicates a CRS community with a lookback period.

Approximately 36 percent of the respondents indicated they live in a flood zone, 61 percent indicated they did not, and three percent reported not knowing. Additionally, 47 percent indicated that they purchase NFIP flood insurance.

We focus next on the three knowledge questions. We find that approximately 29 percent of the homeowners indicated they know if their community participates in the CRS Program. For most of the communities, between 16 and 50 percent reported awareness of whether their community participates.

As shown in Table 13, none of the respondents in Belleair, Indian Rocks Beach, and Treasure Island reported any knowledge of whether their communities participate. While two of these communities do not participate in the CRS Program, one does (Belleair). Additionally, 58 percent of Dunedin respondents and 100 percent of the respondents in South Pasadena indicated knowledge, both of which participate in the CRS Program. Surprisingly, when we examine the responses separately for CRS Program and non-CRS Program communities, a greater percentage of homeowners in non-CRS Program communities indicated an awareness of whether their community participated (approximately 34 percent compared to 26 percent).

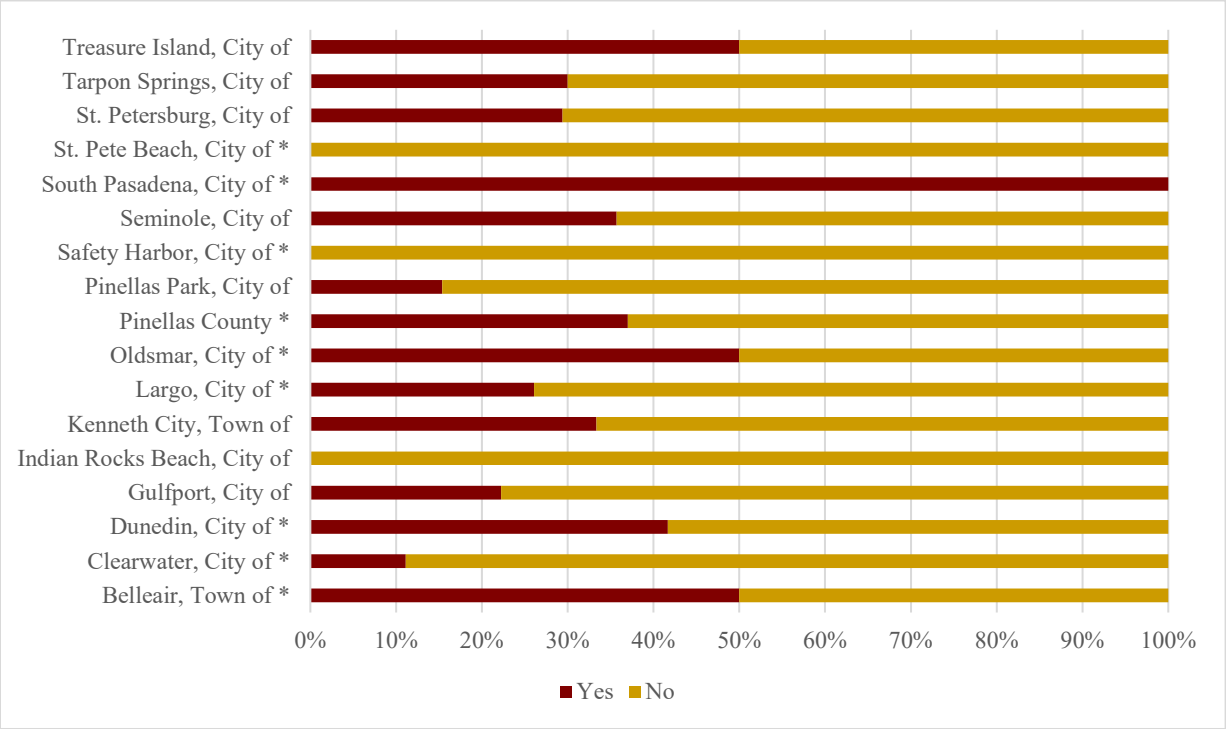
Table 13. Awareness of Community Participation in NFIP CRS Program



* Indicates a CRS community with a lookback period.

The results of the next knowledge question indicated that approximately 30 percent of the respondents are aware that some homeowners can receive discounts on flood insurance but we again see variation across the communities. As reported in Table 14, while none of the homeowners in Indian Rocks Beach, Safety Harbor, and St Pete Beach reported knowledge of the availability of discounts, 50 percent or more of the respondents in Belleair, Oldsmar, South Pasadena, and Treasure Island indicated such knowledge. Additionally, when comparing CRS Program and non-CRS Program communities, we do find that overall, a greater percentage of homeowners in CRS communities have knowledge of the availability of premium discounts (31 percent compared to 27 percent).

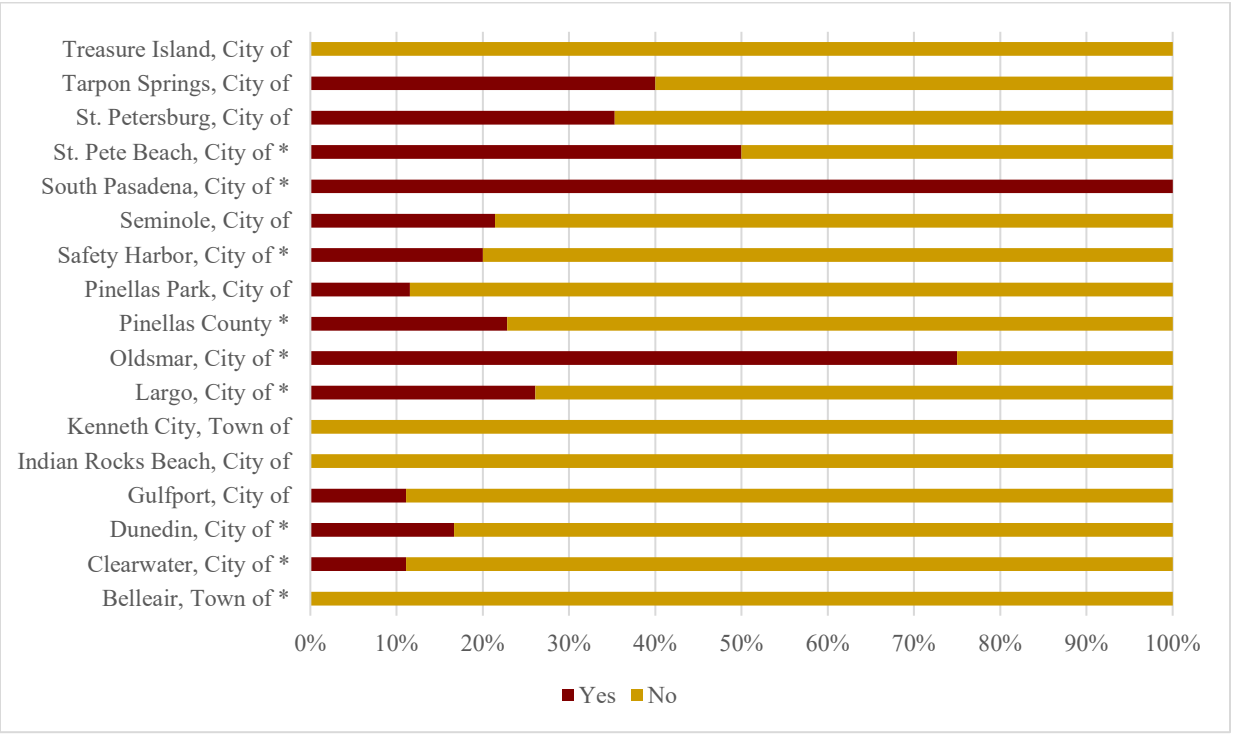
Table 14. Knowledge of Possible Discounts on Flood Insurance



* Indicates a CRS community with a lookback period.

The final knowledge question asks about lookback periods and their associated rules. Approximately 24 percent of the homeowners surveyed indicated they were familiar with lookback periods and their rules. However, there is again variation in the responses across the communities. As reported in Table 15, we observe some communities in which homeowners indicated no familiarity (Belleair, Indian Rocks Beach, Kenneth City, and Treasure Island) and others communities in which a high percentage of homeowners indicated familiarity (Oldsmar and South Pasadena). Interestingly, when we examine the results separately for CRS Program and non-CRS Program communities, we find very a large difference in the responses. Specifically, we find that only 26 percent of homeowners in non-CRS Program communities indicated a familiarity with lookback periods and their rules. However, 77 percent of homeowners in CRS Program communities reported knowledge of lookback periods. Given that all of the homeowners in the survey live in CRS Program communities with lookback periods, this suggests a greater awareness of lookback periods among homeowners that could be impacted by them.

Table 15. Knowledge of Lookback Periods and their Rules



* Indicates a CRS community with a lookback period.

The survey results suggests that homeowners in Pinellas appear to have a low level of knowledge regarding the CRS Program, the availability of discounts on flood insurance, and lookback periods and their rules. We also find significant variation in knowledge across communities. Specifically, in examining the responses separately, we find that a greater percentage of homeowners in non-CRS Program communities indicated an awareness of whether their community participated in the CRS Program, while a greater percentage of the homeowners in CRS Program communities reported knowledge of the availability of premium discounts. Finally, homeowners in CRS Program communities with lookback periods reported a much greater knowledge of lookback periods and their rules, suggesting that a greater percentage of the homeowners that could be impacted by this rule appear to have knowledge of it.

The final set of questions relate to building permits. Forty-four percent of the respondents indicated that they had applied for building permits. Results by community are provided in Table 16. In several communities, including Indian Rocks Beach, Kenneth City, and South Pasadena, none of the homeowners had applied for building permits. Additionally, all of the survey respondents in Belleair, Oldsmar, and St. Pete Beach had applied for permits, all of which are CRS communities. Finally, while there is variation across the communities in terms of the percentage of respondents that have applied for a building permit, this does not appear to vary by CRS Program participation.

Table 16. Building Permit Applications by Community

Community	Yes	No	% Yes
Belleair, Town of *	2		100.0%
Clearwater, City of *	10	26	27.8%
Dunedin, City of *	4	8	33.3%
Gulfport, City of	7	2	77.8%
Indian Rocks Beach, City of		1	0.0%
Kenneth City, Town of		3	0.0%
Largo, City of *	11	12	47.8%
Oldsmar, City of *	4		100.0%
Pinellas County *	50	77	39.4%
Pinellas Park, City of	12	14	46.2%
Safety Harbor, City of *	2	3	40.0%
Seminole, City of	5	9	35.7%
South Pasadena, City of *		2	0.0%
St. Pete Beach, City of *	2		100.0%
St. Petersburg, City of	29	39	42.6%
Tarpon Springs, City of	3	7	30.0%
Treasure Island, City of	1	1	50.0%

* Indicates a CRS community with a lookback period.

When we examine the responses to the questions that capture whether homeowners have been impacted by lookback periods, we find little evidence of this. Only seven percent of homeowners reported being denied a building permit because of lookback period regulations and about 13 percent indicated that they had delayed or foregone improvements because of lookback period regulations.

The results by community are shown in Table 17 The table reveals that only homeowners residing in Largo, Pinellas County, Pinellas Park, and St. Petersburg communities have been denied permits. Two of these communities participate in the CRS Program (Largo and Pinellas County). We also find homeowners in only a few communities (Dunedin, Largo, Pinellas, Pinellas Park, and St. Petersburg) reported delaying or forgone improvements due to lookback period regulations, three of which participate in the CRS Program.

Table 17. Building Permits and Lookback Periods

	Have you ever been denied a building permit because of the regulations surrounding the NFIP lookback period?			Have you ever delayed or forgone improvements because of the regulations surrounding the NFIP lookback period?		
Community	**Yes**	**No**	**% Yes**	**Yes**	**No**	**% Yes**
Belleair, Town of *		2	0%		2	0%
Clearwater, City of *		10	0%		10	0%
Dunedin, City of *		4	0%	1	3	25%
Gulfport, City of		7	0%		7	0%
Largo, City of *	2	9	18%	3	8	27%
Oldsmar, City of *		4	0%		4	0%
Pinellas County *	6	44	12%	9	41	18%
Pinellas Park, City of	1	11	8%	1	11	8%
Safety Harbor, City of *		2	0%		2	0%
Seminole, City of		5	0%		5	0%
St. Pete Beach, City of *		2	0%		2	0%
St. Petersburg, City of	1	28	3%	4	25	14%
Tarpon Springs, City of		3	0%		3	0%
Treasure Island, City of		1	0%		1	0%

* Indicates a CRS community with a lookback period.

11 Recommendations and Discussion

This section outlines key recommendations based on the findings from our evaluation of lookback periods for substantial property improvements among Florida homeowners. The recommendations aim to enhance homeowner awareness, ensure compliance with regulations, and improve the effectiveness of lookback period policies in managing flood risks and property development in the state.

By addressing gaps in homeowner knowledge, streamlining regulatory processes, and fostering collaboration between stakeholders, these recommendations are designed to balance regulatory compliance with the practical needs of property owners. Additionally, they support broader goals of community resilience, equitable implementation of policies, and alignment with the NFIP standards.

When we consider the totality of the quantitative and qualitative evidence of our study, we arrive at the following policy recommendations:

1. Variations in the existence of and length of lookback periods, in some cases within a single county or metropolitan area, may confuse many stakeholders (beyond just end consumers) and increase difficulty in administration and communication. We recommend an overall reevaluation of the use of lookback periods throughout Florida considering the cost and benefits to key stakeholders. There are several key elements of the review we suggest:

    a. Cost-benefits analysis for the community, understanding that initial evidence suggests the reduction in premiums for community members associated with the lookback periods might not offset the costs of the lookback periods for some communities. Costs include the cost of administration as well as potential negative impacts on development and ultimately property taxes among other issues.
    b. The evaluation should include not only the existence of lookback periods but also the length of the lookback period because costs and benefits appear to vary with the extension of lookback periods to longer periods.
    c. The evaluation should also include building code regulations, which can contribute to the resilience of Florida's homes and communities, including codes that reduce flood risks to existing properties. Codes that require modifications to existing homes can be costly. Depending on the characteristics of the home, they may be cost prohibitive, and in these cases, such codes may reduce other investments in the home that would benefit the owner and their community. Lookback credits for CRS premium discounts are small overall, contributing at most to an NFIP premium reduction of around 5%. These premium discounts alone are likely insufficient to maintaining lookback requirements.

2. For communities electing lookback periods we recommend:

    a. Lookback period should not exceed five years due to potential negative effects on property values and renovations, as well as administrative challenges in enforcement.
    b. Automation of the process to ensure consistency and minimization of costs.
    c. An evaluation of activities that fall under the definition of substantial improvement with care to exclude efforts to harden home from wind mitigation. Explore if local ordinances could allow flexibility for resilience-focused renovations while maintaining cumulative tracking for other types of improvements.
    d. Develop public education campaigns to explain the purpose and benefits of lookback periods, emphasizing the role of these measures in earning flood insurance discounts and reducing flood risks.
    e. Mandate clear disclosure of lookback period policies at the time of property sales and permit applications. This could help reduce confusion and increase compliance with flood plain management standards.

f. Implement digital tracking systems to reduce the administrative burden of monitoring building permits in floodplain areas. These systems could simplify the management of cumulative substantial improvement periods while enhancing transparency and accountability.
g. Regularly assess the impacts of lookback periods and adjust policies based on updated data and community needs. This may ensure that resilience measures remain effective and equitable over time.
h. Ordinance reporting requirements should be standardized to include clear differentiation between resilience improvements and general improvements, transparent tracking of cumulative improvements, regular assessment of economic impacts, and mandatory disclosure requirements in property transactions. This standardization would improve policy effectiveness while reducing confusion and administrative burden.

3. Exploration of other opportunities for receiving CRS credit points that might reduce flood premiums, e.g., open space preservation.

    a. Facilitate knowledge-sharing among CRS communities to identify and adopt best practices for implementing lookback periods. Florida's 264 CRS communities could serve as a valuable resource for understanding diverse approaches to balancing resilience and economic considerations. Our evaluation of CRS credit points earned by communities across the state suggests credits are being earned for a wide range of activities with as many as 1571 points earned for higher regulatory standards and 1482 points for open space preservation. Table 18 shows the maximum points being earned across communities for a variety of flood mitigation activities.

Table 18. Activities Earning CRS credit points in Florida

CRS Activity	Max Points Received by a FL Community
ELEVATION CERTIFICATES	86
MAP INFORMATION SERVICE	90
OUTREACH PROJECTS	350
HAZARD DISCLOSURE	62
FLOOD PROTECTION INFORMATION	114
FLOOD PROTECTION ASSISTANCE	110
FLOOD INSURANCE PROMOTION	155
FLOOD HAZARD MAPPING	96
OPEN SPACE PRESERVATION	1482
HIGHER REGULATORY STANDARDS	1571
FLOOD DATA MAINTENANCE	204
STORMWATER MANAGEMENT	535
FLOODPLAIN MANAGEMENT PLANNING	555
ACQUISITION AND RELOCATION	190
FLOOD PROTECTION	226
DRAINAGE SYSTEM MAINTENANCE	470
FLOOD WARNING AND RESPONSE	365
LEVEES	0
DAMS	22

4. We also recommend that these activities be undertaken with an understanding of the impact on the incentives to create more resilient properties with respect to both flood and wind. To achieve these goals, additional incentives such as grants, tax credits, or low-interest loans, for homeowners to undertake resilience-enhancing renovations.

12 References

90th Congress (1968) – S.3497, Housing and Urvan Development Act of 1968, Congress.gov, Library of Congress, https://www.congress.gov/bill/90th-congress/senate-bill/3497.

93rd Congress (1973) – H.R.8449, Flood Disaster Protection Act of 1973, Congress.gov, Library of Congress, https://www.congress.gov/bill/93rd-congress/house-bill/8449.

100th Congress (1988) - H.R.2707, Major Disaster Relief and Emergency Assistance Amendments of 1987, Congress.gov, Library of Congress, https://www.congress.gov/bill/100th-congress/house-bill/2707.

103rd Congress (1994) - H.R.3191, Riegle Community Development and Regulatory Improvement Act of 1994, Congress.gov, Library of Congress, https://www.congress.gov/bill/103rd-congress/house-bill/3474.

108th Congress (2004) – S.2238, Bunning-Bereuter-Blumenauer Flood Insurance Reform Act of 2004, Congress.gov, https://www.congress.gov/bill/108th-congress/senate-bill/2238.

109th Congress (2006) - H.R.5441 - Department of Homeland Security Appropriations Act, 2007, Congress.gov, Library of Congress, https://www.congress.gov/bill/109th-congress/house-bill/5441.

112th Congress (2012) – H.R.4348 – MAP-21, Congress.gov, Library of Congress, https://www.congress.gov/bill/112th-congress/house-bill/4348.

113th Congress (2014a) - H.R.219 - H.R.152 - Making supplemental appropriations for the fiscal year ending September 30, 2013, to improve and streamline disaster assistance for Hurricane Sandy, and for other purposes, Congress.gov, Library of Congress, https://www.congress.gov/bill/113th-congress/house-bill/152.

113th Congress (2014b) – H.R.3547 - Consolidated Appropriations Act, 2014, Congress.gov, Library of Congress, https://www.congress.gov/bill/113th-congress/house-bill/3547.

113th Congress (2014c) – H.R.3370 – Homeowner Flood Insurance Affordability Act of 2014, Congress.gov, Library of Congress, https://www.congress.gov/bill/113th-congress/house-bill/3370.

Aarbu, K. (2017). Asymmetric information in the home insurance market. *Journal of Risk and Insurance*, *84*, 35–72.

Abegaz, Ruth, Wang, Fei, an Xu, Jun, (2024), History, Causes, and Trend of Floods in the U.S.: A Review, *Natural Hazards*, https://doi.org/10.1007/s11069-024-06791-y.

Addoum, J., Eichholtz, P., Steiner, E., and Yönder, E. (2024). Climate change and commercial real estate: Evidence from Hurricane Sandy. *Real Estate Economics*, 52, 687–713. https://doi.org/10.1111/1540-6229.12435.

American Academy of Actuaries, (2011), The National Flood Insurance Program: Past, Present…and Future? https://www.actuary.org/sites/default/files/files/publications/AcademyFloodInsurance_Monograph_110715.pdf.

Anglin, P. and Arnott, R. (1991). Residential real estate brokerage as a principal-agent problem. *Journal of Real Estate Finance and Economics*, 4, 99–125.

Arnott, R.J. (1992). Moral hazard and competitive insurance markets. In: Dionne, G. (eds) *Contributions to Insurance Economics*. Huebner International Series on Risk, Insurance and Economic Security, vol 13. Springer, Dordrecht. https://doi.org/10.1007/978-94-017-1168-5_13.

Arnott, R. and Stiglitz, J. (1991). The welfare economics of moral hazard. In: Loubergé, H. (eds) *Risk, Information and Insurance*. Springer, Dordrecht. https://doi.org/10.1007/978-94-009-2183-2_5.

Association of State Flood Plain Managers, (2020), Flood Mapping for the Nation: A Cost Analysis for Completing and Maintaining the Nation's NFIP Flood Map Inventory, Association of State Floodplain Managers Foundation.

Bea, Keith, (2007), Federal Emergency Management Policy Changes After Hurricane Katrina: A Summary of Statutory Provisions, https://sgp.fas.org/crs/homesec/RL33729.pdf.

Atreya, A. and Czajkowski, J. (2019). Graduated flood risks and property prices in Galveston County. *Real Estate Economics*, *47(3,,* 807–844.A

Atreya, A. and Ferreira, S. (2015). Seeing is believing? Evidence from property prices in inundated areas. *Risk Analysis, 35(5),* 828–848.

Atreya, A., Ferreira, S., and Kriesel, W. (2013). Forgetting the flood? An analysis of the flood risk discount over time. *Land Economics*, *89(4),* 577–596.

Bakkensen, L., and Barrage, L. (2017). Flood risk belief heterogeneity and coastal home price dynamics: Going under water? NBER Working Paper. https://www.nber.org/papers/w23854.

Bakkensen, L. and Ma, L. (2020). Sorting over flood risk and implications for policy reform. *Journal of Environmental Economics and Management*, *104*, 102362.

Belanger, P. and Bourdeau-Brien, M. (2017). The impact of flood risk on the price of residential properties: the case of England. *Housing Studies*, *33(6)*, 876–901. https://doi.org/10.1080/02673037.2017.1408781.

Bender, M., Knutson, T., Tuleya, R., Sirutis, J., Vecchi, G., Garner, S., and Held, I. (2010). Modeled impact of anthropogenic warming on the frequency of intense Atlantic hurricanes. *Science*, *327(5964)*, 454–458.

Bin, O., Crawford, T., Kruse, J., and Landry, C. (2008). Viewscapes and flood hazard: Coastal housing market response to amenities and risk. *Land Economics*, *84*(3), 434–448.

Bin, O., and Kruse, J. (2006). Real Estate Market Response to Coastal Flood Hazards. *Natural Hazards Review*, 7(4): 137-44.

Bin, O. and Landry, C. (2013). Changes in implicit flood risk premiums: empirical evidence from the housing market. *Journal of Environmental Economics and Management*, *65*(3), 361–376. https://doi-org.libproxy.uncg.edu/10.1016/j.jeem.2012.12.002.

Bin, O. and Polasky, S. (2004). Effects of flood hazards on property values: Evidence before and after hurricane Floyd. *Land Economics*, 80(4), 490–500.

Blantis, A. (2024). Cumbria's Property Market Under the Surge: A Flood Risk Examination. A case study on how flood risk in flood-prone area of Cumbria, England affects residential real estate property prices. Frw.studenttheses.ub.rug.nl. https://frw.studenttheses.ub.rug.nl/4456/.

Bogin, A. and Doerner, W. (2019). Property renovations and their impact on house price index construction. *Journal of Real Estate Research*, 41:2, 249-284, DOI: 10.1080/10835547.2019.12091526.

Brody, Samuel D., Sammy Zahran, Wesley E. Highfield, Sarah P. Bernhardt, and Arnold Vedlitz, (2009), Policy learning for Flood Mitigation: A longitudinal Assessment of the Community Rating System in Florida, *Risk Analysis, 29, 6*: 912-929.

Browne and Hoyt, (2000), The Demand for Flood Insurance: empirical Evidence, *Journal of Risk and Uncertainty, 20:3*; 291-306.

Bui, N., Wen, L., and Sharp, B. (2024). House prices and flood risk exposure: An integration of hedonic property model and spatial econometric analysis. *Journal of Real Estate Finance and Economics, 69*, 100–131. https://doi.org/10.1007/s11146-022-09930-z.

Carbone, J., Hallstrom, D., and Smith, V. (2006). Can natural experiments measure behavioral responses to environmental risks? *Environmental and Resource Economics*, *33*: 273–97.

Carroll, W. (1989). Fixed-percentage commissions and moral hazard in residential real estate brokerage. *Journal of Real Estate Finance and Economics*, *2,* 349–365.

Chiappori, P. and Salanie, B. (2000). Testing for asymmetric information in insurance markets. *Journal of Political Economy*, 108, 56–78.

Chiang-Hsieh, L.-H. (2021). Is it the flood, or the disclosure? An inquiry to the impact of flood risk on residential housing prices. *Land Use Policy*, 106, 105443. https://doi.org/10.1016/j.landusepol.2021.105443.

Chivers, J. and Flores, N. (2002). Market failure in information: The national flood insurance program. *Land Economics*, *78(4),* 515–521.

Clayton, J., Devaney, S., Sayce, S., and Van de Wetering, J. (2021). Climate risk and real estate prices: What do we know? *The Journal of Portfolio Management*, *47(10),* 75-90.

Colby, S. J. and Zipp, K. Y. (2021). Excess vulnerability from subsidized flood insurance: Housing market adaptation when premiums equal expected flood damage. *Climate Change Economics*, 12:01.

Congressional Budget Office, (2023), Communities at Risk of Flooding, Congressional Budget Office.

Daniel, V., Florax, R., and Rietveld, P. (2009). Flooding risk and housing values: an economic assessment of environmental hazard. *Ecological Economics*, *69(2),* 355–365. https://doi-org.libproxy.uncg.edu/10.1016/j.ecolecon.2009.08.018.

Dei-Tutu, V. (2002). Flood hazards, insurance, and house prices: A hedonic property price analysis. M.S. Research Paper, Department of Economics, East Carolina University.

Dennis, B. (2022). Climate change and financial policy: A literature review. *Finance and Economics Discussion Series.* Washington: Board of Governors of the Federal Reserve System, https://doi.org/10.17016/FEDS.2022.048.

Department of Homeland Security, (2002), Proposal to Create the Department of Homeland Security. https://www.dhs.gov/sites/default/files/publications/book_0.pdf.

Derrig, R. (2002). Insurance fraud. *Journal of Risk and Insurance*, *69,* 271–287.

Dionne, G. and Wang, K. (2013). Does insurance fraud in automobile theft insurance fluctuate with the business cycle? *Journal of Risk and Uncertainty*, 47, 67–92.

Donnelly, W. (1989). Hedonic price analysis of the effects of a floodplain on property values. *Water Resources Bulletin*, 24: 581-586.

Duke, Alan. (2012) Superstorm Sandy Breaks Records, CNN.com, https://www.cnn.com/2012/10/30/us/sandy-records/index.html.

Dumm, R., Eckles, D., and Halek, M. (2013). An examination of adverse selection in the public provision for insurance. *The Geneva Risk and Insurance Review*, *38*, 127–147.

Dumm, R.E., Nyce, C., Sirmans, G.S., and Smersh, G. (2022). Pricing moral hazard in residential properties: The impact of sinkhole claims on house prices. *Journal of Real Estate Finance and Economics*, *64*, 30–70. https://doi.org/10.1007/s11146-020-09804-2.

Eastman, A. D. (2015). The homeowner flood insurance affordability act: Why the federal government should not be in the insurance business. *American Journal of Business and Management*, *4(2)*, 71–75. https://doi.org/10.11634/216796061706638.

Eichholtz, P., Steiner, E., and Yonder, E. (2019). Where, when, and how do sophisticated investors respond to flood risk? https://ecommons.cornell.edu/items/39cbc199-fbd5-4411-9754-c41a85c9bfef.

Ellen, I. and Meltzer, R. (2024). Heterogeneity in the recovery of local real estate markets after extreme events: The case of Hurricane Sandy. *Real Estate Economics*, *52*, 714–752. https://doi.org/10.1111/1540-6229.12485.

Ellis, K., Sylvester, L., and Trepanier, J. (2015). Spatiotemporal patterns of extreme hurricanes impacting US Coastal Cities. *Nat Hazards*, *75*, 2733–2749.

Endah Saptutyningsih and Nursetiawan. *2024 IOP Conf. Ser.: Earth Environ. Sci. 1314012061. https://iopscience.iop.org/article/10.1088/1755-1315/1314/1/012061/meta*

Executive Order 12127, 44 FR 19367, 3 CFR, 1979 (1979), https://www.archives.gov/federal-register/codification/executive-order/12127.html.

Fan, Q. and Davlasheridze, M. (2016). Flood risk, flood mitigation, and location choice: evaluating the national flood insurance program's community rating system. *Risk analysis*, *36*, 1125–1147.

Fang, L., Li, L., and Yavas, A. (2023). The impact of distant hurricane on local housing markets. *Journal of Real Estate Finance and Economics*, *66*, 327–372. https://doi.org/10.1007/s11146-021-09843-3.

Federal Emergency Management Agency. (2010). Substantial Improvement/Substantial Damage.

Federal Emergency Management Agency, (2009), Risk Mapping, Assessment, and Planning (Risk MAP) Multi-Year Plan: Fiscal Years 2010-2014.

Federal Emergency Management Agency, (2017).National Flood Insurance Program Community Rating System: Coordinator's Manual, https://www.fema.gov/sites/default/files/documents/fema_community-rating-system_coordinators-manual_2017.pdf.

Federal Emergency Management Agency, (2019a). Pub. 1, https://www.fema.gov/sites/default/files/2020-03/publication-one_english_2019.pdf.

Federal Emergency Management Agency, (2019b). Disaster Recovery Reform Act (DRRA) Annual Report, https://www.fema.gov/sites/default/files/2020-07/fema_DRRA-annual-report_2019.pdf.

Federal Emergency Management Agency, (2021).National Flood Insurance Program Community Rating System: Addendum to the Coordinator's Manual, https://www.fema.gov/sites/default/files/documents/fema_community-rating-system_coordinator-manual_addendum-2021.pdf.

Federal Emergency Management Agency, (2021b), "Discovery Recovery Reform Act 2018," Disaster Recovery Reform Act of 2018 | FEMA.gov.

Federal Emergency Management Agency (FEMA),(2023).Flood Insurance Rate Map (FIRM) Database Technical Reference Preparing Flood Insurance Rate Map Databases.

Federal Emergency Management Agency, (2024a). Disaster Recovery Reform Act of 2018, https://www.fema.gov/disaster/disaster-recovery-reform-act-2018.

Federal Emergency Management Agency, (2024b), The Watermark - National Flood Insurance Program Financial Statements, https://www.fema.gov/flood-insurance/work-with-nfip/watermark-financial-statements.

Federal Emergency Management Agency, Flood Maps, (2024c).https://www.fema.gov/flood-maps.

Federal Emergency Management Agency, (2024d), Historical Flood Risk and Costs, Historical Flood Risk and Costs | FEMA.gov.

Fisher, J. and Rutledge, S. (2021). The impact of hurricanes on the value of commercial real estate. *Business Economics*, *56*(3), 129–145. https://doi-org.libproxy.uncg.edu/10.1057/s11369-021-00212-9.

Frimpong, E., A C. Reilly, and B. Niemeier, (2023), Does Federal Flood Haszard Mitigation Assistance Affect Community Rating System Participation*?, Risk Analysis, 43*: 1414-1433.

Fuerst, F. and Warren-Myers, G. (2021). Pricing climate risk: Are flooding and sea level rise risk capitalized in Australian residential property? *Climate Risk Management*, 100361. https://doi.org/10.1016/j.crm.2021.100361.

Gallagher, J. (2014). Learning about an infrequent event: evidence from flood insurance take-up in the United States. *American Economic Journal: Applied Economics*, *6 (3),* 206-233.

Gao, F., Powers, M., and Wang, J. (2017). Decomposing asymmetric information in china's automobile insurance market. *Journal of Risk and Insurance*, 84(4), 1269–1293.

Georgic, W. and Klaiber, H. A. (2022). Stocks, flows, and flood insurance: A nationwide analysis of the capitalized impact of annual premium discounts on housing values. *Journal of Environmental Economics and Management*, Volume (111), 102567, ISSN 0095-0696, https://doi.org/10.1016/j.jeem.2021.102567.

Gibson, M. and Mullins, J. (2020). Climate risk and beliefs in New York floodplains. *Journal of the Association of Environmental and Resource Economists 7*:1069–111.

Gourevitch, J., Kousky, C., Liao, Y., Nolte, C., Pollack, A., Porter, J., and Weill, J. (2023). Unpriced climate risk and the potential consequences of overvaluation in US housing markets. *Nature Climate Change*, 1–8. https://doi.org/10.1038/s41558-023-01594-8.

Gruhl, H., Brehm, J., Ghosh, A., Breidenbach, P., and aus dem Moore, N. (2023). Adjusting to the new normal: River flood risk and the real estate market. USAEE Working Paper No. 23-600, Available at SSRN: *https://ssrn.com/abstract=4591894* *or* ***http://dx.doi.org/10.2139/ssrn.4591894.***

Gwin, C. and Maxam, C. (2002). Why do real estate appraisals nearly always equal offer price? A theoretical justification. *Journal of Property Investment and Finance*, 20(3), 242–253.

Gyourko, J. and Saiz, A. (2004). Reinvestment in the housing stock: The role of construction costs and the supply side. *Journal of Urban Economics*, 55, 238–256. www.elsevier.com/locate/jue.

Gyourko, J. and Tracy, J. (2006). Using home maintenance and repairs to smooth variable earnings. *The Review of Economics and Statistics*, 88 (4): 736–747.

Hallstrom, D. and Smith, V. (2005). Market responses to hurricanes. *Journal of Environmental Economics and Management*, *50*(3), 541–561. https://doi-org.libproxy.uncg.edu/10.1016/j.jeem.2005.05.002.

Harris B. and, B. D. Moore. (2013). Residential Property Taxes in the United States. Washington DC: Brookings Urban-Brookings Tax Policy Center. http://www.brookings.edu/research/residential-property-taxes-in-the-unitedstates

Harrison, D., Smersh, G., and Schwartz, A. (2001). Environmental determinants of housing prices: the impact of flood zone status. *Journal of Real Estate Research*, *21*(1–2), 3–20.

Helms, A. (2003). Understanding gentrification: An empirical analysis of the determinants of urban housing renovation. *Journal of Urban Economics*, 54, 474–498. www.elsevier.com/locate/jue.

Hernández, K., Luna, F., and Madeira, C. (2022). Climate change's impact on real estate prices in Chile. PLOS Sustain Transform 1(11): e0000035. *https://doi.org/10.1371/journal.pstr.0000035.*

Hernandez, K. and Madeira, C. (2022). The impact of climate change on economic output across industries in Chile. PLoS ONE 17(4): e0266811. *https://doi.org/10.1371/journal.pone.0266811.*

Highfield WE, Brody SD, (2013). Evaluating the effectiveness of local mitigation activities in reducing flood losses, *Natural Hazards Review, 14*, 4:229–236.

Hino, M. and Burke, M. (2020). Does Information About Climate Risk Affect Property Values*?* Working Paper No. 1069, Stanford University.

Holmstrom, V. (2022). Housing externalities: The impact of exterior renovations on housing prices in Helsinki. Master's Thesis. Aalto University School of Business.

Horne, D. and Rosenblatt, E. (1996). Property appraisals and moral hazard. Available at SSRN: https://ssrn. com/abstract=9124.

Homeland Security, (2002). Homeland Security Act of 2002, Pub. L. No. 107-296, https://www.govinfo.gov/app/details/PLAW-107publ296.

Horn, D. P. and J. T. Brown, (2018). Introduction to the National Flood Insurance Program (NFIP), Congressional Research Service, R44593.

Horn, D. P. and B. Webel, 2024, Introduction to the National Flood Insurance Program (NFIP), Congressional Research Service, R44593.

Hudson, P., Botzen, W., Czajkowski, J., and Kreibich, H. (2017). Moral hazard in natural disaster insurance markets: Empirical evidence from Germany and the United States. *Land Economics*, *93*(2), 179-208.

Iliyasu, J., Sanusi, A., Mamman, S. (2023). Pricing environmental amenities and climate change risks in real estate markets. *Environ Model Assess*, *https://doi.org/10.1007/s10666-023-09919-9.*

Indaco, A., Ortega, F. and Taşpınar, S. (2019). National Survey of Mortgage Originations. *Cityscape*, Vol. 21, No. 2, pp. 129-156. https://www.jstor.org/stable/26696379.

Insurance Information Institute, (2024), "Facts + Statistics: Flood Insurance," website Facts + Statistics: Flood insurance | III.

Insurance Information Institute and Munich Re, (2023). Homeowners Perception of Weather Risks: 2023Q2 Consumer Survey, Insurance Information Institute.

Joint Economic Committee Report, (2024), jec-report-on-economic-cost-of-flooding.pdf.

Kijewski-Correa, T., Javeline, D., Kakenmaster, W., and Chesler, A. (2023). Economic incentives for coastal homeowner adaptation to climate change. *Climate Policy*, 1–13. https://doi.org/10.1080/14693062.2023.2215207.

Knight, J., Miceli, T., and Sirmans, C. (2000). Repair expenses, selling contracts and house prices. *Journal of Real Estate Research*, *20*(3), 323–336. https://doi.org/10.1080/10835547.2000.12091040.

Knight, J. and Sirmans, C. F. (1996). Depreciation, maintenance, and housing prices. *Journal of Housing Economics*, Volume (5), Issue 4, pp. 369-389. ISSN 1051-1377, https://doi.org/10.1006/jhec.1996.0019.

Kousky, C. (2010). Learning from extreme events: risk perceptions after the flood. *Land Economics*, *86*(3), 395–422.

Kousky, C., Kunreuther, H., LaCour-Little, M., and Wachter, S. (2020). Flood risk and the US housing market. *Journal of Housing Research, 29*(sup1), S3–S24.

Kousky, C. and Michel-Kerjan, E. (2012). Hurricane sandy, storm surge and the national flood insurance program: A primer on New York and New Jersey. *Resources for the Future*, Washington, DC, pp. 1-10.

Kriesel, W. and Landry, C. (2004). Participation in the national flood insurance program: An empirical analysis for coastal properties. *Journal of Risk and Insurance*, *71(3),* 405–420.

Landry, C. E. and M. R. Jahan-Parvar, (2011), Flood Insurance coverage in the Coastal Zone, *The Journal of Rik and Insurance*, *78*, 2:361-388.

Landry, C. E, Turner, D., and Petrolia, D., (2021), Environmental and Resource Economics 79: 357-389, https://doi.org/10.1007/s10640-021-00565-x.

Li, J. and C. E. Landry, (2018), Flood Risk, Local Hazard Mitigation, and the Community Rating System of the National Flood Insurance Program, Land Economics, 94, 2, 175-198.

Liang, C., Lee, C., and Yong, L. (2020). Impacts of urban renewal on neighborhood housing prices: Predicting response to psychological effects. *Journal of Housing and the Built Environment*, 35, 191–213. https://doi.org/10.1007/s10901-019-09673-z.

Lindell, M.K., Hwang, S.N., (2008), Households' perceived personal risk and responses in a multi-hazard environment", Risk Analysis, 28, 539–556.

Lindsay, B/ R. and E. M. Webster, (2019), FEMA and SBA Disaster Assistance for Individuals and Households: Application Processes, Determinations, and Appeals, Congressional Research Service, R45238.

MacDonald, D., Murdoch, J., and White, H. (1987). Uncertain hazards, insurance, and consumer choice: Evidence from housing markets. *Land Economics*, *63*: 361-371.

MacDonald, D., White, H., Taube, P., and Huth, W. (1990). Flood hazard pricing and insurance premium differentials: Evidence from the housing market. *Journal of Risk and Insurance* 57 (4): 654-663.

Mayers, David, and Clifford W. Smith, Jr. (1982) . On the Corporate Demand for Insurance, *Journal of Business* 55, 190-205.

McCoy, S. and Zhao, X. (2018). A city under water: A geospatial analysis of storm damage, changing risk perceptions, and investment in residential housing. *Journal of the Association of Environmental and Resource Economists*, *5(2),* 301–330.

McCluskey, J. and Rausser, G. (2003). Hazardous waste sites and housing appreciation rates. *Journal of Environmental Economics and Management*, *45*(2), 166–176.

McKenzie, R. and Levendis, J. (2010). Flood hazards and urban housing markets: The effects of Katrina on New Orleans. *Journal of Real Estate Finance and* Economics, *40(1),* 62–76.

Mclean, A., Horváth, Á., and Kiss, H. (2013). *How does an increase in energy efficiency affect housing prices? A case study of a renovation.* In: *Book of proceedings: 20th Annual Conference of the European Real Estate Society.*Verlag, Vienna, pp. 39-55. ISBN 978-3-85437-323-0.

McMillen, D. and Thorsnes, P. (2006). Housing renovations and the quantile repeat-sales price index. *Real Estate Economics*, *34:* 567-584. https://doi.org/10.1111/j.1540-6229.2006.00179.x.

McNamara, D. and Keeler, A. (2013). A coupled physical and economic model of the response of coastal real estate to climate risk. *Nature Climate Change*, 3(6), 559–562.

Miceli, T. (1989). The optimal duration of real estate listing contracts. *Real Estate Economics*, 17, 267–277.

Michel-Kerjan, E. O. and C. Kousky, (2021), Come Rain or Shin e: Evidence on Flood Insurance Purchases in Florida, *Journal of Risk and Insurance,* 77, 2: 369-397.

Molk, P. (2018). Playing with fire: testing moral hazard in homeowners' insurance valued policies. *Utah Law Review, 2018(2),* 347-410.

Morgan, A. (2007). The impact of Hurricane Ivan on expected flood losses, perceived flood risk, and property values. *Journal of Housing Research*, 16(1): 47–60.

National Flood Insurance Program, (2024), Policy Information by State and Community as of 9/30/3024," https://nfipservices.floodsmart.gov/sites/default/files/nfip_policy-information-by-state_20240930.xlsx

National Association of Insurance Commissioners, (2024), Flood Insurance/National Flood Insurance Program (NFIP). (n.d.). https://content.naic.org/cipr-topics/flood-insurancenational-flood-insurance-program-nfip,

National Weather Services, (2024). Hurricane Katrina - August 2005,https://www.weather.gov/mob/katrina#:~:text=A%20Killer%20Hurricane%20Our%20Country%20Will%20Never%20Forget&text=In%20addition%2C%20Katrina%20is%20one,un%2Dadjusted%202005%20dollars).

Nikola, N. (2011). The effect of pipe repairs on housing prices. Master's Thesis. School of Economics, Aalto University.

Noonan, Douglas S. and Abdul-Akeem A. Sadiq, (2018), Flood Risk Management: Exploring the Impacts of The Community Rating System Program on Poverty and Income Inequality, *Risk Analysis, 38*, 3: 489-503.

Nyce, C., (1999). Into harm's way: The relationship among homeowners' insurance premiums, property values, and natural hazards. Dissertation. University of Pennsylvania.

Nyce, C., Dumm, R., Smersh, G., and Sirmans, G. S. (2015). The capitalization of homeowners' insurance premiums in house prices. *Journal of Risk and Insurance*, Vol. 82, No. 4.

Ortega, F. and Taspinar, S. (2018). Rising sea levels and sinking property values: Hurricane Sandy and New York's housing market. *Journal of Urban Economics*, *106*, 81–100. https://doi-org.libproxy.uncg.edu/10.1016/j.jue.2018.06.005.

Paleo-Torres, A., K. Gurley, J. Pinelli, M. Baradaranshoraka, M. Zhao, A. Suppasri, X. Peng, (2020), Vulnerability of Florida residential structures to hurricane induced coastal flood, *Engineering Structures*, Vol. 220, https://doi.org/10.1016/j.engstruct.2020.111004

Peer, Andrea, Hurricane Sandy: Facts, FAQs, and how to help, (2024). World Vision, https://www.worldvision.org/disaster-relief-news-stories/2012-hurricane-sandy-facts.

Picard, P. (2013). Economic analysis of insurance fraud. In G. Dionne (Ed.), *Handbook of insurance*. New York, NY: Springer.

Posey, J. and Rogers, W. (2010). The impact of special flood hazard area designation on residential property values. *Public Works Management & Policy*, 15(2), 81–90.

Robinson, S. and McIntosh, M. (2022). A literature review of environmental, social, and governance (ESG) in commercia real estate. *Journal of Real Estate Literature*, *30*(1-2), 1–14. https://doi.org/10.1080/09277544.2022.2106639

Sadiq A. and D. Noonan, (2015). Local Capacity and Resilience to Flooding: Community Responsiveness to the Community Ratings System Program Incentives. *Natural Hazards*, 78: 14113-1428.

Schuetz, J. (2024). How will US households adjust their housing behaviors in response to climate change? *Real Estate Economics*, 52, 596–617. https://doi.org/10.1111/1540-6229.12486

Severen, C., Costello, C., and Deschenes, O. (2018). A forward-looking Ricardian approach: Do land markets capitalize climate change forecasts? *Journal of Environmental Economics and Management*, *89*, 235–254. https://doi-org.libproxy.uncg.edu/10.1016/j.jeem.2018.03.009.

Shahbandian, M.. (2019). Building Renovation and Property Value. Master's Thesis. Linnaeus University, Faculty of Technology, Department of Built Environment and Energy Technology.

Shavell, S. (1979). On moral hazard and insurance. *The Quarterly Journal of Economics*, 93, 541–562.

Sheldon, T. and Zhan, C. (2022). The impact of hurricanes and floods on domestic migration. *Journal of Environmental Economics and Management*, 115, 102726.

Shiller, R. and Weiss, A. (2000). Moral hazard in home equity conversion. *Real Estate Economics*, 28, 1–31.

Shilling, J., Sirmans, C. F., and Benjamin, J. (1989). Flood insurance, wealth redistribution, and urban property values. *Journal of Urban Economics*, 26: 43-53.

Shr, Y. and Zipp, K. (2019). The aftermath of flood zone remapping: The asymmetric impact of flood maps on housing prices. *Land Economics*, 95 (2) 174-192; DOI: 10.3368/le.95.2.174.

Shu, E., Porter, J., Wilson, B., Bauer, M., and Pope, M. (2022). The economic impact of flood zone designations on residential property valuation in Miami-Dade County. *Journal of Risk and Financial Management*, *15*(10), 434. https://doi.org/10.3390/jrfm15100434.

Skantz, T. and Strickland, T. (1987). House prices and a flood event: An empirical investigation of market efficiency. *Journal of Real Estate Research*, 2: 75-83.

Smith, V., Carbone, J., Pope, J., Hallstrom, D., and Darden, M. (2006). Adjusting to natural disasters. *Journal of Risk and Uncertainty*, 33, 37–54.

Smith, M., McNamara, D., Williams, Z., Gopalakrishnan, S., and Landry, C. (2023). Policy and market forces delay inevitable real estate price declines on the coast. *Research Square (Research Square)*. https://doi.org/10.21203/rs.3.rs-3182266/v1.

Smith, Vernon L. (1968). 'Optimal Insurance Coverage,*"Journal of Political Economy* 76, 68-77.

Society of Actuaries,(2020). Residential Flood Risk in the United States: Quantifying Flood Losses, Mortgage Risk and Sea Level Rise."Society of Actuaries.

Solt, M. and Miller, N. (1985). Managerial incentives: Implications for the financial performance of real estate investment trusts. *Real Estate Economics*, 13, 404–423.

Speyrer, J. and Ragas, W. (1991). Housing prices and flood risk: An examination using spline regression. *Journal of Real Estate Finance and Economics*, 4: 395-407.

Sriver, R., Urban, N., Olson, R., and Keller, K. (2012). Toward a physically plausible upper bound of sea-level rise projections. *Climatic Change* 115:893–902.

Strauss, B., Ziemlinski, R., Weiss, J., and Overpeck, J. (2012). Tidally adjusted estimates of topographic vulnerability to sea level rise and flooding for the contiguous United States. *Environmental Research Letters*, 7(1), 1-12.

Tesselaar, M., Botzen, W., Robinson, P., Aerts, J., and Zhou, F. (2022). Charity hazard and the flood insurance protection gap: An EU scale assessment under climate change. *Ecological Economics*, 193, 107289. *https://doi.org/10.1016/j.ecolecon.2021.107289.*

Department of Homeland Security, (2002), Proposal to Create the Department of Homeland Security. https://www.dhs.gov/sites/default/files/publications/book_0.pdf.

Turnbull, G., Zahirovic-Herbert, V., and Mothorpe, C. (2013). Flooding and liquidity on the bayou: The capitalization of food risk into house value and ease-of-sale. *Real Estate Economics*, 41, 103-129.

Tyndall, J. (2023). Sea level rise and home prices: evidence from Long Island. *Journal of Real Estate Finance and Economics*, 67(4), 579–605. https://doi-org.libproxy.uncg.edu/10.1007/s11146-021-09868-8.

Tyler, J., A. Sadiq, and D. S. Noonan, (2019)., A Review of the Community Flook Risk Management Literature in the USA: Lessons for Improving Community Resilience, *Natural Hazards*, 96: 1223-1248.

Tyler, J., A. Sadiq, D. S. Noonan, and R. M. Entress, (2021), Decision Making for Managing Community Flood Risks: Perspectives of the United States Floodplain Managers, *International Journal of Disaster Risk Science*, 12: 649-660.

University of Rhode Island, (2024), Hurricanes: Science and Society https://www.hurricanescience.org/history/storms/1960s/betsy/index.html.

Volkman-Wise, J. (2015). Representativeness and managing catastrophe risk. *Journal of Risk and Uncertainty*, 51(3), 267–290.

Votsis, A. and Perrels, A. (2016). Housing prices and the public disclosure of flood risk: A difference-indifferences analysis in Finland. *The Journal of Real Estate Finance and Economics, 53*(4), 450–471.

Webster, E. M., E. A. Lee, B. R. Lindsay, A. E. Normand, D. P. Horn, and N. Paris, (2021). The Disaster Recovery Reform Act of 2018 (DRRA): Implementation Updates for Select Provisions, Congressional Research Service, R46776.

Wei, F. and Zhao, L. (2022). The effect of flood risk on residential land prices. *Land*, *11*(10), 1612. https://doi.org/10.3390/land11101612.

Wilhelmsson, M. (2008). House price depreciation rates and level of maintenance. *Journal of Housing Economics*, *17*(1), 88-101.

Wing, O., Lehman, W., Bates, P., Sampson, C., Quinn, N., Smith, A., Neal, J., Porter, J., and Kousky, C. (2022). Inequitable patterns of us flood risk in the Anthropocene. *Nature Climate Change*, 12, 156–162.

Winter, R. (1992). Moral hazard and insurance contracts. In: Dionne, G. (eds) *Contributions to Insurance Economics*. Huebner International Series on Risk, Insurance and Economic Security, vol 13. Springer, Dordrecht. https://doi.org/10.1007/978-94-017-1168-5_3.

Yi, D. and Choi, H. (2020). Housing market response to new flood risk information and the impact on poor tenants. *The Journal of Real Estate Finance and Economics*, 61(1), 55–79.

Zahran, S. D., Brody, W. E. Highfield & A Vedlitz, (2010). Non-linear incentives, plan design, and flood mitigation: the case of the Federal Emergency Management Agency's community rating system, *Journal of Environmental Planning and Management*, *53:2*, 219-239.

Zhang, L. (2016). Flood hazards impact on neighborhood house prices: A spatial quantile regression analysis. *Regional Science and Urban Economics*, Volume 60, pp. 12-19. ISSN 0166-0462, https://doi.org/10.1016/j.regsciurbeco.2016.06.005.

Zhang, L. and Leonard, T. (2019). Flood hazards impact on neighborhood house prices. *The Journal of Real Estate Finance and Economics, 58*(4), 656–674.

Zhang, F., Lin, N., and Kunreuther, H. (2022). Benefits of and strategies to update premium rates in the US National Flood Insurance Program under climate change. *Risk Analysis*. https://doi.org/10.1111/risa.14048.

Zhou, F., Endendijk, T., and Wouter Botzen, W. (2023). A review of the financial sector impacts of risks associated with climate change. *Annual Review of Resource Economics*, *15*(1). https://doi.org/10.1146/annurev-resource-101822-105702.

Appendix A NFIP Regulations

NFIP regulations related to new construction and SI can be found in § 60.3 Flood plain management criteria for flood-prone areas. The Code of Federal Regulations is available online at https://www.ecfr.gov/current/title-44/chapter-I/subchapter-B/part-60/subpart-A/section-60.3 and states:

"The Federal Insurance Administrator will provide the data upon which flood plain management regulations shall be based. If the Federal Insurance Administrator has not provided sufficient data to furnish a basis for these regulations in a particular community, the community shall obtain, review and reasonably utilize data available from other Federal, State or other sources pending receipt of data from the Federal Insurance Administrator. However, when special flood hazard area designations and water surface elevations have been furnished by the Federal Insurance Administrator, they shall apply. The symbols defining such special flood hazard designations are set forth in § 64.3 of this subchapter. In all cases the minimum requirements governing the adequacy of the flood plain management regulations for flood-prone areas adopted by a particular community depend on the amount of technical data formally provided to the community by the Federal Insurance Administrator. Minimum standards for communities are as follows:

(a) When the Federal Insurance Administrator has not defined the special flood hazard areas within a community, has not provided water surface elevation data, and has not provided sufficient data to identify the floodway or coastal high hazard area, but the community has indicated the presence of such hazards by submitting an application to participate in the Program, the community shall:

> (1) Require permits for all proposed construction or other development in the community, including the placement of manufactured homes, so that it may determine whether such construction or other development is proposed within flood-prone areas;
>
> (2) Review proposed development to assure that all necessary permits have been received from those governmental agencies from which approval is required by Federal or State law, including section 404 of the Federal Water Pollution Control Act Amendments of 1972, 33 U.S.C. 1334;
>
> (3) Review all permit applications to determine whether proposed building sites will be reasonably safe from flooding. If a proposed building site is in a flood-prone area, all new construction and substantial improvements shall

(i) be designed (or modified) and adequately anchored to prevent flotation, collapse, or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy,
(ii) be constructed with materials resistant to flood damage,
(iii) be constructed by methods and practices that minimize flood damages, and
(iv) be constructed with electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities that are designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding.

(4) Review subdivision proposals and other proposed new development, including manufactured home parks or subdivisions, to determine whether such proposals will be reasonably safe from flooding. If a subdivision proposal or other proposed new development is in a flood-prone area, any such proposals shall be reviewed to assure that

(i) all such proposals are consistent with the need to minimize flood damage within the flood-prone area,
(ii) all public utilities and facilities, such as sewer, gas, electrical, and water systems are located and constructed to minimize or eliminate flood damage, and
(iii) adequate drainage is provided to reduce exposure to flood hazards;

(5) Require within flood-prone areas new and replacement water supply systems to be designed to minimize or eliminate infiltration of flood waters into the systems; and

(6) Require within flood-prone areas

(i) new and replacement sanitary sewage systems to be designed to minimize or eliminate infiltration of flood waters into the systems and discharges from the systems into flood waters and
(ii) onsite waste disposal systems to be located to avoid impairment to them or contamination from them during flooding.

(b) When the Federal Insurance Administrator has designated areas of special flood hazards (A zones) by the publication of a community's FHBM or FIRM, but has neither produced water surface elevation data nor identified a floodway or coastal high hazard area, the community shall:

(1) Require permits for all proposed construction and other developments including the placement of manufactured homes, within Zone A on the community's FHBM or FIRM;

(2) Require the application of the standards in paragraphs (a) (2), (3), (4), (5) and (6) of this section to development within Zone A on the community's FHBM or FIRM;

(3) Require that all new subdivision proposals and other proposed developments (including proposals for manufactured home parks and subdivisions) greater than 50 lots or 5 acres, whichever is the lesser, include within such proposals base flood elevation data;

(4) Obtain, review and reasonably utilize any base flood elevation and floodway data available from a Federal, State, or other source, including data developed pursuant to paragraph (b)(3) of this section, as criteria for requiring that new construction, substantial improvements, or other development in Zone A on the community's FHBM or FIRM meet the standards in paragraphs (c)(2), (c)(3), (c)(5), (c)(6), (c)(12), (c)(14), (d)(2) and (d)(3) of this section;

(5) Where base flood elevation data are utilized, within Zone A on the community's FHBM or FIRM:

> (i) Obtain the elevation (in relation to mean sea level) of the lowest floor (including basement) of all new and substantially improved structures, and
> (ii) Obtain, if the structure has been floodproofed in accordance with paragraph (c)(3)(ii) of this section, the elevation (in relation to mean sea level) to which the structure was floodproofed, and
> (iii) Maintain a record of all such information with the official designated by the community under § 59.22 (a)(9)(iii);

(6) Notify, in riverine situations, adjacent communities and the State Coordinating Office prior to any alteration or relocation of a watercourse, and submit copies of such notifications to the Federal Insurance Administrator;

(7) Assure that the flood carrying capacity within the altered or relocated portion of any watercourse is maintained;

(8) Require that all manufactured homes to be placed within Zone A on a community's FHBM or FIRM shall be installed using methods and practices which minimize flood damage. For the purposes of this requirement, manufactured homes must be elevated and anchored to resist flotation, collapse, or lateral movement. Methods of anchoring may include, but are not to be limited to, use of over-the-top or frame ties to ground anchors. This requirement is in addition to applicable State and local anchoring requirements for resisting wind forces.

(c) When the Federal Insurance Administrator has provided a notice of final flood elevations for one or more special flood hazard areas on the community's FIRM and, if appropriate, has designated other special flood hazard areas without base flood elevations on the community's FIRM, but has not identified a regulatory floodway or coastal high hazard area, the community shall:

(1) Require the standards of paragraph (b) of this section within all A1-30 zones, AE zones, A zones, AH zones, and AO zones, on the community's FIRM;

(2) Require that all new construction and substantial improvements of residential structures within Zones A1-30, AE and AH zones on the community's FIRM have the lowest floor (including basement) elevated to or above the base flood level, unless the community is granted an exception by the Federal Insurance Administrator for the allowance of basements in accordance with § 60.6 (b) or (c);

(3) Require that all new construction and substantial improvements of non-residential structures within Zones A1-30, AE and AH zones on the community's firm

(i) have the lowest floor (including basement) elevated to or above the base flood level or,
(ii) together with attendant utility and sanitary facilities, be designed so that below the base flood level the structure is watertight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy;

(4) Provide that where a non-residential structure is intended to be made watertight below the base flood level,

(i) a registered professional engineer or architect shall develop and/or review structural design, specifications, and plans for the construction, and shall certify that the design and methods of construction are in accordance with accepted standards of practice for meeting the applicable provisions of paragraph (c)(3)(ii) or (c)(8)(ii) of this section, and
(ii) a record of such certificates which includes the specific elevation (in relation to mean sea level) to which such structures are floodproofed shall be maintained with the official designated by the community under § 59.22(a)(9)(iii);

(5) Require, for all new construction and substantial improvements, that fully enclosed areas below the lowest floor that are usable solely for parking of vehicles, building access or storage in an area other than a basement and which are subject to flooding shall be

designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters. Designs for meeting this requirement must either be certified by a registered professional engineer or architect or meet or exceed the following minimum criteria: A minimum of two openings having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding shall be provided. The bottom of all openings shall be no higher than one foot above grade. Openings may be equipped with screens, louvers, valves, or other coverings or devices provided that they permit the automatic entry and exit of floodwaters.

(6) Require that manufactured homes that are placed or substantially improved within Zones A1-30, AH, and AE on the community's FIRM on sites

> (i) Outside of a manufactured home park or subdivision,
> (ii) In a new manufactured home park or subdivision,
> (iii) In an expansion to an existing manufactured home park or subdivision, or
> (iv) In an existing manufactured home park or subdivision on which a manufactured home has incurred "substantial damage" as the result of a flood, be elevated on a permanent foundation such that the lowest floor of the manufactured home is elevated to or above the base flood elevation and be securely anchored to an adequately anchored foundation system to resist floatation collapse and lateral movement.

(7) Require within any AO zone on the community's FIRM that all new construction and substantial improvements of residential structures have the lowest floor (including basement) elevated above the highest adjacent grade at least as high as the depth number specified in feet on the community's FIRM (at least two feet if no depth number is specified);

(8) Require within any AO zone on the community's FIRM that all new construction and substantial improvements of nonresidential structures

> (i) have the lowest floor (including basement) elevated above the highest adjacent grade at least as high as the depth number specified in feet on the community's FIRM (at least two feet if no depth number is specified), or
> (ii) together with attendant utility and sanitary facilities be completely floodproofed to that level to meet the floodproofing standard specified in § 60.3(c)(3)(ii);

(9) Require within any A99 zones on a community's FIRM the standards of paragraphs (a)(1) through (a)(4)(i) and (b)(5) through (b)(9) of this section;

(10) Require until a regulatory floodway is designated, that no new construction, substantial improvements, or other development (including fill) shall be permitted within Zones A1-30 and AE on the community's FIRM, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one foot at any point within the community.

(11) Require within Zones AH and AO, adequate drainage paths around structures on slopes, to guide floodwaters around and away from proposed structures.

(12) Require that manufactured homes to be placed or substantially improved on sites in an existing manufactured home park or subdivision within Zones A-1-30, AH, and AE on the community's FIRM that are not subject to the provisions of paragraph (c)(6) of this section be elevated so that either

> (i) The lowest floor of the manufactured home is at or above the base flood elevation, or
> (ii) The manufactured home chassis is supported by reinforced piers or other foundation elements of at least equivalent strength that are no less than 36 inches in height above grade and be securely anchored to an adequately anchored foundation system to resist floatation, collapse, and lateral movement.

(13) Notwithstanding any other provisions of § 60.3, a community may approve certain development in Zones Al-30, AE, and AH, on the community's FIRM which increase the water surface elevation of the base flood by more than one foot, provided that the community first applies for a conditional FIRM revision, fulfills the requirements for such a revision as established under the provisions of § 65.12, and receives the approval of the Federal Insurance Administrator.

(14) Require that recreational vehicles placed on sites within Zones A1-30, AH, and AE on the community's FIRM either

> (i) Be on the site for fewer than 180 consecutive days,
> (ii) Be fully licensed and ready for highway use, or
> (iii) Meet the permit requirements of paragraph (b)(1) of this section and the elevation and anchoring requirements for “manufactured homes” in paragraph (c)(6) of this section.

A recreational vehicle is ready for highway use if it is on its wheels or jacking system, is attached to the site only by quick disconnect type utilities and security devices, and has no permanently attached additions.

(d) When the Federal Insurance Administrator has provided a notice of final base flood elevations within Zones A1-30 and/or AE on the community's FIRM and, if appropriate, has designated AO zones, AH zones, A99 zones, and A zones on the community's FIRM, and has provided data from which the community shall designate its regulatory floodway, the community shall:

(1) Meet the requirements of paragraphs (c) (1) through (14) of this section;

(2) Select and adopt a regulatory floodway based on the principle that the area chosen for the regulatory floodway must be designed to carry the waters of the base flood, without increasing the water surface elevation of that flood more than one foot at any point;

(3) Prohibit encroachments, including fill, new construction, substantial improvements, and other development within the adopted regulatory floodway unless it has been demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the proposed encroachment would not result in any increase in flood levels within the community during the occurrence of the base flood discharge;

(4) Notwithstanding any other provisions of § 60.3, a community may permit encroachments within the adopted regulatory floodway that would result in an increase in base flood elevations, provided that the community first applies for a conditional FIRM and floodway revision, fulfills the requirements for such revisions as established under the provisions of § 65.12, and receives the approval of the Federal Insurance Administrator.

(e) When the Federal Insurance Administrator has provided a notice of final base flood elevations within Zones A1-30 and/or AE on the community's FIRM and, if appropriate, has designated AH zones, AO zones, A99 zones, and A zones on the community's FIRM, and has identified on the community's FIRM coastal high hazard areas by designating Zones V1-30, VE, and/or V, the community shall:

(1) Meet the requirements of paragraphs (c)(1) through (14) of this section;

(2) Within Zones V1-30, VE, and V on a community's FIRM,

(i) obtain the elevation (in relation to mean sea level) of the bottom of the lowest structural member of the lowest floor (excluding pilings and columns) of all new and substantially improved structures, and whether or not such structures contain a basement, and

(ii) maintain a record of all such information with the official designated by the community under § 59.22(a)(9)(iii);

(3) Provide that all new construction within Zones V1-30, VE, and V on the community's FIRM is located landward of the reach of mean high tide;

(4) Provide that all new construction and substantial improvements in Zones V1-30 and VE, and also Zone V if base flood elevation data is available, on the community's FIRM, are elevated on pilings and columns so that

(i) the bottom of the lowest horizontal structural member of the lowest floor (excluding the pilings or columns) is elevated to or above the base flood level; and
(ii) the pile or column foundation and structure attached thereto is anchored to resist flotation, collapse and lateral movement due to the effects of wind and water loads acting simultaneously on all building components. Water loading values used shall be those associated with the base flood. Wind loading values used shall be those required by applicable State or local building standards. A registered professional engineer or architect shall develop or review the structural design, specifications and plans for the construction, and shall certify that the design and methods of construction to be used are in accordance with accepted standards of practice for meeting the provisions of paragraphs (e)(4) (i) and (ii) of this section.

(5) Provide that all new construction and substantial improvements within Zones V1-30, VE, and V on the community's FIRM have the space below the lowest floor either free of obstruction or constructed with non-supporting breakaway walls, open wood lattice-work, or insect screening intended to collapse under wind and water loads without causing collapse, displacement, or other structural damage to the elevated portion of the building or supporting foundation system. For the purposes of this section, a breakway wall shall have a design safe loading resistance of not less than 10 and no more than 20 pounds per square foot. Use of breakway walls which exceed a design safe loading resistance of 20 pounds per square foot (either by design or when so required by local or State codes) may be permitted only if a registered professional engineer or architect certifies that the designs proposed meet the following conditions:

(i) Breakaway wall collapse shall result from a water load less than that which would occur during the base flood; and,
(ii) The elevated portion of the building and supporting foundation system shall not be subject to collapse, displacement, or other structural damage due to the effects of wind and water loads acting simultaneously on all building components

(structural and non-structural). Water loading values used shall be those associated with the base flood. Wind loading values used shall be those required by applicable State or local building standards.

Such enclosed space shall be useable solely for parking of vehicles, building access, or storage.

(6) Prohibit the use of fill for structural support of buildings within Zones V1-30, VE, and V on the community's FIRM;

(7) Prohibit man-made alteration of sand dunes and mangrove stands within Zones V1-30, VE, and V on the community's FIRM which would increase potential flood damage.

(8) Require that manufactured homes placed or substantially improved within Zones V1-30, V, and VE on the community's FIRM on sites

(i) Outside of a manufactured home park or subdivision,
(ii) In a new manufactured home park or subdivision,
(iii) In an expansion to an existing manufactured home park or subdivision, or
(iv) In an existing manufactured home park or subdivision on which a manufactured home has incurred "substantial damage" as the result of a flood, meet the standards of paragraphs (e)(2) through (7) of this section and that manufactured homes placed or substantially improved on other sites in an existing manufactured home park or subdivision within Zones VI-30, V, and VE on the community's FIRM meet the requirements of paragraph (c)(12) of this section.

(9) Require that recreational vehicles placed on sites within Zones V1-30, V, and VE on the community's FIRM either

(i) Be on the site for fewer than 180 consecutive days,
(ii) Be fully licensed and ready for highway use, or
(iii) Meet the requirements in paragraphs (b)(1) and (e) (2) through (7) of this section.

A recreational vehicle is ready for highway use if it is on its wheels or jacking system, is attached to the site only by quick disconnect type utilities and security devices, and has no permanently attached additions.

(f) When the Federal Insurance Administrator has provided a notice of final base flood elevations within Zones A1-30 or AE on the community's FIRM, and, if appropriate, has designated AH zones, AO zones, A99 zones, and A zones on the community's FIRM, and has identified flood

protection restoration areas by designating Zones AR, AR/A1-30, AR/AE, AR/AH, AR/AO, or AR/A, the community shall:

(1) Meet the requirements of paragraphs (c)(1) through (14) and (d)(1) through (4) of this section.

(2) Adopt the official map or legal description of those areas within Zones AR, AR/A1-30, AR/AE, AR/AH, AR/A, or AR/AO that are designated developed areas as defined in § 59.1 in accordance with the eligibility procedures under § 65.14.

(3) For all new construction of structures in areas within Zone AR that are designated as developed areas and in other areas within Zone AR where the AR flood depth is 5 feet or less:

(i) Determine the lower of either the AR base flood elevation or the elevation that is 3 feet above highest adjacent grade; and
(ii) Using this elevation, require the standards of paragraphs (c)(1) through (14) of this section.

(4) For all new construction of structures in those areas within Zone AR that are not designated as developed areas where the AR flood depth is greater than 5 feet:

(i) Determine the AR base flood elevation; and
(ii) Using that elevation require the standards of paragraphs (c)(1) through (14) of this section.

(5) For all new construction of structures in areas within Zone AR/A1-30, AR/AE, AR/AH, AR/AO, and AR/A:

(i) Determine the applicable elevation for Zone AR from paragraphs (a)(3) and (4) of this section;
(ii) Determine the base flood elevation or flood depth for the underlying A1-30, AE, AH, AO and A Zone; and
(iii) Using the higher elevation from paragraphs (a)(5)(i) and (ii) of this section require the standards of paragraphs (c)(1) through (14) of this section.

(6) For all substantial improvements to existing construction within Zones AR/A1-30, AR/AE, AR/AH, AR/AO, and AR/A:

(i) Determine the A1-30 or AE, AH, AO, or A Zone base flood elevation; and
(ii) Using this elevation apply the requirements of paragraphs (c)(1) through (14) of this section.

(7) Notify the permit applicant that the area has been designated as an AR, AR/A1-30, AR/AE, AR/AH, AR/AO, or AR/A Zone and whether the structure will be elevated or protected to or above the AR base flood elevation."

Appendix B NFIP Participation Summary: All Florida Counties

Table B-1. Summary of NFIP Participation

County	Sum of Policies in Force	Sum of Total Coverage	Sum of Total Written Premium + FPF	Sum of Total Annual Payment
Alachua County	2757	$ 785,756,000	$ 1,712,174	$ 2,169,394
Baker County	159	$ 36,952,000	$ 125,527	$ 154,353
Bay County	32046	$ 8,457,795,000	$ 15,010,197	$ 19,096,215
Bradford County	437	$ 102,956,000	$ 353,317	$ 443,263
Brevard County	44860	$ 12,787,240,000	$ 27,421,284	$ 34,008,010
Broward County	200911	$ 52,906,921,000	$ 110,201,555	$ 137,437,441
Calhoun County	79	$ 18,343,000	$ 81,257	$ 100,564
Charlotte County	40155	$ 10,661,935,000	$ 59,158,389	$ 72,126,192
Citrus County	6287	$ 1,493,406,000	$ 10,738,783	$ 13,080,625
Clay County	4626	$ 1,432,674,000	$ 3,672,491	$ 4,522,244
Collier County	105064	$ 27,643,178,000	$ 107,405,068	$ 132,067,944
Columbia County	694	$ 170,095,000	$ 509,804	$ 643,420
Desoto County	502	$ 117,955,000	$ 475,696	$ 572,152
Dixie County	648	$ 114,628,000	$ 840,540	$ 1,006,714
Duval County	30093	$ 9,285,069,000	$ 21,947,261	$ 27,230,463
Escambia County	17557	$ 4,985,304,000	$ 12,391,678	$ 15,599,182
Flagler County	10930	$ 3,238,135,000	$ 7,517,760	$ 9,306,249
Franklin County	2444	$ 697,058,000	$ 4,526,961	$ 5,698,510
Gadsden County	99	$ 25,249,000	$ 72,100	$ 90,769
Gilchrist County	191	$ 41,960,000	$ 172,903	$ 217,313
Glades County	216	$ 53,554,000	$ 154,858	$ 197,331
Gulf County	1765	$ 520,524,000	$ 2,189,088	$ 2,789,839
Hamilton County	50	$ 9,822,000	$ 40,273	$ 50,824

County	Sum of Policies in Force	Sum of Total Coverage	Sum of Total Written Premium + FPF	Sum of Total Annual Payment
Hardee County	155	$ 32,303,000	$ 174,307	$ 199,517
Hendry County	789	$ 219,894,000	$ 745,823	$ 942,403
Hernando County	3489	$ 939,831,000	$ 4,490,922	$ 5,478,108
Highlands County	1036	$ 267,807,000	$ 530,365	$ 692,421
Hillsborough County	64060	$ 18,557,022,000	$ 76,242,595	$ 93,031,881
Holmes County	89	$ 20,825,000	$ 80,561	$ 99,687
Indian River County	19609	$ 5,595,961,000	$ 16,647,853	$ 20,711,615
Jackson County	114	$ 28,892,000	$ 97,207	$ 121,992
Jefferson County	78	$ 18,818,000	$ 51,972	$ 64,190
Lafayette County	156	$ 30,810,000	$ 136,362	$ 174,292
Lake County	3857	$ 1,112,092,000	$ 2,501,424	$ 3,136,469
Lee County	139405	$ 35,886,168,000	$ 183,189,159	$ 222,914,832
Leon County	2818	$ 834,568,000	$ 2,248,361	$ 2,861,025
Levy County	1019	$ 203,485,000	$ 1,683,408	$ 2,042,831
Liberty County	16	$ 3,218,000	$ 11,723	$ 14,549
Madison County	95	$ 20,542,000	$ 68,436	$ 87,728
Manatee County	37107	$ 10,259,030,000	$ 41,399,915	$ 51,073,914
Marion County	3559	$ 979,469,000	$ 2,055,467	$ 2,625,668
Martin County	15136	$ 4,384,153,000	$ 11,056,703	$ 13,726,784
Miami-Dade County	356920	$ 88,546,648,000	$ 201,628,255	$ 249,729,761
Monroe County	31789	$ 8,692,992,000	$ 58,301,754	$ 72,031,653
Nassau County	9611	$ 2,881,708,000	$ 6,727,531	$ 8,439,607
Okaloosa County	19050	$ 5,019,685,000	$ 10,809,424	$ 13,573,973
Okeechobee County	1372	$ 330,083,000	$ 1,071,919	$ 1,351,681
Orange County	16318	$ 4,858,634,000	$ 9,072,853	$ 11,477,063
Osceola County	9211	$ 2,542,163,000	$ 5,175,041	$ 6,643,836

County	Sum of Policies in Force	Sum of Total Coverage	Sum of Total Written Premium + FPF	Sum of Total Annual Payment
Palm Beach County	129990	$ 35,921,254,000	$ 65,998,488	$ 82,884,854
Pasco County	23831	$ 6,320,790,000	$ 27,175,180	$ 33,077,279
Pinellas County	130376	$ 32,906,380,000	$ 157,558,867	$ 190,533,934
Polk County	7459	$ 1,994,661,000	$ 4,158,058	$ 5,287,765
Putnam County	1206	$ 256,941,000	$ 1,121,011	$ 1,386,386
Santa Rosa County	12198	$ 3,839,233,000	$ 8,469,217	$ 10,569,341
Sarasota County	61799	$ 16,643,934,000	$ 66,612,100	$ 81,582,581
Seminole County	7584	$ 2,246,636,000	$ 4,896,938	$ 6,063,827
St. Johns County	33718	$ 9,749,654,000	$ 25,106,523	$ 31,355,477
St. Lucie County	18996	$ 5,082,230,000	$ 10,329,042	$ 12,906,720
Sumter County	3025	$ 888,464,000	$ 1,594,300	$ 2,001,948
Suwannee County	454	$ 99,417,000	$ 386,870	$ 488,777
Taylor County	619	$ 123,900,000	$ 975,120	$ 1,194,750
Union County	62	$ 15,041,000	$ 52,365	$ 64,840
Unknown	54	$ 10,882,000	$ 83,920	$ 92,594
Volusia County	47452	$ 12,137,038,000	$ 26,042,787	$ 32,157,072
Wakulla County	1256	$ 299,311,000	$ 2,185,578	$ 2,659,579
Walton County	17493	$ 4,873,717,000	$ 8,362,403	$ 11,245,825
Washington County	117	$ 27,457,000	$ 99,289	$ 124,276
Grand Total	**1,737,117**	**$ 461,290,250,000**	**$ 1,434,126,360**	**$ 1,767,534,316**

Note: Information obtained from the NFIP website available at https://nfipservices.floodsmart.gov/reports-flood-insurance-data.

Appendix C Flood Zones as Identified on FIRMS

Table C-1. Flood Zone Symbols

Zone Symbol	Description
A	Area of special flood hazard without water surface elevations determined.
A1 - 30, AE	Area of special flood hazard with water surface elevations determined.
AO	Area of special flood hazards having shallow water depths and/or unpredictable flow paths between 1 and 3 feet.
A99	Area of special flood hazard where enough progress has been made on a protective system, such as dikes, dams, and levees, to consider it complete for insurance rating purpose.
AH	Areas of special flood hazards having shallow water depths and/or unpredictable flow paths between 1 and 3 feet, and with water surface elevations determined.
AR	Area of special flood hazard that results from the decertification of a previously accredited flood protection system that is determined to be in the process of being restored to provide base flood protection.
V	Area of special flood hazards without water surface elevations determined, and with velocity, that is inundated by tidal floods (coastal high hazard area).
V1- 30, VE	Area of special flood hazards, with water surface elevations determined and with velocity, that is inundated by tidal floods (coastal high hazard area).
VO	Area of special flood hazards having shallow water depths and/or unpredictable flow paths between 1 and 3 feet and with velocity.
B, X	Areas of moderate flood hazards or areas of future-conditions flood hazard.
C, X	Area of minimal hazards.
D	Area of undetermined, but possible, flood hazards.
M	Area of special mudslide (i.e., mudflow) hazards.
N	Area of moderate mudslide (i.e., mudflow) hazards.
P	Area of undetermined, but possible, mudslide hazards.
E	Area of special flood-related erosion hazard.

Note: Information obtained from Table 1 on pages 3 and 4 of Horn and Webel (2024).

Appendix D NFIP Code Related to Substantial Improvement

A. SUBSTANTIAL IMPROVEMENT

44 CFR 59.1. Definitions: "Substantial improvement" means any reconstruction, rehabilitation, addition or other improvement to a structure, the total cost of which equals or exceeds 50 percent of the market value of the structure before the start of construction of the improvement.

This section provides information on determining whether a building has been substantially improved and on what NFIP requirements apply.

PROJECTS AFFECTED

All building improvement projects worthy of a permit must be considered. These include:

- Remodeling projects.
- Rehabilitation projects.
- Building additions.
- Repair and reconstruction projects (these are addressed in more detail in Section B on substantial damage)

If your community does not require permits for, say, reroofing, minor maintenance or projects under a certain dollar amount, then such projects are not subject to the substantial improvement requirements. However, if you have a larger project that includes reroofing, etc., then it must include the entire cost of the project.

One problem you may face is a builder trying to avoid the requirement by applying for a permit for only part of the job and then later applying for another permit to finish the work. If both applications are together worth more than 50% of the value of the building, the combined project should be considered a substantial improvement and subject to the rules.

FEMA requires that the entire improvement project be counted as one. In order to help you enforce this, you may want to count all applications submitted over, say, one year as one project. Check with your attorney on whether your ordinance clearly gives you the authority to do this and be sure to spell it out in the permit papers given to the applicant.

Some communities require that improvements be calculated cumulatively over several years. All improvement and repair projects undertaken over a period of five years, 10 years or the life of the structure are added up. When they total 50 percent, the building must be brought into compliance as if it were new construction.

The Community Rating System credits keeping track of improvements to enforce a cumulative substantial improvement requirement. It also credits using a lower threshold than 50 percent. These credits are found under Activity 430, Section 431.c and d in the *CRS Coordinator's Manual* and the *CRS Application*. See also *CRS Credit for Higher Regulatory Standards* for example regulatory language.

Post-FIRM buildings

The rules do not address only pre-FIRM buildings—they cover *all* buildings, post-FIRM ones included.

In most cases, a post-FIRM building will be properly elevated or otherwise compliant with regulations for new construction. However, sometimes a map change results in a higher BFE or change in FIRM zone. A substantial improvement to a post-FIRM building may require that the building be elevated to protect it from the new, higher, regulatory BFE.

It should be remembered that all additions to a post-FIRM building must be elevated at least as high as the BFE in effect when the building was built. (You can't allow a compliant building to become noncompliant by allowing additions at grade.) If a new, higher BFE has been adopted since the building was built, additions that are substantial improvements must be elevated to the new BFE.

THE FORMULA

A project is a substantial improvement if:

$$\frac{\text{Cost of improvement project}}{\text{Market value of the building}} \geq 50 \text{ percent}$$

For example, if a proposed improvement project will cost $30,000 and the value of the building is $50,000:

$$\frac{\$30{,}000}{\$50{,}000} = 0.6 \text{ (60 percent)}$$

The cost of the project exceeds 50 percent of the building's value, so it is a substantial improvement. The floodplain regulations for new construction apply and the building must meet

the post-FIRM construction requirements. If the project is an addition, only the addition has to be elevated (see the examples later in this section).

The formula is based on the cost of the project and the value of the building. These two numbers must be reviewed in detail.

Project cost

The cost of the project means all structural costs, including

- all materials
- labor
- built-in appliances
- overhead
- profit
- repairs made to damaged parts of the building worked on at the same time

A more detailed list is included in Figure 8-1.

To determine substantial improvement, you need a detailed cost estimate for the project, prepared by a licensed general contractor, professional construction estimator or your office.

Your office must review the estimate submitted by the permit applicant. To verify it, you can use your professional judgment and knowledge of local and regional construction costs, or you can use building code valuation tables published by the major building code groups. These tables can be used for determining estimates for particular replacement items if the type of structure in question is listed in the tables.

There are two possible exemptions you should be aware of: 1) improvements to correct code violations do not have to be included in the cost of an improvement or repair project and 2) historic buildings can be exempted from substantial improvement requirements. These are explained in more detail later on.

Market value

In common parlance, market value is the price a willing buyer and seller agree upon. The market value of a structure reflects its original quality, subsequent improvements, physical age of building components and current condition.

However, market value for property can be different than that of the building itself. Market value of developed property varies widely due to the desirability of its location. For example, two houses of similar size, quality and condition will have far different prices if one is on the coast, or in the best school district, or closer to town than the other—but the value of the building materials and labor that went into both houses will be nearly the same.

For the purposes of determining substantial improvement, market value pertains only to the structure in question. It does not pertain to the land, landscaping or detached accessory structures on the property. Any value resulting from the location of the property should be attributed to the value of the land, not the building.

Items to be included

— All structural elements, including:
— Spread or continuous foundation footings and pilings
— Monolithic or other types of concrete slabs
— Bearing walls, tie beams and trusses
— Floors and ceilings
— Attached decks and porches
— Interior partition walls
— Exterior wall finishes (brick, stucco, siding) including painting and moldings
— Windows and doors
— Reshingling or retiling a roof
— Hardware
— All interior finishing elements, including:
— Tiling, linoleum, stone, or carpet over subflooring
— Bathroom tiling and fixtures
— Wall finishes (drywall, painting, stucco, plaster, paneling, marble, etc.)
— Kitchen, utility and bathroom cabinets
— Built-in bookcases, cabinets, and furniture
— Hardware
— All utility and service equipment, including:
— HVAC equipment
— Plumbing and electrical services
— Light fixtures and ceiling fans
— Security systems
— Built-in kitchen appliances
— Central vacuum systems
— Water filtration, conditioning, or recirculation systems
— Cost to demolish storm-damaged building components
— — Labor and other costs associated with moving or altering undamaged building components to accommodate improvements or additions
— — Overhead and profits

Items to be excluded

— Plans and specifications
— Survey costs
— Permit fees
— Post-storm debris removal and clean up
— Outside improvements, including:
— Landscaping
— Sidewalks
— Fences
— Yard lights
— Swimming pools
— Screened pool enclosures
— Detached structures (including garages, sheds and gazebos)
— Landscape irrigation systems

Figure 8-1. Items included in calculating cost of the project

Acceptable estimates of market value can be obtained from these sources:

- An independent appraisal by a professional appraiser. The appraisal must exclude the value of the land and not use the "income capitalization approach" which bases value on the use of the property, not the structure.
- Detailed estimates of the structure's actual cash value— the replacement cost for a building, minus a depreciation percentage based on age and condition. For most situations, the building's actual cash value should approximate its market value. Your community may prefer to use actual cash value as a substitute for market value, especially where there is not sufficient data or enough comparable sales.
- Property values used for tax assessment purposes with an adjustment recommended by the tax appraiser to reflect current market conditions (adjusted assessed value).
- The value of buildings taken from NFIP claims data (usually actual cash value).
- Qualified estimates based on sound professional judgment made by the staff of the local building department or tax assessor's office.

Some market value estimates are often used only as screening tools (i.e., NFIP claims data and property appraisals for tax assessment purposes) to identify those structures where the substantial improvement ratios are obviously less than or greater than 50 percent (i.e., less than 40 percent or greater than 60 percent). For structures that fall in the 40 percent to 60 percent range, more precise market value estimates are sometimes necessary.

SUBSTANTIAL IMPROVEMENT EXAMPLES

Example 1. Minor rehabilitation

A rehabilitation is defined as an improvement made to an existing structure which does not affect the external dimensions of the structure.

If the cost of the rehabilitation is less than 50 percent of the structure's market value, the building does not have to be elevated or otherwise protected. However, it is advisable to incorporate methods to reduce flood damage, such as use of flood-resistant materials and installation of electrical, heating and air conditioning units above the BFE.

Figure 8-2 shows a building that had a small rehabilitation project. Central air conditioning was installed and the electrical system was upgraded. The value of the building before the project was $60,000. The value of the project was $12,000:

$\frac{\$12,000}{\$60,000}$ = 0.2 (20 percent)	The project costs less than 50 percent of the building, so this is not a substantial improvement.

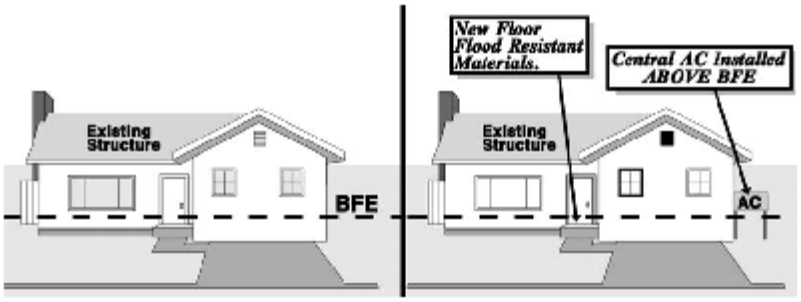


Figure 8-2. Minor rehabilitations use flood-resistant methods and materials

Neither structure would benefit from post-FIRM flood insurance rates because they are not elevated.

Note: To gauge what happens to flood insurance premiums if a substantially improved building is not brought up to post-FIRM standards, see Figures 7-7 through 7-12.

Example 2. Substantial rehabilitation

If the rehab costs more than 50 percent of the value of the building, your ordinance requires that an existing structure be elevated and/or the basement filled to meet the elevation standard.

Figure 8-3 shows a building that has been allowed to run down. It's market value is $35,000. To rehab it will require gutting the interior and replacing all wallboard, built-in cabinets, bathroom fixtures and furnace. The interior doors and flooring will be repaired. The house will get new siding and a new roof. The cost of this rehab will be $25,000:

$\frac{\$25,000}{\$35,000} = 71.4$ percent

Because total cost of the project is greater than 50 %the rehab is a substantial improvement

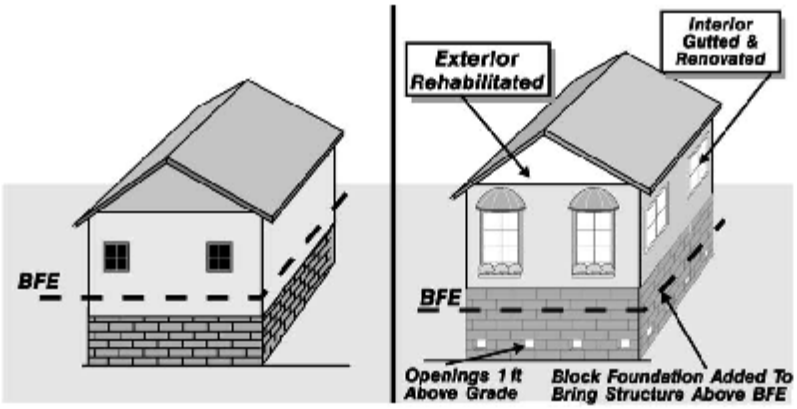


Figure 8-3. substantially rehabilitated building elevated above the BFE.

In A Zones, elevation may be on fill, crawlspace, columns, etc. In V Zones, only pilings, columns or other open foundations are allowed. The new structure would benefit from post-FIRM flood insurance rates.

Example 3. Lateral addition—residential

Additions are improvements that increase the square footage of a structure. Commonly, this includes the structural attachment of a bedroom, den, recreational room garage or other type of addition to an existing structure. Note that if one building is attached to another through a covered breezeway or similar connection, it is a separate building and not an addition.

When an addition is a substantial improvement, the addition must be elevated or floodproofed, providing that improvements to the *existing* structure are minimal. Figures 8-4 and 8-5 illustrate lateral additions that are compliant.

Depending on the flood zone and details of the project, the existing building may not have to be elevated. The determining factors are the common wall and what improvements are made to the existing structure. If the common wall is demolished as part of the project, then the entire structure must be elevated. If only a doorway is knocked through it and only minimal finishing is done, then only the addition has to be elevated.

In A Zones only, if significant improvements are made to the existing structure (such as a kitchen makeover), both it and the addition must be elevated and otherwise brought into compliance. Some states and many communities require that both the existing structure and lateral additions be elevated in all cases.

In V Zones, the existing structure always has to be elevated, placed on an engineered foundation system, etc., when an addition is proposed that constitutes a substantial improvement. This is due to the "free-of obstruction" standard whereby the lower existing structure would obstruct the storm surge, causing damage to the addition.

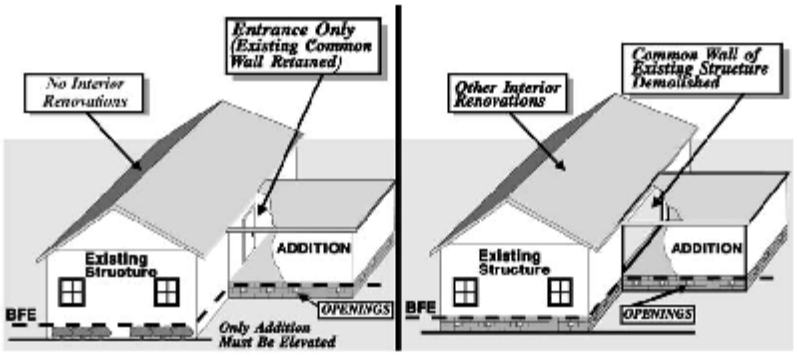


Figure 8-4. Lateral additions to a residential building in an A Zone.

In V Zones, the entire building must be elevated on pilings, columns or other open foundations. The

structure on the left would not benefit from post-FIRM flood insurance rates because it was not elevated.

Example 4. Lateral addition—nonresidential

A substantial improvement addition to a nonresidential building may be either elevated or floodproofed. Otherwise, all the criteria for residential buildings reviewed in Example 3 must be met.

If floodproofing is used, the builder must ensure that the wall between the addition and the original building is floodproofed. Floodproofing is not allowed as a construction measure in V Zones.

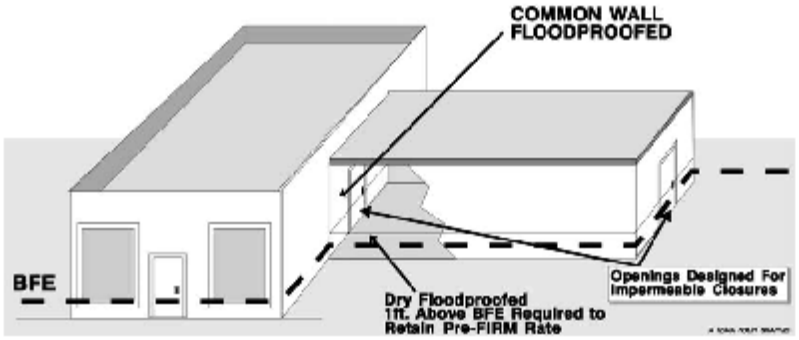


Figure 8-5. Lateral addition to a nonresidential building in an A Zone.

This approach is not allowed in V Zones. The structure would *not* benefit from post-FIRM flood insurance rates because the original building was not elevated or flood-proofed.

Example 5. Vertical addition—residential

When the proposed substantial improvement is a full or partial second floor, the entire structure must be elevated (Figure 8-6). In this instance, the existing building provides the foundation for the addition. Failure of the existing building would result in failure of the addition, too.

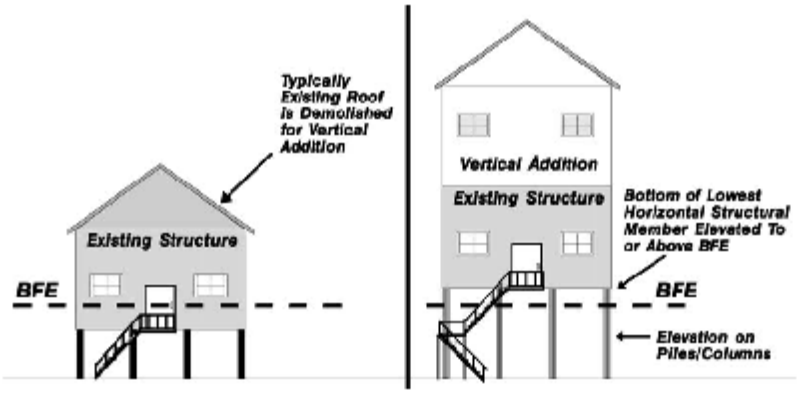


Figure 8-6. Vertical addition to a residential building in a V Zone.

The new structure would benefit from post-FIRM flood insurance rates.

Appendix E Lookback Period by Source of Identification

Table E-1. Lookback Periods by Source

Community Name	Final Lookback Period Indicator	Lookback Period Specified in Ordinances	Lookback Indicated in Flood Plain Manager Survey	Lookback Indicated in CRS Credit File
ALACHUA COUNTY	1	5	1	1
ALACHUA, CITY OF	0	None specified	0	0
ALFORD, TOWN OF	0	None specified	0	0
ALTAMONTE SPRINGS, CITY OF	0	None specified	0	0
ALTHA, TOWN OF	0	None specified	0	0
ANNA MARIA, CITY OF	1	1	0	0
APALACHICOLA, CITY OF	1	10	1	0
APOPKA, CITY OF	0	None specified	0	0
ARCADIA, CITY OF	1	None specified	1	0
ARCHER, CITY OF	0	None specified	0	0
ASTATULA, TOWN OF	0	None specified	0	0
ATLANTIC BEACH, CITY OF	0	None specified	0	0
ATLANTIS, CITY OF	0	None specified	0	0
AUBURNDALE, CITY OF	0	None specified	0	0
AVENTURA, CITY OF	1	5	0	0
AVON PARK, CITY OF	1	10	0	0
BAKER COUNTY	0	None specified	0	0
BAL HARBOUR VILLAGE, VILLAGE OF	0	None specified	0	0
BALDWIN, TOWN OF	0	None specified	0	0
BARTOW, CITY OF	0	None specified	0	0
BASCOM, TOWN OF	0	None specified	0	0
BAY COUNTY	1	10	1	1
BAY HARBOR ISLANDS, TOWN OF	0	None specified	0	0
BELLE GLADE, CITY OF	0	None specified	0	0
BELLE ISLE, CITY OF	0	None specified	0	0
BELLEAIR BEACH, CITY OF	1	5	0	0
BELLEAIR BLUFFS, CITY OF	0	None specified	0	0
BELLEAIR SHORE, TOWN OF	0	None specified	0	0
BELLEAIR, TOWN OF	1	5	0	0
BELLEVIEW, CITY OF	0	None specified	0	0
BEVERLY BEACH, TOWN OF	0	None specified	0	0
BISCAYNE PARK, VILLAGE OF	0	None specified	0	0
BLOUNTSTOWN,CITY OF	0	None specified	0	0

BOCA RATON, CITY OF	1	3	1	0
BONIFAY, CITY OF	0	None specified	0	0
BONITA SPRINGS, CITY OF	1	5	0	1
BOWLING GREEN, CITY OF	0	None specified	0	0
BOYNTON BEACH, CITY OF	0	None specified	0	0
BRADENTON BEACH, CITY OF	0	None specified	0	0
BRADENTON, CITY OF	1	None specified	1	0
BRADFORD COUNTY	0	None specified	0	0
BRANFORD, TOWN OF	0	None specified	0	0
BREVARD COUNTY	0	None specified	0	0
BRINY BREEZES, TOWN OF	0	None specified	0	0
BRISTOL, CITY OF	1	80	0	0
BRONSON, TOWN OF	0	None specified	0	0
BROOKER, TOWN OF	0	None specified	0	0
BROOKSVILLE, CITY OF	0	None specified	0	0
BROWARD COUNTY	0	None specified	0	0
BUNNELL, CITY OF	1	50	0	0
BUSHNELL, CITY OF	0	None specified	0	0
CALHOUN COUNTY	0	None specified	0	0
CALLAHAN, TOWN OF	0	None specified	0	0
CALLAWAY, CITY OF	1	Life of the building	0	0
CAMPBELLTON, TOWN OF	0	None specified	0	0
CAPE CANAVERAL PORT AUTHORITY	0	None specified	0	0
CAPE CANAVERAL, CITY OF	1	10	0	1
CAPE CORAL, CITY OF	0	None specified	0	0
CARRABELLE, CITY OF	1	1	1	0
CARYVILLE, TOWN OF	0	None specified	0	0
CASSELBERRY, CITY OF	0	None specified	0	0
CEDAR KEY, CITY OF	0	None specified	0	0
CENTER HILL, CITY OF	0	None specified	0	0
CENTURY, TOWN OF	0	None specified	0	0
CHARLOTTE COUNTY	0	None specified	0	0
CHATTAHOOCHEE, CITY OF	0	None specified	0	0
CHIEFLAND, CITY OF	0	None specified	0	0
CHIPLEY,CITY OF	0	None specified	0	0
CINCO BAYOU, TOWN OF	0	None specified	0	0
CITRUS COUNTY	0	None specified	0	0
CLAY COUNTY	0	None specified	0	0
CLEARWATER, CITY OF	1	5	0	0
CLERMONT, CITY OF	0	None specified	0	0
CLEWISTON, CITY OF	0	None specified	0	0

CLOUD LAKE, TOWN OF	1	None specified	1	0
COCOA BEACH, CITY OF	0	None specified	0	0
COCOA, CITY OF	0	None specified	0	0
COCONUT CREEK, CITY OF	1	None specified	1	0
COLEMAN, CITY OF	0	None specified	0	0
COLLIER COUNTY	0	None specified	0	0
COLUMBIA COUNTY	0	None specified	0	0
COOPER CITY, CITY OF	1	10	0	1
CORAL GABLES, CITY OF	1	5	0	0
CORAL SPRINGS, CITY OF	0	None specified	0	0
COTTONDALE, CITY OF	0	None specified	0	0
CRESCENT CITY, CITY OF	0	None specified	0	0
CRESTVIEW, CITY OF	1	2	0	0
CROSS CITY, TOWN OF	0	None specified	0	0
CRYSTAL RIVER, CITY OF	0	None specified	0	0
CUTLER BAY, TOWN OF	1	5	1	1
DADE CITY, CITY OF	0	None specified	0	0
DANIA BEACH, CITY OF	1	1	1	1
DAVENPORT, CITY OF	0	None specified	0	0
DAVIE, TOWN OF	0	None specified	0	0
DAYTONA BEACH SHORES, CITY OF	0	None specified	0	0
DAYTONA BEACH, CITY OF	1	5	0	0
DEBARY, CITY OF	0	None specified	0	0
DEERFIELD BEACH, CITY OF	0	None specified	0	0
DEFUNIAK SPRINGS, CITY OF	0	None specified	0	0
DELAND, CITY OF	0	None specified	0	0
DELRAY BEACH, CITY OF	0	None specified	0	0
DELTONA, CITY OF	1	None specified	1	0
DESOTO COUNTY	1	life of the building	0	0
DESTIN, CITY OF	1	10	0	1
DIXIE COUNTY	0	None specified	0	0
DORAL, CITY OF	1	5	1	1
DUNDEE, TOWN OF	0	None specified	0	0
DUNEDIN, CITY OF	1	5	0	1
DUNNELLON, CITY OF	0	None specified	0	0
EAGLE LAKE, CITY OF	0	None specified	0	0
EATONVILLE, TOWN OF	1	30	0	0
EBRO, TOWN OF	0	None specified	0	0
EDGEWATER, CITY OF	0	None specified	0	0
EDGEWOOD, CITY OF	0	None specified	0	0
EL PORTAL, VILLAGE OF	1	1	0	0

ESCAMBIA COUNTY	1	10	0	0
ESTERO, VILLAGE OF	1	None specified	0	1
ESTO, TOWN OF	0	None specified	0	0
EUSTIS, CITY OF	0	None specified	0	0
EVERGLADES CITY, CITY OF	0	None specified	0	0
FANNING SPRINGS, CITY OF	0	None specified	0	0
FELLSMERE, CITY OF	0	None specified	0	0
FERNANDINA BEACH, CITY OF	0	None specified	0	0
FLAGLER BEACH, CITY OF	0	None specified	0	0
FLAGLER COUNTY	1	5	1	0
FLORIDA CITY, CITY OF	1	10	0	0
FORT LAUDERDALE, CITY OF	1	2	1	0
FORT MEADE, CITY OF	1	10	0	0
FORT MYERS BEACH, TOWN OF	0	None specified	0	0
FORT MYERS, CITY OF	1	1	0	0
FORT PIERCE, CITY OF	0	None specified	0	0
FORT WALTON BEACH, CITY OF	0	None specified	0	0
FORT WHITE, TOWN OF	0	None specified	0	0
FRANKLIN COUNTY	1	1	0	0
FREEPORT, CITY OF	1	10	0	0
FROSTPROOF, CITY OF	1	life of a structure	0	0
FRUITLAND PARK, CITY OF	0	None specified	0	0
GADSDEN COUNTY	1	10	0	0
GAINESVILLE, CITY OF	0	None specified	0	0
GILCHRIST COUNTY	0	None specified	0	0
GLADES COUNTY	1	None specified	1	0
GLEN RIDGE, TOWN OF	0	None specified	0	0
GOLDEN BEACH, TOWN OF	1	10	1	0
GOLF, VILLAGE OF	0	None specified	0	0
GRACEVILLE, CITY OF	0	None specified	0	0
GRAND RIDGE, TOWN OF	0	None specified	0	0
GRANT-VALKARIA, TOWN OF	0	None specified	0	0
GREEN COVE SPRINGS, CITY OF	0	None specified	0	0
GREENACRES, CITY OF	1	5	0	0
GREENSBORO, TOWN OF	0	None specified	0	0
GREENVILLE, TOWN OF	0	None specified	0	0
GRETNA, CITY OF	0	None specified	0	0
GROVELAND, CITY OF	0	None specified	0	0
GULF BREEZE, CITY OF	1	5	0	1
GULF COUNTY	0	None specified	0	0
GULF STREAM, TOWN OF	0	None specified	0	0

GULFPORT, CITY OF	0	None specified	0	0
HAINES CITY, CITY OF	0	None specified	0	0
HALLANDALE BEACH, CITY OF	0	None specified	0	0
HAMILTON COUNTY	0	None specified	0	0
HAMPTON, CITY OF	1	10	0	0
HARDEE COUNTY	0	None specified	0	0
HAVANA, TOWN OF	1	10	0	0
HAVERHILL, TOWN OF	0	None specified	0	0
HAWTHORNE, CITY OF	0	None specified	0	0
HENDRY COUNTY	0	None specified	0	0
HERNANDO COUNTY	0	None specified	0	0
HIALEAH GARDENS, CITY OF	0	None specified	0	0
HIALEAH, CITY OF	1	5	0	1
HIGH SPRINGS, CITY OF	0	None specified	0	0
HIGHLAND BEACH, TOWN OF	1	None specified	1	0
HIGHLANDS COUNTY	1	10	1	0
HILLIARD, TOWN OF	0	None specified	0	0
HILLSBORO BEACH, TOWN OF	0	None specified	0	0
HILLSBOROUGH COUNTY	1	1	0	0
HOLLY HILL, CITY OF	0	None specified	0	0
HOLLYWOOD, CITY OF	1	5	1	1
HOLMES BEACH, CITY OF	1	1	0	0
HOLMES COUNTY	0	None specified	0	0
HOMESTEAD, CITY OF	0	None specified	0	0
HORSESHOE BEACH, TOWN OF	0	None specified	0	0
HOWEY IN THE HILLS, TOWN OF	0	None specified	0	0
HYPOLUXO, TOWN OF	1	10	1	0
INDIALANTIC, TOWN OF	0	None specified	0	0
INDIAN CREEK VILLAGE, VILLAGE OF	1	1	0	0
INDIAN HARBOR BEACH, CITY OF	0	None specified	0	0
INDIAN RIVER COUNTY	1	10	0	1
INDIAN RIVER SHORES, TOWN OF	1	None specified	1	0
INDIAN ROCKS BEACH, CITY OF	0	None specified	0	0
INDIAN SHORES, TOWN OF	1	10	1	1
INDIANTOWN, VILLAGE OF	0	None specified	0	0
INGLIS, TOWN OF	0	None specified	0	0
INTERLACHEN, TOWN OF	0	None specified	0	0
INVERNESS, CITY OF	0	None specified	0	0
ISLAMORADA, VILLAGE OF	0	None specified	0	0
JACKSON COUNTY	0	None specified	0	0
JACKSONVILLE BEACH, CITY OF	0	None specified	0	0

JACKSONVILLE, CITY OF	1	10	0	0
JASPER, CITY OF	0	None specified	0	0
JAY, TOWN OF	0	None specified	0	0
JEFFERSON COUNTY	0	None specified	0	0
JUNO BEACH, TOWN OF	1	10	0	1
JUPITER INLET COLONY, TOWN OF	1	5	0	0
JUPITER ISLAND, TOWN OF	0	None specified	0	0
JUPITER, TOWN OF	1	life of a structure	0	1
KENNETH CITY, TOWN OF	0	None specified	0	0
KEY BISCAYNE, VILLAGE OF	0	None specified	0	0
KEY COLONY BEACH, CITY OF	1	3	0	0
KEY WEST, CITY OF	1	1	0	1
KEYSTONE HEIGHTS, CITY OF	0	None specified	0	0
KISSIMMEE, CITY OF	0	None specified	0	0
LA CROSSE, TOWN OF	0	None specified	0	0
LABELLE,CITY OF	0	None specified	0	0
LADY LAKE, TOWN OF	1	3	0	0
LAFAYETTE COUNTY	0	None specified	0	0
LAKE ALFRED, CITY OF	0	None specified	0	0
LAKE BUTLER, CITY OF	0	None specified	0	0
LAKE CITY, CITY OF	0	None specified	0	0
LAKE CLARKE SHORES, TOWN OF	0	None specified	0	0
LAKE COUNTY	0	None specified	0	0
LAKE HAMILTON, TOWN OF	0	None specified	0	0
LAKE HELEN, CITY OF	0	None specified	0	0
LAKE MARY, CITY OF	1	10	0	1
LAKE PARK, TOWN OF	1	5	0	0
LAKE PLACID, TOWN OF	0	None specified	0	0
LAKE WALES, CITY OF	0	None specified	0	0
LAKE WORTH BEACH, CITY OF	0	None specified	0	0
LAKELAND, CITY OF	1	10	0	0
LANTANA, TOWN OF	0	None specified	0	0
LARGO, CITY OF	1	5	0	1
LAUDERDALE LAKES, CITY OF	0	None specified	0	0
LAUDERDALE-BY-THE-SEA, TOWN OF	0	None specified	0	0
LAUDERHILL, CITY OF	0	None specified	0	0
LAWTEY, CITY OF	0	None specified	0	0
LAYTON, CITY OF	1	None specified	0	1
LAZY LAKE, VILLAGE OF	0	None specified	0	0
LEE COUNTY	1	1	0	0
LEE, TOWN OF	0	None specified	0	0

LEESBURG, CITY OF	0	None specified	0	0
LEON COUNTY	1	10	1	1
LEVY COUNTY	1	5	1	0
LIBERTY COUNTY	1	80	0	0
LIGHTHOUSE POINT, CITY OF	0	None specified	0	0
LIVE OAK, CITY OF	0	None specified	0	0
LONGBOAT KEY, TOWN OF	1	10	0	1
LONGWOOD, CITY OF	1	1	0	0
LOXAHATCHEE GROVES, TOWN OF	0	None specified	0	0
LYNN HAVEN, CITY OF	0	None specified	0	0
MACCLENNY,CITY OF	0	None specified	0	0
MADEIRA BEACH, CITY OF	0	None specified	0	0
MADISON COUNTY	1	during the life of a structure.	0	0
MADISON, CITY OF	0	None specified	0	0
MAITLAND, CITY OF	0	None specified	0	0
MALABAR, TOWN OF	0	None specified	0	0
MALONE, TOWN OF	0	None specified	0	0
MANALAPAN, TOWN OF	0	None specified	0	0
MANATEE COUNTY	1	1	0	0
MANGONIA PARK, TOWN OF	0	None specified	0	0
MARATHON, CITY OF	1	1	1	0
MARCO ISLAND, CITY OF	1	1	1	1
MARGATE, CITY OF	0	None specified	0	0
MARIANNA, CITY OF	1	the life of the structure.	0	0
MARINELAND, TOWN OF	0	None specified	0	0
MARION COUNTY	0	None specified	0	0
MARTIN COUNTY	1	5	0	1
MARY ESTHER, CITY OF	0	None specified	0	0
MASCOTTE, CITY OF	0	None specified	0	0
MAYO, TOWN OF	0	None specified	0	0
MCINTOSH, TOWN OF	0	None specified	0	0
MEDLEY, TOWN OF	0	None specified	0	0
MELBOURNE BEACH, TOWN OF	0	None specified	0	0
MELBOURNE VILLAGE, TOWN OF	0	None specified	0	0
MELBOURNE, CITY OF	0	None specified	0	0
MEXICO BEACH, CITY OF	1	1	0	0
MIAMI BEACH, CITY OF	1	1	1	0
MIAMI GARDENS, CITY OF	1	0.5	0	0
MIAMI LAKES, TOWN OF	1	10	0	1
MIAMI SHORES VILLAGE, VILLAGE OF	1	1	0	0

MIAMI SPRINGS, CITY OF	1	the life of a building.	0	0
MIAMI, CITY OF	1	2	0	1
MIAMI-DADE COUNTY	1	5	0	0
MICANOPY, TOWN OF	0	None specified	0	0
MIDWAY, CITY OF	0	None specified	0	0
MILTON, CITY OF	0	None specified	0	0
MINNEOLA, CITY OF	0	None specified	0	0
MIRAMAR, CITY OF	0	None specified	0	0
MONROE COUNTY	0	None specified	0	0
MONTICELLO, CITY OF	0	None specified	0	0
MONTVERDE, TOWN OF	0	None specified	0	0
MOORE HAVEN, CITY OF	0	None specified	0	0
MT. DORA, CITY OF	0	None specified	0	0
MULBERRY, CITY OF	0	None specified	0	0
NAPLES, CITY OF	1	1	1	0
NASSAU COUNTY	0	None specified	0	0
NEPTUNE BEACH, CITY OF	1	5	1	0
NEW PORT RICHEY, CITY OF	1	5	1	1
NEW SMYRNA BEACH, CITY OF	1	10	0	1
NEWBERRY, CITY OF	0	None specified	0	0
NICEVILLE, CITY OF	0	None specified	0	0
NOMA, TOWN OF	0	None specified	0	0
NORTH BAY VILLAGE, CITY OF	1	10	0	1
NORTH LAUDERDALE, CITY OF	0	None specified	0	0
NORTH MIAMI BEACH, CITY OF	1	5	0	1
NORTH MIAMI, CITY OF	1	5	0	1
NORTH PALM BEACH, VILLAGE OF	0	None specified	0	0
NORTH PORT, CITY OF	1	5	1	0
NORTH REDINGTON BEACH, TOWN OF	0	None specified	0	0
OAK HILL, CITY OF	0	None specified	0	0
OAKLAND PARK, CITY OF	0	None specified	0	0
OAKLAND, TOWN OF	0	None specified	0	0
OCALA, CITY OF	1	1	0	0
OCEAN BREEZE, TOWN OF	0	None specified	0	0
OCEAN RIDGE, TOWN OF	1	Life of the building	0	1
OCOEE, CITY OF	0	None specified	0	0
OKALOOSA COUNTY	0	None specified	0	0
OKEECHOBEE COUNTY	0	None specified	0	0
OKEECHOBEE, CITY OF	0	None specified	0	0
OLDSMAR, CITY OF	1	15	0	0
OPA-LOCKA, CITY OF	0	None specified	0	0

ORANGE CITY, CITY OF	0	None specified	0	0
ORANGE COUNTY	1	Life of the building	1	1
ORANGE PARK, TOWN OF	0	None specified	0	0
ORCHID, TOWN OF	0	None specified	0	0
ORLANDO, CITY OF	0	None specified	0	0
ORMOND BEACH, CITY OF	1	5	1	1
OSCEOLA COUNTY	0	None specified	0	0
OTTER CREEK, TOWN OF	0	None specified	0	0
OVIEDO, CITY OF	1	10	0	1
PAHOKEE, CITY OF	1	3	0	0
PALATKA, CITY OF	0	None specified	0	0
PALM BAY, CITY OF	1	5	1	0
PALM BEACH COUNTY	1	5	0	1
PALM BEACH GARDENS, CITY OF	0	None specified	0	0
PALM BEACH SHORES, TOWN OF	0	None specified	0	0
PALM BEACH, TOWN OF	1	1	1	0
PALM COAST, CITY OF	1	10	1	1
PALM SHORES, TOWN OF	0	None specified	0	0
PALM SPRINGS, VILLAGE OF	1	None specified	0	1
PALMETTO BAY, VILLAGE OF	1	5	0	1
PALMETTO, CITY OF	1	1	0	0
PANAMA CITY BEACH, CITY OF	0	None specified	0	0
PANAMA CITY, CITY OF	1	10	0	1
PARKER, CITY OF	0	None specified	0	0
PARKLAND, CITY OF	1	None specified	1	0
PASCO COUNTY	1	1	0	0
PAXTON, TOWN OF	0	None specified	0	0
PEMBROKE PARK, TOWN OF	0	None specified	0	0
PEMBROKE PINES, CITY OF	1	10	0	1
PENNEY FARMS, TOWN OF	0	None specified	0	0
PENSACOLA BEACH-SANTA ROSA ISLANDAUTHORITY	1	None specified	1	1
PENSACOLA, CITY OF	0	None specified	0	0
PERRY, CITY OF	0	None specified	0	0
PIERSON, TOWN OF	0	None specified	0	0
PINECREST, VILLAGE OF	1	1	0	0
PINELLAS COUNTY	1	1	0	0
PINELLAS PARK, CITY OF	0	None specified	0	0
PLANT CITY, CITY OF	1	1	0	0
PLANTATION, CITY OF	1	5	0	1
POLK CITY, CITY OF	0	None specified	0	0

POLK COUNTY	1	10	1	0
POMONA PARK, TOWN OF	0	None specified	0	0
POMPANO BEACH, CITY OF	0	None specified	0	0
PONCE DE LEON, TOWN OF	0	None specified	0	0
PONCE INLET, TOWN OF	0	None specified	0	0
PORT ORANGE, CITY OF	1	5	1	1
PORT RICHEY, CITY OF	1	1	0	0
PORT ST JOE, CITY OF	0	None specified	0	0
PORT ST. LUCIE, CITY OF	1	Life of the building	0	1
PUNTA GORDA, CITY OF	1	None specified	0	1
PUTNAM COUNTY	0	None specified	0	0
QUINCY,CITY OF	1	Life of the building	0	0
REDINGTON BEACH, TOWN OF	0	None specified	0	0
REDINGTON SHORES, TOWN OF	1	1	0	1
RIVIERA BEACH, CITY OF	0	None specified	0	0
ROCKLEDGE, CITY OF	0	None specified	0	0
ROYAL PALM BEACH, VILLAGE OF	1	5	1	1
SAFETY HARBOR, CITY OF	1	1	0	0
SAN ANTONIO, CITY OF	0	None specified	0	0
SANFORD, CITY OF	0	None specified	0	0
SANIBEL, CITY OF	0	None specified	0	0
SANTA ROSA COUNTY	0	None specified	0	0
SARASOTA COUNTY	0	None specified	0	0
SARASOTA, CITY OF	0	None specified	0	0
SATELLITE BEACH, CITY OF	0	None specified	0	0
SEA RANCH LAKES, VILLAGE OF	0	None specified	0	0
SEBASTIAN, CITY OF	0	None specified	0	0
SEBRING, CITY OF	0	None specified	0	0
SEMINOLE COUNTY	1	5	0	1
SEMINOLE TRIBE OF FLORIDA	0	None specified	0	0
SEMINOLE, CITY OF	0	None specified	0	0
SEWALLS POINT, TOWN OF	0	None specified	0	0
SHALIMAR, TOWN OF	0	None specified	0	0
SNEADS,TOWN OF	1	10	1	0
SOPCHOPPY, CITY OF	0	None specified	0	0
SOUTH BAY, CITY OF	0	None specified	0	0
SOUTH DAYTONA, CITY OF	0	None specified	0	0
SOUTH MIAMI, CITY OF	0	None specified	0	0
SOUTH PALM BEACH, TOWN OF	0	None specified	0	0
SOUTH PASADENA, CITY OF	1	1	0	0
SOUTHWEST RANCHES, TOWN OF	0	None specified	0	0

SPRINGFIELD, CITY OF	0	None specified	0	0
ST. AUGUSTINE BEACH, CITY OF	0	None specified	0	0
ST. AUGUSTINE, CITY OF	0	None specified	0	0
ST. CLOUD, CITY OF	0	None specified	0	0
ST. JOHNS COUNTY	1	10	1	0
ST. LEO, TOWN OF	0	None specified	0	0
ST. LUCIE COUNTY	0	None specified	0	0
ST. LUCIE VILLAGE, TOWN OF	0	None specified	0	0
ST. MARKS, CITY OF	0	None specified	0	0
ST. PETE BEACH, CITY OF	1	5	0	0
ST. PETERSBURG, CITY OF	0	None specified	0	0
STARKE, CITY OF	1	10	0	0
STUART, CITY OF	0	None specified	0	0
SUMTER COUNTY	0	None specified	0	0
SUNNY ISLES BEACH, CITY OF	1	10	0	0
SUNRISE, CITY OF	0	None specified	0	0
SURFSIDE, TOWN OF	1	5	0	1
SUWANNEE COUNTY	0	None specified	0	0
SWEETWATER, CITY OF	0	None specified	0	0
TALLAHASSEE, CITY OF	0	None specified	0	0
TAMARAC, CITY OF	0	None specified	0	0
TAMPA, CITY OF	1	1	0	0
TARPON SPRINGS, CITY OF	0	None specified	0	0
TAVARES, CITY OF	0	None specified	0	0
TAYLOR COUNTY	0	None specified	0	0
TEMPLE TERRACE, CITY OF	0	None specified	0	0
TEQUESTA, VILLAGE OF	0	None specified	0	0
TITUSVILLE, CITY OF	1	5	1	1
TREASURE ISLAND, CITY OF	0	None specified	0	0
TRENTON, CITY OF	1	Life of the building	0	0
UMATILLA, CITY OF	0	None specified	0	0
UNION COUNTY	0	None specified	0	0
VALPARAISO, CITY OF	1	1	0	0
VENICE, CITY OF	1	1	0	0
VERNON, CITY OF	0	None specified	0	0
VERO BEACH, CITY OF	0	None specified	0	0
VIRGINIA GARDENS, VILLAGE OF	0	None specified	0	0
VOLUSIA COUNTY	1	5	0	1
WAKULLA COUNTY	0	None specified	0	0
WALDO, CITY OF	1	None specified	1	0
WALTON COUNTY	1	5	0	1

WASHINGTON COUNTY	0	None specified	0	0
WAUCHULA, CITY OF	0	None specified	0	0
WAUSAU, TOWN OF	0	None specified	0	0
WEBSTER, CITY OF	0	None specified	0	0
WELAKA, TOWN OF	0	None specified	0	0
WELLINGTON, VILLAGE OF	0	None specified	0	0
WEST MELBOURNE, CITY OF	0	None specified	0	0
WEST MIAMI, CITY OF	0	None specified	0	0
WEST PALM BEACH, CITY OF	1	5	1	1
WEST PARK, CITY OF	0	None specified	0	0
WESTLAKE, CITY OF	0	None specified	0	0
WESTON, CITY OF	0	None specified	0	0
WESTVILLE, TOWN OF	0	None specified	0	0
WEWAHITCHKA, CITY OF	0	None specified	0	0
WHITE SPRINGS, TOWN OF	0	None specified	0	0
WILDWOOD, CITY OF	0	None specified	0	0
WILLISTON, CITY OF	1	5	0	0
WILTON MANORS, CITY OF	0	None specified	0	0
WINDERMERE, TOWN OFF	1	10	0	0
WINTER GARDEN, CITY OF	1	10	0	0
WINTER HAVEN, CITY OF	1	10	0	0
WINTER PARK, CITY OF	1	10	0	0
WINTER SPRINGS, CITY OF	1	5	0	0
WORTHINGTON SPRINGS, TOWN OF	0	None specified	0	0
YANKEETOWN, TOWN OF	1	5	1	1
ZEPHYRHILLS, CITY OF	1	1	0	0
ZOLFO SPRINGS, TOWN OF	0	None specified	0	0

Appendix F Data Sources and Construction of Samples

In this Appendix, we discuss the sources of the data for our analysis and the methodologies applied to create the samples for our analysis.

F.1 List of NFIP communities in Florida

The NFIP Community Layer Comprehensive dataset, sourced from the OpenFEMA website[46], provides extensive information on the NFIP communities within Florida. The dataset enables linking the NFIP communities to specific geographic and administrative entities by tying Community ID numbers (CIDs) to counties, places, and unique areas such as tribal lands and Special Land Use Areas (SLUAs).

After filtering for Florida-based communities, the dataset consists of 1,045 records, including both assigned and unassigned Community IDs. Since the Community ID is essential for linking specific communities to NFIP data, records without a Community ID were dropped, reducing the dataset to 490 records.

Some communities, especially those identified as Census Places, SLUAs, or tribal lands, span multiple counties or geographic areas. This can result in multiple entries for the same CID, as a single community might intersect various administrative boundaries. For these instances, we drop duplicate records and ensure that the dataset retains only unique entries for each community. This process removed 9 additional records, leaving 481 unique communities. The distribution based in the geometry source is:

- *Census County*: Covers 66 county-level entries, representing larger administrative regions.
- *Census Place*: Comprises 411 place-level records, including municipalities like cities and towns.
- *NFHL (National Flood Hazard Layer)*: Includes 4 unique cases (3 SLUA and 1 Tribe), representing communities with distinct administrative status. These communities span multiple places or counties without direct alignment to Census geographies.

F.2 Community-level Flood Insurance Data

We construct community-level flood insurance data in 2023 from the OpenFEMA dataset[47], aggregating policy-level data across 451 NFIP communities. A primary filter was applied to retain only single-family homes, thus excluding non-residential and multi-family properties.

[46] https://www.fema.gov/openfema-data-page/nfip-community-layer-comprehensive-v1
[47] https://www.fema.gov/openfema-data-page/fima-nfip-redacted-policies-v2

This dataset captures essential metrics, including total policy counts per community, average premium levels, and structure coverage limits, with each metric separately calculated for Special Flood Hazard Areas (SFHA) and non-SFHA zones. Additionally, the dataset includes CRS scores, which reflect each community's efforts to mitigate flood risk through resilience initiatives. By providing values for each key metric across both SFHA and non-SFHA zones, this dataset enables a detailed comparison of insurance dynamics and financial protections between higher and lower-risk areas, offering insight into the varied impacts of flood risk on insurance strategies across diverse communities.

Variables in the dataset include:

- Total number of policies per community.
- Number of policies within Special Flood Hazard Areas (SFHA).
- Number of policies outside SFHA.
- Average policy premium across all zones.
- Average policy premium within SFHA.
- Average policy premium outside SFHA.
- Average structure coverage limit across all zones.
- Average structure coverage limit within SFHA.
- Average structure coverage limit outside SFHA.
- CRS Credit Percentage used to rate all SFHA policies.
- CRS Credit Percentage used specifically to rate SFHA policies.
- CRS Credit Percentage used specifically to rate non-SFHA policies.

F.3 Lookback Period Data

We utilize the lookback period data at the community level. For the purpose of our analysis, we focus on the following two information.

- *Lookback Period Indicator*. This variable is equal to one if at least one of the following criteria are satisfied:
    - a community has a lookback period via ordinances.
    - Survey respondents indicated a lookback period in a community.
    - The CRS indicated credit for a lookback period (as defined by the variable csi11 = 20 or 40).
- *Lookback Period Length*. In our initial data collection, the distribution of lookback periods across communities shows significant variability. Among 468 communities in our initial data, a majority of communities, 69.44% (325 communities), have no specified lookback period. For communities that do specify a period, the lengths and terminology vary considerably. Among the specified periods, values range from 0.5 years (1 community, 0.21%) to as high as 80 years (2 communities, 0.43%). The most common finite period is 5 years, with 9.40% (44 communities) adopting this duration. Other notable durations include 10 years (40

communities, 8.55%) and 1 year (34 communities, 7.26%). Approximately 3.21% of communities (15 communities) specify their lookback period in terms tied to the lifespan of the property, using phrases such as "life of a structure" or "life of the building." These indefinite durations, though individually small in percentage, collectively represent a notable portion of the specified lookback periods.

F.3.1 Defining Lookback Periods in the Empirical Analysis

For communities with a specified lookback period, the length of these periods varies. In our final data set of 379 communities, a large portion, approximately 69.7% (264 communities), had no specified lookback period. For the remaining communities with a lookback period in place, there is significant variation in duration, with the periods ranging from as short as 0.5 years to as long as 80 years. A small subset of communities (1 community, or 0.26%) has lookback periods of 0.5 years, while the most common specified durations are 1 year (28 communities, or 7.4%), 5 years (35 communities, or 9.2%), and 10 years (31 communities, or 8.2%). Additionally, a few communities implement very long lookback periods, such as 50 years (1 community, 0.26%) and 80 years (1 community, 0.26%), or even describe the lookback period in terms of the "life of a structure" (2 communities, 0.53%).

Based on this observed variation in lookback periods, we categorize these communities in multiple ways to capture the different ways that communities might approach risk management. These categorizations allow for flexible analysis across short, moderate, and extended timeframes, enabling nuanced interpretations of community-level risk management strategies. Importantly, by employing these various categorizations, we are also able to check if our results are robust across different definitions of lookback periods, ensuring that the findings are not sensitive to a specific categorization approach.

The four versions of lookback period categorization include:

Version 1: A binary classification of lookback periods into (1) 5 years or less and (2) above 5 years.

Version 2: Another binary approach, dividing communities into those with (1) less than 5 years and (2) 5 years or more. Since the threshold of 5 years represents the largest group, this alternative categorization identifies whether the threshold of 5 years acts as a meaningful separator between different community risk management strategies.

Version 3: A three-level classification where communities are categorized as (1) 1 year or less, (2) 2-5 years, and (3) more than 5 years.

Version 4: Communities are grouped into four categories based on the length of the lookback period: (1) 1 year or less, (2) 2-5 years, (3) 6-10 years, and (4) above 10 years.

F.4 Housing Data

We collect the housing data from the 2023 Name – Address – Legal (NAL) files, which are part of the property tax data released by the Florida Department of Revenue (FDR) for each county. These files are comprehensive records that include essential parcel-level details for property assessment purposes, covering both residential and non-residential parcels. Every parcel of real property has a just value, the property's market value. A primary filter was applied to retain only single-family homes, thus excluding non-residential and multi-family properties. There are 5,874,831 single-family homes in 67 counties in 2023.

The NAL data provides information on key aspects of each parcel, including parcel identification, assessment values, physical characteristics, exemption values, and location details. Important metrics include:

- Parcel Identification: A unique identifier for each parcel, managed at the county level, allows for tracking and analyzing individual properties within each county.
- Land and Improvement Values: The dataset includes both the just (market) value and assessed value of the land and improvements (buildings), which are adjusted based on various state-level statutory guidelines.
- Use Codes and Strata: Parcels are categorized by use codes, classifying them as residential, commercial, industrial, or agricultural. Each category is further divided into strata, depending on factors like the number of residential units or business type, for more granular assessment and analysis.
- Exemption Details: The data specifies various property tax exemptions applied to parcels, such as homestead exemptions, senior citizen exemptions, and veteran exemptions, which affect the taxable value.
- Geographical Attributes: Location-specific information, including neighborhood and market area codes, township, and physical address, supports geographical analysis of property values and trends.
- Sales Information: For parcels sold in recent years, details about sale prices, dates, and qualification codes are provided to help track market trends and assess property turnover.

We calculated the following variables for our housing analysis.

- Property Value: We calculate the natural logarithm of just value to normalize the distribution of property values, which helps address potential skewness.

- Property Age and Squared Age: Property age was calculated as the difference between the current year (2023) and actual year built. Additionally, the squared term was created to capture potential non-linear effects of age on property value.
- Land and Living Area: We include land square footage and total living area. Squared terms for total living area and land square footage are also included to capture potential diminishing returns of property size variables on valuation.
- Improvement Quality Indicators: This variable represents the overall quality of the primary structure(s) on each property. Property appraisers classify improvement quality based on standardized guidelines, typically referencing sources such as the Marshall and Swift/Marshall Valuation Service or other appraisal manuals. The ratings are general, aiming to reflect an external "average" standard rather than a county-specific one. For analysis, improvement quality was categorized into three levels:
    1. Low Quality: Includes values of 2 or lower, capturing minimum or below-average quality structures.
    2. Mid Quality: Assigned to values of exactly 3, representing average quality.
    3. High Quality: Comprises values above 3, indicating above-average to superior-quality structures.
- Homestead Exemption Indicator: A binary variable was created, set to 1 if a parcel had a non-missing positive just value homestead, marking properties with homestead exemptions. This exemption reflects tax adjustments under Florida's "Save Our Homes" legislation, important for assessing property tax impacts.
- Renovation Indicators: Three indicators were constructed to capture recent renovations:
    1. Renovated in the past 1 year: Set to 1 if the parcel's effective year built (based on renovations) is in the past year, while the actual year built is beyond 1 year.
    2. Renovated in the past 3 years: Set to 1 if the parcel's effective year built (based on renovations) is within three years, while the actual year built is beyond three years.
    3. Renovated in the past 5 years: Set to 1 if the parcel's effective year built is within five years and the actual year built exceeds five years.

F.5 Census Data

We collect the 2022 American Community Survey (ACS) data 5-year estimates at the Census Places level. The raw data include 955 places in Florida. Amony these 955 places, there are 411 incorporated places and 544 census designated places (CDPs). The incorporated places are legally bounded entities while CDPs are statistical entities. Our focus is incorporated places as they are legally incorporated under state law, have a legally defined boundary, and an active functioning governmental structure. Examples of incorporated places include cities, towns, villages, etc.[48]

The dataset provides rich demographic and socioeconomic information. We filtered the data to include relevant variables for our analysis, including population counts, housing characteristics, income, and education levels. These variables together provide a comprehensive profile of each community's demographic, economic, and housing characteristics.

F.5.1 Geographic Identifiers

- FIPS: The Federal Information Processing Standard code uniquely identifies geographic areas
- QName: The name of the geographic area, corresponding to the FIPS code, for easy reference in reports and analyses.

F.5.2 Demographic Variables

- Population (log): The natural logarithm of the total population, providing a scaled measure of population size.
- Density (log): The natural logarithm of population density, calculated as the total population per square mile, capturing the intensity of population concentration.
- Average Household Size (log): The natural logarithm of the average household size, representing scaled household size.
- % Population Aged 65 or Above: The percentage of the population aged 65 and over, calculated as the sum of individuals in the 65-69, 70-74, and 75+ age brackets divided by the total population, measuring the proportion of senior residents.
- % White: The percentage of the population identifying as White, non-Hispanic, derived as the ratio of White individuals to the total population.
- % Married: The percentage of the population that is married, based on individuals living in married households.
- % College: The percentage of individuals aged 25+ with at least a college degree, indicating educational attainment.

[48] https://www.census.gov/content/dam/Census/data/developers/understandingplace.pdf

F.5.3 Economic Variables

- Median Household Income (log): The natural logarithm of median household income, representing a scaled income measure at the household level.
- Unemployment Rate: The unemployment rate, defined as the percentage of unemployed individuals within the labor force.
- Gini Index: The Gini index, a measure of income inequality in a community, where higher values indicate greater inequality.
- % Below Poverty Line: The percentage of the population living below the poverty line, indicating economic hardship.
- % with Health Insurance: The percentage of the population with health insurance coverage, reflecting access to health resources.

F.5.4 Housing Market Variables

- % Owner Occupied: The percentage of housing units that are owner-occupied, indicating homeownership prevalence.
- % Vacant: The percentage of housing units that are vacant, showing housing availability.
- Median House Age: The median age of housing units, capturing the general age of the housing stock.
- Median House Value (log): The natural logarithm of the median house value, providing a scaled property value measure.
- Median Gross Rent (log): The natural logarithm of median gross rent, a scaled measure of average rental costs.
- % Mortgage: The percentage of homeowners with a mortgage, indicating mortgage reliance among homeowners.
- % Owner Costs: Median monthly owner costs as a percentage of household income over the past year, capturing the affordability of housing costs relative to income.

F.6 Building Permit Data

We acquire building permit data provided by Dewey, a trusted data provider. The dataset, named Builty, is a unified source of building permit intelligence. It collects, enriches, and standardizes permit data from over 20,000 local jurisdictions across the United States, providing structured and comprehensive data for municipalities nationwide. The Builty permit data is queried specifically for building permits filed in Florida in 2023, ensuring consistency with the other datasets used in this analysis. The raw data includes 1,159,481 building permit observations.

There are several caveats to this analysis due the data matching and cleaning challenges. First, each jurisdiction reports data differently, making the reporting process inconsistent and challenging to clean, especially given the tight deadline of the project deliverables. Due to this limitation, we rely on the number of building permit observations scaled by population as our primary analysis outcome. Second, the match between jurisdiction and community ID is not perfect because of noise and inconsistencies in the data.

F.6.1 House-to-Flood Zone Mapping

The parcel-level shapefile data were sourced from the Florida Department of Revenue, providing detailed property-level information on parcels across all the 67 counties of Florida in 2023. The dataset includes a unique identifier for each parcel and attributes such as property assessments, land use, improvement quality, and other physical characteristics that can influence local housing values.

To enhance the dataset, we used Geographic Information Systems (GIS) to overlay each parcel's shapefile with the Flood Insurance Rate Map (FIRM). This overlay process was essential for identifying flood zone exposure at the parcel level, specifically highlighting flood zone types and extent of coverage. For each parcel, multiple observations were recorded depending on the number of flood zones intersecting with that parcel. There are 10,595,971 polygons in total. For each parcel-to-flood-zone match (i.e., polygons), we extract the following information from the FIRM:

- FLD_ZONE. Flood Zone. This is a flood zone designation. These zones are used by FEMA to designate the SFHAs and for insurance rating purposes. Acceptable values for this field are listed in the D_Zone table.
- SFHA_TF. Special Flood Hazard Area. If the area is within a SFHA this field would be true. This field will be true for any area coded as an A or V flood zone area. It should be false for any X or D flood areas. Acceptable values for this field are listed in the D_TrueFalse table.

For each parcel-to-flood-zone match (i.e., polygons), we create the following variables:

- Indicators for Flood Zone Presence and Type: The overlay allowed us to identify if a parcel was located in the Special Flood Hazard Area (SFHA) and specify the flood zone classification (e.g., A, AE, VE, X), which represents varying degrees of flood risk as defined by FEMA.
- Flood Zone Coverage Percentage: For each flood zone intersecting a parcel, we calculated the percentage of the parcel's area within that zone, enabling a proportional analysis of flood risk exposure.

Next, we aggregate the parcel-to-flood-zone matches and calculate the following variables at the parcel level.

- Special Flood Hazard Area Indicator: A binary variable was constructed based on the sfha_tf field to indicate parcels located within a Special Flood Hazard Area (SFHA), a high-risk flood category.
- Flood Zone Indicators: Each flood zone (e.g., A, AE, V, VE, X) was assigned an indicator variable to signify whether a parcel is located within that specific zone.
- Flood Zone Coverage Percentage: For parcels in multiple zones, cumulative percentages were calculated to reflect the total parcel area within each flood zone.

This GIS-driven approach facilitates a granular understanding of each parcel's flood risk exposure and forms the foundation for assessing the impact of flood zones on property valuation. We use the parcel-level variables in the analysis of flood zone impacts on flood insurance take-up and housing value.

F.6.2 House-to-Community Mapping

Mapping parcels to NFIP communities presents several challenges. As described earlier, NFIP communities can be either incorporated places, such as cities and towns, or entire counties, which means a single parcel may align with multiple Census Geoids. Furthermore, some communities, like Special Land Use Areas (SLUAs) and tribal lands, don't align neatly with Census-defined areas and may span several counties or geographic regions. These factors introduce potential duplication for Community Identification Numbers (CIDs) if a single NFIP community intersects multiple administrative boundaries.

To map parcels to NFIP communities, we developed a multi-method approach that tackles the complexities associated with varying community definitions and boundary overlaps. We prioritized the alignment of Census Places to NFIP communities, guided by literature insights, particularly Gallagher (2014), which confirms that NFIP community boundaries generally align with Census Place definitions. This alignment provides a reliable foundation for mapping, though unique areas like SLUAs and tribal lands required additional methods. Our strategy included three methods, each offering a unique perspective to ensure all parcels were accurately assigned to their NFIP communities.

Method 1: Mapping Parcels to Census Places

The first method used Census Place data as a foundation for NFIP community assignments:

1. Data Preparation: Using the American Community Survey (ACS) 2022, we identified 955 places in Florida, comprising 411 legally defined places (incorporated areas) and 544 Census-designated places (CDPs).
2. Community Layer Matching: With the NFIP Community Layer, we filtered for Florida-specific communities and identified 481 Census Place matches, including both incorporated and designated places. These matches were assigned directly to parcels that lay within these Census Place boundaries.

3. Data Processing: For each parcel, we used QGIS to overlay, for each county, the parcel-level shapefiles with the community shapefiles from NFIP. This step ensured each parcel had an initial community assignment based on geographic overlay with Census Places, thus providing a base layer of community information.

Method 2: Mapping Parcels to NFIP Communities Using QGIS

In this approach, we used QGIS to overlay each county's parcel shapefiles directly onto the NFIP community boundary shapefiles. This method was essential for achieving accurate parcel-to-community mappings, particularly due to unique cases like Special Land Use Areas (SLUA) and tribal lands. These areas do not always correspond directly to Census Places, making it challenging to capture them using standard place-to-community matching. In addition, this approach was critical for accurately mapping parcels to NFIP communities in cases where parcels spanned multiple community boundaries or where the boundaries didn't align perfectly with Census Places.

Using QGIS, we loaded each county's parcel shapefile along with the NFIP community boundary shapefile. By overlaying these shapefiles, we could identify the precise location of each parcel relative to the NFIP-defined community boundaries.

Method 3: Geocoding with Latitude and Longitude Matching

The third method involved geocoding each parcel to generate precise latitude and longitude coordinates, which were then used to match parcels to NFIP communities based on geographic location. This approach was useful for parcels where boundary data was inconsistent or incomplete.

We first obtained latitude and longitude coordinates for each parcel using Python scripts. With the coordinates available, we used NFIP community shapefiles to perform a spatial join, mapping parcels to their corresponding communities. Each county's parcels were processed separately, and a text file was generated for each county with columns for parcelno (parcel ID) and cis_cid (community ID).

Final Data Aggregation

After executing each mapping method, we consolidated the data into one comprehensive dataset. We prioritized Census Place matches from Method 1 as the primary assignment, followed by QGIS-derived community matches from Method 2 for unmatched places and NFHL-based matches for SLUA and tribal areas. Method 3 was then used to complete the mapping of any remaining unmatched records. This approach ensured each parcel was matched to only one community, effectively resolving overlaps across methods.

F.6.3 Distance to the coastline

We calculate the distance to the coastline for each community, which is relevant in understanding the varying impacts of flood risk and coastal dynamics across communities. We use QGIS and

leverage coastline data available from OpenStreetMap (OSM) through the QuickOSM plugin. The process involved the following steps:

1. Loading Coastline Data: Using the QuickOSM plugin in QGIS, we download and load coastline features. In the QuickOSM dialog, we set the key to natural and the value to coastline within the area of interest, which produced a layer of coastline geometries.

2. Coordinate System Matching: To ensure accurate distance measurements, we verify that both our community (place) shapefile and coastline layer used compatible coordinate systems. The coastline layer is in EPSG:4326 (WGS 84), a global standard, while the place layer is in EPSG:4269 (NAD83). We reproject the place layer to EPSG:4326 to align with the coastline layer.

3. Calculating Distances: With the data aligned, we use the "Distance to Nearest Hub (points)" tool from the QGIS Processing Toolbox. In this setup, the community shapefile is set as the input layer, and the coastline layer served as the "hub" layer. By specifying miles as the output distance unit, the tool calculates the shortest distance from each community point to the nearest point along the coastline.

We calculate the following variable as one proxy for risk exposure.

- Distance to Coast in Miles (log): The natural logarithm of the distance from the centroid of the place to the nearest coast in miles, a proxy for flood risk and proximity to coastal areas.

F.7 Community-level Sample Construction

The community-level dataset provides a uniquely comprehensive foundation for analyzing the effects of lookback periods on community resilience, insurance uptake, premium variations, and property values. Integrating parcel-level flood zone mappings, community-level flood insurance metrics, and socio-demographic data, this sample captures the nuanced interactions between flood risk, policy measures, and market responses. This multi-source framework offers a detailed view into community-specific impacts of flood exposure, housing stock characteristics, socio-economic factors, and resilience initiatives. Additionally, the dataset's richness supports rigorous cost-benefit analyses, enabling assessments of the financial impacts associated with insurance policies and resilience investments. This layered perspective is critical for informing flood insurance policy and evaluating the long-term value of flood plain management strategies, advancing an evidence-based approach to community resilience and risk mitigation.

After merging the datasets as detailed in the Data Section and creating the variables as outlined in the Geocoding and Mapping Section, our final sample consists of 379 communities, of which 128 have a lookback period indicator equals to one. Among those 128 communities, 115 have a specified lookback period.

We summarize the data aggregation below:

(1) 490 communities are collected from the NFIP Community Layer Comprehensive dataset 2023.
(2) 451 communities are collected from the community-level flood insurance data in 2023 from the OpenFEMA dataset.
(3) After merging (1) and (2), we obtain 450 communities, in which 381 are incorporated places.
(4) After merging the 381 incorporated places with the American Community Survey (ACS) 2022, 5-year estimates, at the Census Places level, we obtain 379 communities.
(5) Among these 379 communities, 128 communities have a lookback period indicator = 1 because they have at least one of the following criteria are satisfied:
    i. a community has a lookback period via ordinances.
    ii. Survey respondents indicated a lookback period in a community.
    iii. The CRS indicated credit for a lookback period (as defined by the variable csi11 = 20 or 40).
(6) Among these 128 communities, 115 communities specify the length of their lookback period in their ordinances.

Table F-1 presents summary statistics for all communities in the merged sample. About 34% of the communities in the sample have a specified lookback period, as indicated by the mean of the lookback period indicator (0.34). This suggests a significant portion of communities incorporate this policy. On average, 27% of single-family residences (SFRs) are located in Special Flood Hazard Areas (SFHAs), with a wide range across communities (standard deviation of 32%). The median percentage of SFRs in SFHAs is 12%. Communities are, on average, 25.49 miles from the coast, with significant variation (standard deviation of 26.37 miles).

The average community population is 28,673, but the distribution is skewed, as evidenced by a median population of 7,252. Average household size is 2.45, and 25% of the population is aged 65 or older. Communities are predominantly white (69%), with 47% of residents married and 51% holding a college degree. Median household income varies widely, with a mean of $73,019 and a standard deviation of $34,614. The unemployment rate averages 5%, and the poverty rate averages 10%. Communities have a moderate level of income inequality, as measured by a mean Gini index of 0.46. Median house values average $374,465, while median gross rent is $1,409. Median house age is approximately 41 years. About 68% of homes are owner-occupied, while 20% are vacant.

The take-up rate for flood insurance across all SFRs is 21%, with a higher rate of 37% in SFHAs and a significantly lower rate of 12% outside SFHAs. Premiums relative to house value are

generally low, with higher premiums observed in SFHAs (mean of 0.04) compared to non-SFHAs (mean of 0.01). Average property values (mean of just value) are higher in SFHAs ($679,551) compared to non-SFHAs ($501,505). The substantial variation in property values, as indicated by standard deviations exceeding $500,000, reflects the diverse economic and housing conditions across the sample.

In Table F-2, we compare communities with and without a lookback period across several key demographic, economic, and housing variables. Communities with a lookback period tend to have a higher percentage of single-family residences (SFRs) located within Special Flood Hazard Areas (SFHAs) on average (0.36) compared to those without a lookback period (0.22). Additionally, these communities are generally closer to the coast, with a median distance of approximately 5 miles, whereas communities without a lookback period have a greater median distance from the coast (approximately 23.8 miles).

In terms of population characteristics, communities with a lookback period tend to be larger, with an average population of about 47,426 compared to 19,111 for communities without a lookback period. They also have higher population density on average (3,267 people per square mile vs. 2,329 for communities without a lookback period). Economic characteristics reveal that communities with a lookback period tend to have a higher median household income, with a mean of $78,178 compared to $70,378 in communities without such a policy. Additionally, communities with a lookback period have higher median house values, with a mean of approximately $443,505, which is notably higher than the mean of $338,832 in communities without a lookback period. Housing costs, measured by % Owner Costs and median gross rent, are also higher in communities with a lookback period, suggesting that these areas may have a higher cost of living.

The table also indicates that insurance take-up rates are higher in communities with a lookback period. Specifically, the take-up rate for SFRs in SFHAs is notably higher at 0.47 in these communities, compared to 0.32 in communities without a lookback period. This trend extends to non-SFHA areas as well, where the take-up rate is 0.15 in communities with a lookback period, compared to 0.11 in those without. These differences suggest that communities with a lookback period may have greater awareness of or responsiveness to flood risks, as reflected in higher insurance participation rates.

Overall, the comparison in Table F-2suggests that communities with a lookback period tend to be wealthier, more densely populated, and more proactive in managing flood risks through higher insurance take-up rates. These communities are also typically closer to coastal areas, where flood risks might be perceived as more pressing, thus motivating the adoption of longer lookback periods for risk management.

F.8 Parcel-level Sample Construction

We incorporate parcel-level data to enable a more granular analysis. The parcel-level data helps enhance our analysis of the impact of lookback periods on housing values by examining property-specific characteristics that may influence valuation, as the data covers essential details like just value, land and improvement values, tax exemption status, and geographical attributes for individual properties across Florida's 67 counties. This granularity allows us to control for property-level factors, such as property age, land and living area sizes, improvement quality, homestead exemption status, and recent renovations, which could impact housing values independently of community-level policies. This parcel-based approach thus enables a nuanced examination of whether and how the presence and length of lookback periods affect property values, offering insights into localized effects that might otherwise be obscured in broader community-level analysis.

After excluding observations with missing location and housing attributes, as well as incomplete control variables, our final sample includes 2,746,870 single-family residences across the 379 communities. Of these, 1,416,389 homes are situated in the 115 communities that have a lookback period.

Table F-1. Descriptive Statistics for All Communities in the Merged Sample

	Mean	Standard Deviation	25th Percentile	Median	75th Percentile	N
Lookback Period Indicator	0.34	0.47	0.00	0.00	1.00	379
% SFR in SFHA	0.27	0.32	0.05	0.12	0.35	379
Distance to Coast (Miles)	25.49	26.37	2.71	13.53	45.18	379
Population	28,673	68,695	2,162	7,252	27,427	379
Density	2,645	2,900	782	1,683	3,677	379
Average Household Size	2.45	0.44	2.16	2.40	2.73	379
% Population Aged 65 or Above	0.25	0.13	0.16	0.21	0.30	379
% While	0.69	0.20	0.55	0.72	0.85	379
% Married	0.47	0.12	0.40	0.46	0.56	379
% College	0.51	0.32	0.26	0.46	0.73	379
Median Household Income ($)	73,019	34,614	50,537	64,988	84,667	375
Unemployment Rate	0.05	0.04	0.03	0.04	0.06	379
Gini Index	0.46	0.07	0.41	0.45	0.50	379
% Below Poverty Line	0.10	0.08	0.05	0.08	0.14	379
% with Health Insurance	0.49	0.31	0.29	0.45	0.62	379
% Owner Occupied	0.68	0.16	0.58	0.69	0.79	379
% Vacant	0.20	0.15	0.10	0.15	0.22	379
Median House Age	40.84	11.35	34.00	42.00	48.00	379
Median House Value ($)	374,465	337,621	194,299	283,350	427,750	376
Median Gross Rent ($)	1,409	517	1,023	1,372	1,682	361

% Mortgage	0.51	0.15	0.41	0.52	0.61	379
% Owner Costs	18.74	4.59	16.20	18.20	20.90	379
Take-up Rate: All SFRs	0.21	0.24	0.02	0.10	0.31	379
Take-up Rate: SFRs in SFHA	0.37	0.27	0.13	0.33	0.58	370
Take-up Rate: SFRs in Non-SFHA	0.12	0.22	0.01	0.04	0.13	357
Premium / House Value	0.00	0.00	0.00	0.00	0.00	379
Premium / House Value in SFHA	0.04	0.11	0.00	0.01	0.03	343
Premium / House Value in Non-SFHA	0.01	0.05	0.00	0.00	0.00	339
Mean of Just Value	556,303	540,312	232,035	364,599	663,489	379
Mean of Just Value in SFHA	679,551	596,173	291,474	449,860	913,150	379
Mean of Just Value in Non-SFHA	501,505	528,445	220,991	328,642	521,567	379

Table F-2. Community Characteristics by Lookback Period Status

	With Lookback Period			Without Lookback Period		
	Mean	**Median**	**N**	**Mean**	**Median**	**N**
% SFR in SFHA	0.22	0.09	251	0.36	0.18	128
Distance to Coast (Miles)	28.72	23.75	251	19.16	5.01	128
Population	19,110	5,373	251	47,426	16,689	128
Density	2,329	1,388	251	3,267	2,236	128
Average Household Size	2.48	2.41	251	2.40	2.38	128
% Population Aged 65 or Above	0.24	0.22	251	0.26	0.21	128
% While	0.69	0.73	251	0.69	0.70	128
% Married	0.47	0.46	251	0.48	0.47	128
% College	0.47	0.41	251	0.59	0.52	128
Median Household Income ($)	70,377	63,798	248	78,178	68,824	127
Unemployment Rate	0.05	0.05	251	0.05	0.04	128
Gini Index	0.45	0.44	251	0.48	0.47	128
% Below Poverty Line	0.11	0.09	251	0.09	0.07	128
% with Health Insurance	0.50	0.45	251	0.46	0.42	128
% Owner Occupied	0.69	0.70	251	0.67	0.66	128
% Vacant	0.19	0.15	251	0.21	0.16	128
Median House Age	40.51	42.00	251	41.48	41.00	128
Median House Value ($)	338,832	261,800	248	443,504	326,549	128
Median Gross Rent ($)	1,329	1,298	235	1,560	1,512	126
% Mortgage	0.50	0.52	251	0.51	0.53	128
% Owner Costs	18.25	17.80	251	19.69	18.80	128
Take-up Rate: All SFRs	0.17	0.06	251	0.28	0.18	128
Take-up Rate: SFRs in SFHA	0.32	0.26	242	0.47	0.47	128
Take-up Rate: SFRs in Non-SFHA	0.11	0.03	239	0.15	0.08	118
Premium / House Value	0.00	0.00	251	0.00	0.00	128
Premium / House Value in SFHA	0.04	0.01	218	0.04	0.01	125
Premium / House Value in Non-SFHA	0.01	0.00	224	0.01	0.00	115
Mean of Just Value	480,292	317,288	251	705,356	489,946	128
Mean of Just Value in SFHA	605,296	388,579	242	819,938	593,843	128
Mean of Just Value in Non-SFHA	420,659	293,369	239	665,251	412,541	118

Table F-3. Sample Statistics - All Communities

Variable	Obs.	Mean	Standard Deviation
Take-up Rate	448	19.88	23.62
Take-up Rate SFHA	438	37.86	37.40
CRS Participation Indicator	468	0.52	0.50
CRS Class	468	8.14	2.02
Lookback Period Indicator	468	0.34	0.47

Appendix G Results of Empirical Analysis

Table G-1. Regression Analysis of Take-up Rates

	All Florida Communities		CRS Communities	
Variable	**(1)**	**(2)**	**(3)**	**(4)**
CRS Class	-4.211*** (0.514)	-3.904*** (0.551)	-0.509 (1.201)	-0.281 (1.235)
Lookback Period? (Y/N)		3.613 (2.337)		2.643 (3.256)
Adj. R^2	0.129	0.131	-0.003	-0.005
N	448	448	244	244

Table G-2. CRS Credit Points and Flood Insurance Take-up Rate

Dependent Variable: Take-up Rate	All SFRs		SFRs in SFHA		SFRs in Non-SFHA	
	(1)	(2)	(3)	(4)	(5)	(6)
Class 1 – 5	0.21***	0.06***	0.31***	0.15***	0.10**	-0.02
	(0.04)	(0.02)	(0.04)	(0.05)	(0.04)	(0.05)
Class 6 – 9	0.23***	0.04***	0.28***	0.10***	0.10***	-0.02
	(0.02)	(0.01)	(0.03)	(0.03)	(0.02)	(0.05)
% SFR in SFHA		0.46***		0.15***		0.29***
		(0.03)		(0.06)		(0.10)
Distance to Coast in Miles		0.01		-0.04***		0.02***
		(0.00)		(0.01)		(0.01)
Population (log)		-0.01***		-0.01		-0.01
		(0.00)		(0.01)		(0.01)
Density (log)		0.01**		0.03*		0.02*
		(0.01)		(0.02)		(0.01)
Average Household Size (log)		-0.01		0.13		-0.36*
		(0.05)		(0.12)		(0.20)
% Population Aged 65 or Above		0.06		0.18		-0.39*
		(0.09)		(0.18)		(0.21)
% While		0.05		0.16**		0.02
		(0.04)		(0.08)		(0.05)
% Married		0.16**		0.00		-0.01
		(0.08)		(0.20)		(0.17)
% College		0.06		0.14		0.04
		(0.04)		(0.10)		(0.07)
Median Household Income (log)		0.03		-0.10		0.04
		(0.04)		(0.11)		(0.07)
Unemployment Rate		-0.03		-0.23		0.01
		(0.15)		(0.31)		(0.20)
Gini Index		0.24**		-0.04		0.19
		(0.11)		(0.25)		(0.18)
% Below Poverty Line		0.01		0.12		-0.20
		(0.11)		(0.22)		(0.18)
% with Health Insurance		0.00		0.04		0.02
		(0.02)		(0.04)		(0.03)
% Owner Occupied		-0.07		-0.10		0.07
		(0.05)		(0.12)		(0.09)
% Vacant		0.04		-0.10		0.04
		(0.06)		(0.12)		(0.14)
Median House Age		0.00		0.00		0.00
		(0.00)		(0.00)		(0.00)
Median House Value (log)		0.04*		0.11**		0.04
		(0.02)		(0.05)		(0.04)
Median Gross Rent (log)		0.01		0.02		0.08*
		(0.03)		(0.05)		(0.04)
% Mortgage		-0.12*		-0.11		-0.21*
		(0.07)		(0.14)		(0.11)
% Owner Costs		0.00**		0.00		0.00
		(0.00)		(0.00)		(0.00)
Constant	0.09***	-1.17***	0.22***	-0.46	0.08***	-1.30**
	(0.01)	(0.39)	(0.02)	(0.93)	(0.02)	(0.57)
F	51.06***	102.94***	69.50***	35.90***	9.29***	9.78***
r2	0.21	0.88	0.27	0.59	0.05	0.48
N	379.00	359.00	370.00	351.00	357.00	339.00

Note: Standard errors in parentheses. The symbols *, **, and *** indicate significance at the 90%, 95%, and 99%, respectively.

Table G-3. Lookback Period and Flood Insurance Take-up Rate

Dependent Variable: Take-Up Rate	All SFRs		SFRs in SFHA		SFRs in Non-SFHA	
	(1)	(2)	(3)	(4)	(5)	(6)
Lookback Period Indicator	0.11***	0.00	0.15***	0.02	0.04	-0.03
	(0.03)	(0.01)	(0.03)	(0.02)	(0.02)	(0.02)
% SFR in SFHA		0.48***		0.17***		0.29***
		(0.03)		(0.06)		(0.10)
Distance to Coast in Miles		0.00		-0.04***		0.02***
		(0.01)		(0.01)		(0.01)
Population (log)		-0.00		0.01		-0.01
		(0.00)		(0.01)		(0.01)
Density (log)		0.01*		0.03*		0.02
		(0.01)		(0.02)		(0.01)
Average Household Size (log)		-0.01		0.14		-0.36*
		(0.06)		(0.13)		(0.20)
% Population Aged 65 or Above		0.05		0.17		-0.39*
		(0.09)		(0.18)		(0.20)
% While		0.06		0.19**		0.02
		(0.04)		(0.08)		(0.06)
% Married		0.16*		-0.01		-0.02
		(0.08)		(0.20)		(0.17)
% College		0.07*		0.15		0.03
		(0.04)		(0.10)		(0.07)
Median Household Income (log)		0.03		-0.12		0.04
		(0.04)		(0.11)		(0.07)
Unemployment Rate		-0.02		-0.22		0.03
		(0.16)		(0.31)		(0.20)
Gini Index		0.24**		-0.04		0.19
		(0.11)		(0.25)		(0.18)
% Below Poverty Line		-0.05		-0.04		-0.16
		(0.11)		(0.22)		(0.17)
% with Health Insurance		0.01		0.05		0.02
		(0.02)		(0.04)		(0.03)
% Owner Occupied		-0.07		-0.11		0.08
		(0.05)		(0.12)		(0.09)
% Vacant		0.08		0.01		0.02
		(0.06)		(0.13)		(0.16)
Median House Age		0.00		0.00		0.00
		(0.00)		(0.00)		(0.00)
Median House Value (log)		0.04		0.11**		0.05
		(0.02)		(0.05)		(0.04)
Median Gross Rent (log)		0.02		0.04		0.08**
		(0.03)		(0.05)		(0.04)
% Mortgage		-0.12*		-0.10		-0.22**
		(0.07)		(0.15)		(0.11)
% Owner Costs		0.00**		0.00		0.00
		(0.00)		(0.00)		(0.00)
Constant	0.17***	-1.18***	0.32***	-0.46	0.11***	-1.34**
	(0.01)	(0.39)	(0.02)	(0.93)	(0.01)	(0.58)
F-stat	17.62***	103.50***	26.74***	36.03***	2.30	8.70***
Adj. R2	0.05	0.88	0.07	0.58	0.01	0.48
N	379.00	359.00	370.00	351.00	357.00	339.00

Note: Standard errors in parentheses. The symbols *, **, and *** indicate significance at the 90%, 95%, and 99%, respectively.

Table G-4. Lookback Period Length on Flood Insurance Take-up Rate in Communities with Lookback Periods

Dependent Variable	Take-up Rate: All SFRs		Take-up Rate: All SFRs	
	(1)	(2)	(3)	(4)
Lookback Period: 2-5 Years	-0.14**	-0.00		
	(0.07)	(0.02)		
Lookback Period: More than 5 Years	-0.20***	-0.01		
	(0.07)	(0.03)		
Lookback Period: 2-5 Years			-0.14**	-0.01
			(0.07)	(0.02)
Lookback Period: 6-10 Years			-0.18**	-0.03
			(0.07)	(0.03)
Lookback Period: More than 10 Years			-0.23***	0.05*
			(0.08)	(0.03)
% SFR in SFHA		0.53***		0.52***
		(0.06)		(0.06)
Distance to Coast in Miles		0.01		0.01
		(0.01)		(0.01)
Population (log)		0.00		-0.00
		(0.01)		(0.01)
Density (log)		0.01		0.01
		(0.01)		(0.01)
Average Household Size (log)		-0.14		-0.15
		(0.14)		(0.14)
% Population Aged 65 or Above		0.06		0.01
		(0.19)		(0.18)
% While		0.09		0.08
		(0.10)		(0.10)
% Married		0.17		0.26
		(0.19)		(0.19)
% College		0.02		0.00
		(0.12)		(0.11)
Median Household Income (log)		0.17		0.17
		(0.13)		(0.12)
Unemployment Rate		0.11		0.21
		(0.30)		(0.32)
Gini Index		0.03		0.03
		(0.29)		(0.27)
% Below Poverty Line		-0.05		-0.12
		(0.31)		(0.28)
% with Health Insurance		0.18**		0.15*
		(0.08)		(0.08)
% Owner Occupied		-0.05		-0.11
		(0.17)		(0.16)
% Vacant		-0.16		-0.14
		(0.13)		(0.13)
Median House Age		-0.00		-0.00
		(0.00)		(0.00)
Median House Value (log)		0.07		0.06
		(0.07)		(0.07)
Median Gross Rent (log)		-0.10		-0.07
		(0.08)		(0.08)
% Mortgage		-0.26		-0.30
		(0.22)		(0.21)
% Owner Costs		0.01		0.01
		(0.01)		(0.01)
Constant	0.41***	-2.08**	0.41***	-2.20**
	(0.06)	(0.94)	(0.06)	(0.89)
F-stat	4.17**	67.62***	2.97**	74.60***
Adj. R2	0.08	0.90	0.09	0.91
N	115.00	113.00	115.00	113.00

Note: Standard errors in parentheses. The symbols *, **, and *** indicate significance at the 90%, 95%, and 99%, respectively.

Table G-5. Lookback Period Length and Flood Insurance Take-up Rate in Communities with Lookback Policies, by SFHA

Dependent Variable	Take-up Rate: SFRs in SFHA				Take-up Rate: SFRs in Non-SFHA			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lookback Period: 2-5 Years	-0.09	-0.04			-0.10	0.00		
	(0.06)	(0.05)			(0.06)	(0.04)		
Lookback Period: More than 5 Years	-0.21***	-0.05			-0.12*	-0.01		
	(0.06)	(0.06)			(0.06)	(0.04)		
Lookback Period: 2-5 Years			-0.09	-0.05			-0.10	-0.00
			(0.06)	(0.05)			(0.06)	(0.04)
Lookback Period: 6-10 Years			-0.22***	-0.10			-0.12*	-0.04
			(0.07)	(0.06)			(0.06)	(0.04)
Lookback Period: More than 10 Years			-0.19**	0.06			-0.12	0.05
			(0.09)	(0.05)			(0.08)	(0.05)
% SFR in SFHA		0.13		0.11		0.13		0.12
		(0.09)		(0.09)		(0.09)		(0.09)
Distance to Coast in Miles		-0.05***		-0.05***		0.02		0.02
		(0.02)		(0.02)		(0.01)		(0.01)
Population (log)		0.03		0.03		-0.00		-0.00
		(0.02)		(0.02)		(0.01)		(0.01)
Density (log)		-0.01		0.00		0.02		0.03
		(0.03)		(0.03)		(0.03)		(0.03)
Average Household Size (log)		0.40		0.38		-0.58**		-0.60***
		(0.34)		(0.34)		(0.22)		(0.22)
% Population Aged 65 or Above		0.31		0.22		-0.69*		-0.75**
		(0.32)		(0.32)		(0.37)		(0.36)
% While		0.39*		0.37*		0.04		0.02
		(0.22)		(0.22)		(0.12)		(0.12)
% Married		-0.01		0.16		0.18		0.27
		(0.38)		(0.37)		(0.22)		(0.22)
% College		0.24		0.21		0.03		0.00
		(0.26)		(0.24)		(0.18)		(0.18)
Median Household Income (log)		0.10		0.11		-0.01		0.01
		(0.23)		(0.21)		(0.20)		(0.19)
Unemployment Rate		0.35		0.54		0.22		0.33
		(0.58)		(0.64)		(0.41)		(0.39)
Gini Index		-0.89		-0.88		0.44		0.47
		(0.61)		(0.60)		(0.43)		(0.41)
% Below Poverty Line		-0.44		-0.56		-0.12		-0.21
		(0.47)		(0.44)		(0.52)		(0.50)
% with Health Insurance		0.21		0.15		0.20		0.17
		(0.15)		(0.16)		(0.14)		(0.13)
% Owner Occupied		-0.46		-0.58		0.18		0.12
		(0.38)		(0.38)		(0.20)		(0.18)
% Vacant		-0.14		-0.09		-0.08		-0.06
		(0.24)		(0.25)		(0.18)		(0.16)
Median House Age		0.00*		0.00*		-0.00		-0.00
		(0.00)		(0.00)		(0.00)		(0.00)
Median House Value (log)		0.06		0.05		0.16*		0.16
		(0.13)		(0.12)		(0.10)		(0.09)
Median Gross Rent (log)		-0.10		-0.04		-0.10		-0.06
		(0.13)		(0.13)		(0.11)		(0.11)
% Mortgage		-0.40		-0.47		-0.29		-0.34
		(0.36)		(0.34)		(0.28)		(0.26)
% Owner Costs		0.02		0.02		0.00		-0.00
		(0.01)		(0.01)		(0.01)		(0.01)
Constant	0.59***	-1.33	0.59***	-1.56	0.22***	-0.99	0.22***	-1.22
	(0.04)	(1.70)	(0.04)	(1.60)	(0.06)	(1.62)	(0.06)	(1.55)
F-stat	6.53***	13.18***	4.35***	13.93***	1.94	4.74***	1.37	5.11***
Adj. R2	0.10	0.62	0.10	0.64	0.06	0.55	0.06	0.57
N	115.00	113.00	115.00	113.00	106.00	104.00	106.00	104.00

Note: Standard errors in parentheses. The symbols *, **, and *** indicate significance at the 90%, 95%, and 99%, respectively.

Table G-6. CRS credit points and Flood Insurance Premiums

Dependent Variable: Premium to House Value	All SFRs		SFRs in SFHAs		SFRs in Non-SFHAs	
	(1)	(2)	(3)	(4)	(5)	(6)
Class 1 – 5	-0.33***	0.12	-1.07***	-0.25	0.09	0.09
	(0.09)	(0.07)	(0.21)	(0.16)	(0.25)	(0.11)
Class 6 – 9	-0.34***	0.05	-1.29***	-0.20*	0.02	-0.02
	(0.07)	(0.05)	(0.16)	(0.12)	(0.11)	(0.10)
% SFR in SFHA		0.30***		-2.73***		3.30***
		(0.10)		(0.19)		(0.30)
Distance to Coast in Miles		-0.10***		-0.10**		0.01
		(0.02)		(0.04)		(0.02)
Population (log)		-0.02		-0.04		-0.04
		(0.02)		(0.04)		(0.03)
Density (log)		-0.05*		-0.10		-0.02
		(0.02)		(0.07)		(0.05)
Average Household Size (log)		-0.36		0.05		-0.49
		(0.25)		(0.50)		(0.42)
% Population Aged 65 or Above		-0.11		0.58		-0.02
		(0.33)		(0.62)		(0.73)
% While		0.34*		0.37		-0.22
		(0.19)		(0.38)		(0.21)
% Married		0.38		0.25		0.86
		(0.41)		(0.81)		(0.65)
% College		-0.09		0.43		-0.08
		(0.16)		(0.36)		(0.27)
Median Household Income (log)		-0.17		-0.59		-0.22
		(0.16)		(0.44)		(0.30)
Unemployment Rate		0.44		-0.85		-0.93
		(0.62)		(1.33)		(0.91)
Gini Index		-0.98**		-0.96		-0.18
		(0.43)		(1.01)		(0.70)
% Below Poverty Line		1.82***		1.26		0.51
		(0.45)		(1.15)		(0.76)
% with Health Insurance		-0.00		-0.54**		-0.03
		(0.10)		(0.22)		(0.11)
% Owner Occupied		-0.01		-1.00**		-0.39
		(0.21)		(0.44)		(0.41)
% Vacant		0.51**		1.36***		1.55***
		(0.24)		(0.48)		(0.55)
Median House Age		0.00*		-0.01		0.00
		(0.00)		(0.00)		(0.00)
Median House Value (log)		-0.46***		-0.60***		-0.65***

		(0.10)		(0.18)		(0.13)
Median Gross Rent (log)		-0.46***		-0.51**		-0.54**
		(0.09)		(0.21)		(0.24)
% Mortgage		1.01***		2.51***		2.01***
		(0.29)		(0.55)		(0.49)
% Owner Costs		-0.03***		-0.04**		-0.03**
		(0.01)		(0.02)		(0.01)
Constant	-6.10***	5.43***	-3.76***	15.61***	-6.06***	7.95***
	(0.05)	(1.35)	(0.12)	(3.67)	(0.05)	(2.57)
F	13.24***	43.27***	34.01***	45.83***	0.07	24.99***
r2	0.07	0.73	0.18	0.77	0.00	0.70
N	379.00	359.00	343.00	330.00	339.00	324.00

Note: Standard errors in parentheses. The symbols *, **, and *** indicate significance at the 90%, 95%, and 99%, respectively.

Table G-7. Lookback Period and Flood Insurance Premium

Dependent Variable:	Premium/House Value (log): All SFRs		Premium/House Value (log): SFRs in SFHA		Premium/House Value (log): SFRs in Non-SFHA	
	(1)	(2)	(3)	(4)	(5)	(6)
Lookback Period Indicator	-0.18***	0.02	-0.54***	0.09	0.02	-0.03
	(0.07)	(0.04)	(0.17)	(0.09)	(0.12)	(0.07)
% SFR in SFHA		0.31***		-2.78***		3.30***
		(0.10)		(0.19)		(0.29)
Distance to Coast in Miles		-0.11***		-0.08*		0.01
		(0.02)		(0.04)		(0.02)
Population (log)		-0.01		-0.08**		-0.03
		(0.02)		(0.04)		(0.02)
Density (log)		-0.05**		-0.09		-0.03
		(0.02)		(0.07)		(0.05)
Average Household Size (log)		-0.35		0.03		-0.48
		(0.25)		(0.50)		(0.42)
% Population Aged 65 or Above		-0.11		0.59		-0.00
		(0.32)		(0.61)		(0.72)
% While		0.37**		0.28		-0.20
		(0.19)		(0.38)		(0.21)
% Married		0.37		0.31		0.80
		(0.40)		(0.80)		(0.65)
% College		-0.08		0.39		-0.08
		(0.16)		(0.36)		(0.26)
Median Household Income (log)		-0.19		-0.55		-0.23
		(0.16)		(0.43)		(0.30)
Unemployment Rate		0.41		-0.97		-0.95
		(0.61)		(1.35)		(0.93)
Gini Index		-0.98**		-0.91		-0.18
		(0.43)		(0.99)		(0.70)
% Below Poverty Line		1.73***		1.55		0.51
		(0.45)		(1.12)		(0.73)
% with Health Insurance		0.00		-0.55**		-0.03
		(0.10)		(0.22)		(0.11)
% Owner Occupied		-0.01		-0.99**		-0.39
		(0.21)		(0.44)		(0.41)
% Vacant		0.58**		1.17***		1.59***
		(0.24)		(0.45)		(0.54)
Median House Age		0.00*		-0.01		0.00
		(0.00)		(0.00)		(0.00)
Median House Value (log)		-0.46***		-0.60***		-0.64***
		(0.10)		(0.17)		(0.13)
Median Gross Rent (log)		-0.46***		-0.56***		-0.54**
		(0.09)		(0.21)		(0.24)
% Mortgage		1.03***		2.52***		2.01***
		(0.28)		(0.55)		(0.48)
% Owner Costs		-0.03***		-0.04**		-0.03**
		(0.01)		(0.02)		(0.01)
Constant	-6.21***	5.41***	-4.26***	15.75***	-6.04***	7.83***
	(0.04)	(1.37)	(0.10)	(3.63)	(0.06)	(2.57)
F-stat	7.03***	45.21***	10.28***	47.83***	0.02	26.46***
Adj. R2	0.02	0.73	0.03	0.77	0.00	0.70
N	379.00	359.00	343.00	330.00	339.00	324.00

Note: Standard errors in parentheses. The symbols *, **, and *** indicate significance at the 90%, 95%, and 99%, respectively.

Table G-8. Lookback Period Length on Flood Insurance Premium in Communities with Lookback Policies

Dependent Variable	Premium/House Value (log): All SFRs			
	(1)	(2)	(3)	(4)
Lookback Period: 2-5 Years	-0.07	0.02		
	(0.14)	(0.08)		
Lookback Period: More than 5 Years	-0.03	-0.01		
	(0.15)	(0.09)		
Lookback Period: 2-5 Years			-0.07	0.02
			(0.14)	(0.08)
Lookback Period: 6-10 Years			-0.13	0.02
			(0.16)	(0.09)
Lookback Period: More than 10 Years			0.21	-0.07
			(0.22)	(0.13)
% SFR in SFHA		0.33**		0.34**
		(0.16)		(0.17)
Distance to Coast in Miles		-0.17***		-0.18***
		(0.03)		(0.03)
Population (log)		-0.05*		-0.05*
		(0.03)		(0.03)
Density (log)		0.02		0.01
		(0.03)		(0.03)
Average Household Size (log)		0.23		0.24
		(0.54)		(0.54)
% Population Aged 65 or Above		0.63		0.68
		(0.57)		(0.58)
% While		0.67*		0.68*
		(0.37)		(0.37)
% Married		-0.06		-0.15
		(0.62)		(0.65)
% College		-0.15		-0.13
		(0.34)		(0.34)
Median Household Income (log)		-0.10		-0.10
		(0.36)		(0.35)
Unemployment Rate		-1.89*		-2.00**
		(0.97)		(0.98)
Gini Index		-0.24		-0.24
		(0.76)		(0.75)
% Below Poverty Line		2.12**		2.19**
		(0.93)		(0.92)
% with Health Insurance		-0.26		-0.23
		(0.27)		(0.27)
% Owner Occupied		-0.49		-0.42
		(0.45)		(0.45)
% Vacant		0.58		0.55
		(0.50)		(0.50)
Median House Age		0.01*		0.01*
		(0.00)		(0.00)
Median House Value (log)		-0.79***		-0.79***
		(0.20)		(0.21)
Median Gross Rent (log)		-0.02		-0.05
		(0.25)		(0.25)
% Mortgage		1.63**		1.67**
		(0.64)		(0.65)
% Owner Costs		-0.07***		-0.06***
		(0.02)		(0.02)

Constant	-6.35***	5.36**	-6.35***	5.49**
	(0.11)	(2.52)	(0.11)	(2.45)
F-stat	0.12	33.78***	0.86	32.36***
Adj. R2	0.00	0.81	0.03	0.81
N	115.00	113.00	115.00	113.00

Note: Standard errors in parentheses. The symbols *, **, and *** indicate significance at the 90%, 95%, and 99%, respectively.

Table G-9. Lookback Period Length and Flood Insurance Premium in Communities with Lookback Policies, by SFHA

Dependent Variable	Premium/House Value (log): SFRs in SFHA				Premium/House Value (log): SFRs in Non-SFHA			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lookback Period: 2-5 Years	0.60*	0.28			-0.63	0.03		
	(0.32)	(0.21)			(0.38)	(0.26)		
Lookback Period: More than 5 Years	0.77**	0.25			-0.51	0.05		
	(0.33)	(0.20)			(0.36)	(0.24)		
Lookback Period: 2-5 Years			0.60*	0.28			-0.63	0.03
			(0.33)	(0.21)			(0.38)	(0.26)
Lookback Period: 6-10 Years			0.53	0.26			-0.60	0.05
			(0.35)	(0.21)			(0.37)	(0.22)
Lookback Period: More than 10 Years			1.29**	0.22			-0.34	0.04
			(0.54)	(0.30)			(0.37)	(0.33)
% SFR in SFHA		-2.73***		-2.72***		3.71***		3.72***
		(0.35)		(0.35)		(0.46)		(0.46)
Distance to Coast in Miles		-0.17**		-0.18**		0.02		0.02
		(0.07)		(0.07)		(0.07)		(0.07)
Population (log)		-0.24***		-0.24***		-0.12		-0.12
		(0.09)		(0.09)		(0.08)		(0.08)
Density (log)		0.18		0.18		0.15		0.15
		(0.12)		(0.12)		(0.13)		(0.14)
Average Household Size (log)		0.14		0.15		-1.45		-1.44
		(1.20)		(1.21)		(0.93)		(0.94)
% Population Aged 65 or Above		2.18		2.19		0.22		0.22
		(1.40)		(1.42)		(1.66)		(1.70)
% While		-0.10		-0.10		-0.33		-0.33
		(0.85)		(0.86)		(0.55)		(0.55)
% Married		-0.35		-0.38		1.30		1.29
		(1.61)		(1.65)		(1.28)		(1.30)
% College		-0.53		-0.53		0.45		0.45
		(0.89)		(0.89)		(0.87)		(0.87)
Median Household Income (log)		-0.78		-0.78		-0.52		-0.53
		(0.97)		(0.97)		(0.86)		(0.85)
Unemployment Rate		-2.62		-2.65		-5.02***		-5.03***
		(2.44)		(2.51)		(1.88)		(1.87)
Gini Index		1.78		1.78		0.75		0.74
		(1.99)		(1.99)		(1.61)		(1.64)
% Below Poverty Line		1.63		1.65		1.21		1.22
		(2.56)		(2.56)		(2.56)		(2.64)
% with Health Insurance		-1.40*		-1.39*		-0.16		-0.16
		(0.75)		(0.78)		(0.84)		(0.84)
% Owner Occupied		-1.46		-1.44		-0.75		-0.74
		(1.29)		(1.32)		(1.18)		(1.15)
% Vacant		1.69		1.67		1.17		1.16
		(1.07)		(1.09)		(1.13)		(1.14)
Median House Age		-0.01		-0.01		-0.00		-0.00
		(0.01)		(0.01)		(0.01)		(0.01)
Median House Value (log)		-0.43		-0.42		-1.28***		-1.28***
		(0.50)		(0.50)		(0.44)		(0.43)
Median Gross Rent (log)		-0.60		-0.61		0.29		0.29
		(0.59)		(0.59)		(0.52)		(0.53)
% Mortgage		5.39***		5.40***		2.69		2.70
		(1.67)		(1.68)		(1.81)		(1.83)
% Owner Costs		-0.13**		-0.13**		-0.09		-0.09
		(0.06)		(0.05)		(0.06)		(0.07)
Constant	-5.29***	16.43***	-5.29***	16.51***	-5.61***	13.99*	-5.61***	14.03*
	(0.22)	(6.13)	(0.22)	(6.13)	(0.34)	(7.46)	(0.34)	(7.34)
F-stat	3.09**	17.86***	2.51*	17.50***	1.34	13.32***	1.40	14.56***
Adj. R2	0.04	0.81	0.06	0.81	0.05	0.77	0.05	0.77
N	112.00	110.00	112.00	110.00	103.00	102.00	103.00	102.00

Table G-10. Determinants of the Presence of Lookback Period

Dependent Variable	Lookback Period Indicator							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
% SFR in SFHA					1.05***	1.00*		
					(0.32)	(0.52)		
Distance to Coast							-0.39***	-0.29**
							(0.08)	(0.12)
Population (log)	0.38***			0.50***		0.51***		0.49***
	(0.09)			(0.12)		(0.12)		(0.12)
Density (log)	0.00			-0.29*		-0.31*		-0.34**
	(0.15)			(0.17)		(0.17)		(0.17)
Average Household Size (log)	-0.44			0.37		0.06		0.58
	(1.35)			(1.68)		(1.71)		(1.66)
% Population Aged 65 or Above	1.63			-0.08		0.15		0.32
	(1.55)			(2.20)		(2.22)		(2.21)
% While	0.13			1.32		1.26		1.33
	(1.03)			(1.26)		(1.26)		(1.26)
% Married	-1.38			-2.22		-2.52		-2.73
	(1.93)			(2.75)		(2.76)		(2.70)
% College	1.26**			-0.56		-0.34		-0.09
	(0.57)			(1.02)		(1.03)		(1.02)
Median Household Income (log)		0.12		-0.15		-0.14		-0.55
		(0.41)		(1.14)		(1.13)		(1.15)
Unemployment Rate		0.69		4.76		4.31		4.40
		(3.50)		(4.49)		(4.34)		(4.59)
Gini Index		6.02***		-0.68		-0.44		-1.47
		(1.67)		(3.11)		(3.06)		(3.04)
% Below Poverty Line		-2.46		0.58		0.98		1.46
		(2.29)		(3.46)		(3.45)		(3.46)
% with Health Insurance		-0.01		-0.72		-0.68		-0.82
		(0.40)		(0.66)		(0.65)		(0.67)
% Owner Occupied			-1.70**	-0.69		-0.54		-0.38
			(0.82)	(1.33)		(1.35)		(1.32)
% Vacant			0.08	0.82		0.04		0.25
			(1.12)	(1.34)		(1.41)		(1.35)
Median House Age			-0.00	0.02		0.01		0.01
			(0.01)	(0.01)		(0.01)		(0.01)
Median House Value (log)			0.64**	0.99*		0.75		0.90
			(0.32)	(0.54)		(0.56)		(0.55)
Median Gross Rent (log)			0.60	0.79		0.82		0.81
			(0.52)	(0.73)		(0.73)		(0.74)
% Mortgage			-0.89	-2.15		-1.40		-1.45
			(1.17)	(1.77)		(1.78)		(1.80)
% Owner Costs			0.03	0.04		0.02		0.01
			(0.03)	(0.04)		(0.04)		(0.04)
Constant	-4.28*	-4.61	-11.96***	-19.09**	-0.90***	-16.24*	0.27	-12.09
	(2.21)	(4.73)	(2.79)	(9.52)	(0.13)	(9.65)	(0.22)	(9.69)
Chi2	36.26***	18.30***	24.41***	53.86***	10.78***	56.11***	20.89***	58.10***
Adj. R2	0.09	0.04	0.06	0.11	0.02	0.12	0.05	0.13
N	379.00	375.00	359.00	359.00	445.00	359.00	379.00	359.00

Table G-11. Determinants of Longer Lookback Periods in Communities with Lookback Policies

Dependent Variable	More than 5 Years		5 Years or More		More than 5 Years		5 Years or More	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
% SFR in SFHA	-1.19*	-0.61	-1.64***	-1.39				
	(0.62)	(1.15)	(0.58)	(1.05)				
Distance to Coast					0.57***	1.12***	0.50***	0.61**
					(0.16)	(0.36)	(0.17)	(0.28)
Population (log)		-0.12		0.18		-0.13		0.21
		(0.24)		(0.25)		(0.35)		(0.32)
Density (log)		-1.00*		-0.79		-1.37**		-0.87
		(0.54)		(0.60)		(0.68)		(0.61)
Average Household Size (log)		-3.98		-0.03		-5.52		-1.42
		(3.54)		(4.85)		(4.03)		(4.51)
% Population Aged 65 or Above		-4.42		-6.73		-10.05		-8.40
		(4.99)		(6.48)		(6.32)		(8.04)
% While		-5.08*		2.67		-5.98*		2.20
		(2.63)		(2.79)		(3.27)		(2.62)
% Married		0.00		10.70*		3.60		11.55*
		(6.66)		(6.24)		(5.40)		(6.42)
% College		4.96*		6.10*		2.95		5.71
		(2.69)		(3.46)		(2.54)		(3.58)
Median Household Income (log)		8.10***		6.86**		11.47***		7.48**
		(2.99)		(3.22)		(3.72)		(3.54)
Unemployment Rate		-16.77**		-20.88*		-16.24*		-19.51
		(7.31)		(11.90)		(9.26)		(12.89)
Gini Index		-1.30		-5.80		7.00		-3.22
		(6.71)		(7.66)		(8.84)		(7.75)
% Below Poverty Line		-3.50		6.06		-10.68		4.00
		(8.03)		(7.20)		(8.80)		(7.12)
% with Health Insurance		5.17**		7.05**		7.52***		7.94**
		(2.51)		(3.15)		(2.35)		(3.09)
% Owner Occupied		4.99		3.77		6.27*		5.12
		(3.87)		(4.26)		(3.76)		(4.66)
% Vacant		-3.42		-7.76**		-2.78		-8.11**
		(3.20)		(3.56)		(2.70)		(3.71)
Median House Age		-0.07**		-0.01		-0.03		0.00
		(0.03)		(0.04)		(0.04)		(0.04)
Median House Value (log)		-5.77***		-6.37***		-6.64***		-6.49***
		(1.73)		(1.76)		(2.11)		(1.75)
Median Gross Rent (log)		-2.94		-2.07		-3.26*		-1.97
		(1.81)		(2.38)		(1.94)		(2.46)
% Mortgage		-12.49***		-16.23**		-18.68***		-17.44**
		(4.80)		(6.64)		(6.82)		(8.77)
% Owner Costs		0.50***		0.75***		0.81***		0.81***
		(0.19)		(0.27)		(0.25)		(0.31)
Constant	-0.05	14.21	1.46***	10.21	-1.67***	-16.16	-0.10	1.03
	(0.27)	(20.71)	(0.31)	(22.04)	(0.40)	(21.48)	(0.35)	(24.49)
Chi2	3.73*	30.29*	8.11***	28.31	13.23***	36.19**	8.90***	29.85*
Adj. R2	0.03	0.25	0.06	0.29	0.11	0.35	0.07	0.32
N	115.00	113.00	115.00	113.00	115.00	113.00	115.00	113.00

Table G-12. Lookback Period and House Prices

Dependent Variable	House Value (log): All SFRs		House Value (log) SFRs in SFHA		House Value (log) SFRs in Non-SFHA	
	(1)	(2)	(3)	(4)	(5)	(6)
Lookback Period Indicator	0.46***	-0.03	1.35***	0.10	-0.33	-0.01
	(0.11)	(0.03)	(0.25)	(0.13)	(0.36)	(0.27)
% SFR in SFHA		0.23***		4.16***		-6.39***
		(0.08)		(0.53)		(0.71)
Distance to Coast in Miles		-0.01		0.10		-0.04
		(0.01)		(0.12)		(0.09)
Population (log)		0.00		0.24**		0.29***
		(0.01)		(0.09)		(0.10)
Density (log)		0.07***		0.03		-0.21
		(0.02)		(0.12)		(0.17)
Average Household Size (log)		-0.06		-1.74		-0.85
		(0.18)		(1.22)		(1.40)
% Population Aged 65 or Above		-0.13		-2.35		0.16
		(0.31)		(1.90)		(2.34)
% While		-0.10		0.94		-0.89
		(0.11)		(0.63)		(0.82)
% Married		-0.02		1.67		-5.31**
		(0.30)		(1.98)		(2.36)
% College		0.15		-1.50		-0.38
		(0.14)		(1.05)		(0.90)
Median Household Income (log)		0.48**		0.42		2.48**
		(0.19)		(0.93)		(1.01)
Unemployment Rate		0.14		5.97*		3.69
		(0.49)		(3.15)		(3.23)
Gini Index		2.15***		6.48**		4.05
		(0.39)		(2.68)		(2.59)
% Below Poverty Line		-0.44		-3.79*		-1.56
		(0.41)		(2.08)		(2.60)
% with Health Insurance		-0.03		0.94**		0.20
		(0.07)		(0.41)		(0.46)
% Owner Occupied		-0.06		0.64		3.08***
		(0.17)		(1.20)		(1.12)
% Vacant		0.24		-1.39*		-7.27***
		(0.16)		(0.81)		(1.67)
Median House Age		-0.00*		0.01		-0.01
		(0.00)		(0.02)		(0.01)
Median House Value (log)		0.59***		1.00**		0.88*
		(0.07)		(0.42)		(0.50)
Median Gross Rent (log)		0.25**		0.81		-0.31
		(0.11)		(0.54)		(0.62)
% Mortgage		-1.21***		-2.42**		-5.83***
		(0.23)		(1.05)		(1.73)
% Owner Costs		0.03***		0.06		0.05
		(0.01)		(0.04)		(0.05)
Constant	12.80***	-2.80*	10.40***	-18.21**	11.76***	-20.19**
	(0.06)	(1.68)	(0.18)	(8.23)	(0.18)	(8.52)
F-stat	18.26***	107.73***	28.47***	50.67***	0.82	8.87***
Adj. R2	0.05	0.92	0.06	0.64	0.00	0.59
N	379.00	359.00	379.00	359.00	379.00	359.00

Table G-13. Lookback Period Length on House Prices in Communities with Lookback Policies

Dependent Variable	House Value (log): All SFRs			
	(1)	(2)	(3)	(4)
Lookback Period: 2-5 Years	-0.51*	-0.13**		
	(0.27)	(0.07)		
Lookback Period: More than 5 Years	-0.63**	-0.18**		
	(0.30)	(0.08)		
Lookback Period: 2-5 Years	-1.17***	-0.13		
	(0.35)	(0.09)		
Lookback Period: 6-10 Years			-0.51*	-0.13**
			(0.27)	(0.06)
Lookback Period: More than 10 Years			-0.80***	-0.17**
			(0.28)	(0.08)
% SFR in SFHA		0.14		0.15
		(0.11)		(0.11)
Distance to Coast in Miles		0.02		0.02
		(0.02)		(0.02)
Population (log)		0.06***		0.06***
		(0.02)		(0.02)
Density (log)		0.02		0.01
		(0.04)		(0.04)
Average Household Size (log)		-0.66		-0.65
		(0.42)		(0.42)
% Population Aged 65 or Above		-0.64		-0.60
		(0.53)		(0.53)
% While		-0.01		-0.01
		(0.22)		(0.22)
% Married		0.29		0.23
		(0.49)		(0.47)
% College		0.27		0.28
		(0.27)		(0.26)
Median Household Income (log)		0.94*		0.93*
		(0.48)		(0.48)
Unemployment Rate		1.09		1.03
		(1.01)		(1.03)
Gini Index		1.26*		1.26*
		(0.64)		(0.64)
% Below Poverty Line		-0.51		-0.46
		(0.86)		(0.87)
% with Health Insurance		0.42		0.44*
		(0.26)		(0.26)
% Owner Occupied		-0.15		-0.10
		(0.34)		(0.32)
% Vacant		-0.11		-0.13
		(0.31)		(0.31)
Median House Age		-0.00		-0.00
		(0.00)		(0.00)
Median House Value (log)		0.77***		0.77***
		(0.16)		(0.16)
Median Gross Rent (log)		-0.49**		-0.51**
		(0.24)		(0.24)
% Mortgage		-2.11***		-2.08***
		(0.53)		(0.52)
% Owner Costs		0.07***		0.08***
		(0.02)		(0.02)
Constant	13.76***	-4.65	13.76***	-4.56

	(0.24)	(3.18)	(0.24)	(3.16)
F-stat	3.86**	84.32***	4.00**	81.64***
Adj. R2	0.11	0.95	0.09	0.95
N	115.00	113.00	115.00	113.00

Table G-14. Lookback Period Length and House Prices in Communities with Lookback Policies, by SFHA

Dependent Variable	House Value (log): SFRs in SFHA				House Value (log): SFRs in Non-SFHA			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lookback Period: 2-5 Years	-1.08**	-0.26			0.17	-1.10*		
	(0.46)	(0.21)			(0.93)	(0.56)		
Lookback Period: More than 5 Years	-1.74***	-0.30			0.40	-1.37**		
	(0.48)	(0.19)			(0.86)	(0.63)		
Lookback Period: 2-5 Years			-1.08**	-0.26			0.17	-1.12**
			(0.47)	(0.21)			(0.93)	(0.55)
Lookback Period: 6-10 Years			-1.42***	-0.31			0.12	-1.63**
			(0.52)	(0.20)			(0.99)	(0.63)
Lookback Period: More than 10 Years			-2.46***	-0.28			1.04	-0.79
			(0.67)	(0.28)			(0.74)	(0.85)
% SFR in SFHA		2.57***		2.57***		-6.60***		-6.68***
		(0.36)		(0.37)		(1.13)		(1.14)
Distance to Coast in Miles		-0.08		-0.08		0.21		0.23
		(0.08)		(0.08)		(0.20)		(0.20)
Population (log)		0.21**		0.21**		0.76***		0.75***
		(0.09)		(0.09)		(0.20)		(0.20)
Density (log)		-0.15		-0.14		-0.91**		-0.85**
		(0.11)		(0.11)		(0.40)		(0.41)
Average Household Size (log)		-0.38		-0.39		-4.00		-4.10
		(1.00)		(1.01)		(3.36)		(3.30)
% Population Aged 65 or Above		-1.89		-1.91		-7.96		-8.47*
		(1.30)		(1.35)		(4.86)		(4.90)
% While		1.14		1.14		-3.16		-3.24
		(0.76)		(0.76)		(2.24)		(2.16)
% Married		-0.82		-0.78		2.03		2.91
		(1.41)		(1.46)		(4.89)		(4.96)
% College		0.06		0.05		0.99		0.81
		(0.73)		(0.74)		(2.60)		(2.57)
Median Household Income (log)		1.54		1.54		5.32*		5.36*
		(0.95)		(0.95)		(2.83)		(2.74)
Unemployment Rate		5.12*		5.16*		9.21		10.20*
		(2.69)		(2.75)		(5.68)		(5.88)
Gini Index		0.41		0.42		7.86		7.91
		(1.80)		(1.80)		(6.16)		(6.11)
% Below Poverty Line		-2.20		-2.22		-10.75		-11.41
		(2.30)		(2.28)		(7.00)		(6.93)
% with Health Insurance		0.76		0.75		6.20***		5.92***
		(0.64)		(0.67)		(1.98)		(1.99)
% Owner Occupied		-0.26		-0.29		8.62***		7.97**
		(1.08)		(1.06)		(3.15)		(3.05)
% Vacant		-0.95		-0.94		-9.88***		-9.58**
		(0.99)		(0.99)		(3.62)		(3.65)
Median House Age		0.01		0.01		-0.03		-0.03
		(0.01)		(0.01)		(0.03)		(0.03)
Median House Value (log)		0.75		0.75		0.74		0.68
		(0.53)		(0.53)		(1.49)		(1.48)
Median Gross Rent (log)		0.31		0.32		-4.36**		-4.05**
		(0.49)		(0.49)		(1.76)		(1.83)
% Mortgage		-5.11***		-5.12***		-16.83***		-17.18***
		(1.42)		(1.44)		(5.52)		(5.47)
% Owner Costs		0.13**		0.13**		0.34*		0.33*
		(0.06)		(0.06)		(0.18)		(0.18)
Constant	12.82***	-19.02***	12.82***	-19.07***	11.22***	-23.79	11.22***	-25.02
	(0.37)	(5.50)	(0.37)	(5.52)	(0.71)	(19.71)	(0.71)	(19.07)
F-stat	6.53***	70.51***	5.11***	67.14***	0.12	5.34***	1.68	5.21***
Adj. R2	0.11	0.91	0.13	0.91	0.00	0.73	0.01	0.73
N	115.00	113.00	115.00	113.00	115.00	113.00	115.00	113.00

Table G-15. Lookback Period and House Prices – Parcel-level Evidence

	(1)	(2)
	House Value (log)	House Value (log)
Lookback Period: 2-5 Years	**-0.042*** **	
	(0.005)	
Lookback Period: More than 5 Years	**-0.057*** **	
	(0.004)	
Lookback Period: 2-5 Years		-0.039***
		(0.005)
Lookback Period: 6-10 Years		-0.067***
		(0.005)
Lookback Period: More than 10 Years		-0.024***
		(0.002)
Improvement Quality (Mid)	0.123***	0.120***
	(0.004)	(0.004)
Improvement Quality (High)	0.235***	0.230***
	(0.007)	(0.007)
Age	-0.003***	-0.003***
	(0.000)	(0.000)
Age Squared	0.000***	0.000***
	(0.000)	(0.000)
Living Area	0.000***	0.000***
	(0.000)	(0.000)
Living Area Squared	-0.000***	-0.000***
	(0.000)	(0.000)
Land Area	0.000***	0.000***
	(0.000)	(0.000)
Land Area Squared	-0.000***	-0.000***
	(0.000)	(0.000)
Homestead	0.093***	0.092***
	(0.003)	(0.003)
Population (log)	0.020***	0.021***
	(0.001)	(0.001)
Density (log)	0.088***	0.087***
	(0.001)	(0.001)
Average Household Size (log)	-0.837***	-0.851***
	(0.013)	(0.014)
% Population Aged 65 or Above	-0.404***	-0.410***
	(0.015)	(0.015)
% While	0.442***	0.421***
	(0.011)	(0.010)
% Married	0.153***	0.268***
	(0.025)	(0.020)
% College	-0.103***	-0.107***
	(0.017)	(0.018)
Median Household Income (log)	0.339***	0.360***
	(0.016)	(0.018)
Unemployment Rate	2.794***	2.725***
	(0.042)	(0.040)
Gini Index	-0.443***	-0.456***
	(0.023)	(0.024)
% Below Poverty Line	-0.614***	-0.608***
	(0.039)	(0.039)
% with Health Insurance	0.550***	0.530***
	(0.007)	(0.006)
% Owner Occupied	0.228***	0.132***
	(0.009)	(0.007)
% Vacant	-0.362***	-0.357***
	(0.015)	(0.015)
Median House Age	0.007***	0.008***
	(0.000)	(0.000)
Median House Value (log)	0.639***	0.625***
	(0.005)	(0.004)
Median Gross Rent (log)	0.309***	0.316***

	(0.010)	(0.010)
% Mortgage	-1.015***	-1.024***
	(0.014)	(0.015)
% Owner Costs	0.059***	0.057***
	(0.001)	(0.001)
Distance to Coast in Miles (log)	0.024***	0.026***
	(0.001)	(0.000)
Constant	-3.566***	-3.593***
	(0.167)	(0.169)
Adj. R2	0.798	0.798
N	1,416,389	1,416,389

Table G-16. Lookback Period and Renovations – Parcel-level Evidence

	(1)	(2)	(3)	(4)	(5)	(6)
	Renovated in the past 1 year	Renovated in the past 1 year	Renovated in the past 3 years	Renovated in the past 3 years	Renovated in the past 5 years	Renovated in the past 5 years
Lookback Period: 2-5 Years	-0.002***		-0.003***		-0.024***	
	(0.000)		(0.000)		(0.001)	
Lookback Period: More than 5 Years	-0.011***		-0.008***		-0.027***	
	(0.000)		(0.000)		(0.001)	
Lookback Period: 2-5 Years		-0.002***		-0.003***		-0.024***
		(0.000)		(0.000)		(0.001)
Lookback Period: 6-10 Years		-0.010***		-0.006***		-0.027***
		(0.000)		(0.000)		(0.001)
Lookback Period: More than 10 Years		-0.015***		-0.012***		-0.027***
		(0.000)		(0.000)		(0.001)
Improvement Quality (Mid)	-0.001***	-0.001***	-0.011***	-0.011***	-0.009***	-0.009***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Improvement Quality (High)	-0.004***	-0.003***	-0.011***	-0.010***	-0.008***	-0.008***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Age	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Age Squared	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Living Area	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Living Area Squared	-0.000**	-0.000**	-0.000***	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Land Area	-0.000	0.000	-0.000***	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Land Area Squared	-0.000	-0.000	0.000***	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Homestead	-0.001***	-0.001***	-0.000	-0.000	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Population (log)	-0.000	-0.000***	-0.002***	-0.002***	-0.003***	-0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Density (log)	0.006***	0.006***	0.013***	0.013***	0.006***	0.006***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Average Household Size (log)	0.014***	0.016***	-0.052***	-0.051***	-0.037***	-0.037***
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
% Population Aged 65 or Above	0.086***	0.087***	0.288***	0.289***	0.332***	0.332***
	(0.003)	(0.003)	(0.006)	(0.006)	(0.006)	(0.006)
% While	0.023***	0.025***	0.040***	0.043***	0.097***	0.097***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
% Married	-0.084***	-0.097***	-0.103***	-0.118***	-0.102***	-0.102***
	(0.002)	(0.002)	(0.003)	(0.004)	(0.004)	(0.004)
% College	0.012***	0.012***	0.084***	0.084***	0.057***	0.057***
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Median Household Income (log)	-0.046***	-0.049***	-0.108***	-0.111***	-0.054***	-0.054***
	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
Unemployment Rate	0.209***	0.217***	0.466***	0.475***	0.670***	0.670***
	(0.006)	(0.006)	(0.009)	(0.009)	(0.012)	(0.012)
Gini Index	-0.019***	-0.018***	-0.336***	-0.334***	-0.328***	-0.328***
	(0.004)	(0.004)	(0.007)	(0.007)	(0.007)	(0.007)
% Below Poverty Line	0.155***	0.154***	0.372***	0.371***	0.406***	0.406***
	(0.003)	(0.003)	(0.006)	(0.006)	(0.007)	(0.007)
% with Health Insurance	-0.020***	-0.018***	-0.026***	-0.023***	-0.022***	-0.022***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
% Owner Occupied	0.026***	0.036***	0.004*	0.016***	-0.092***	-0.092***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
% Vacant	0.013***	0.013***	-0.065***	-0.065***	-0.099***	-0.099***
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Median House Age	0.000***	0.000***	-0.000***	-0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Median House Value (log)	0.017***	0.019***	0.031***	0.032***	0.009***	0.010***

	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Median Gross Rent (log)	0.011***	0.010***	0.012***	0.011***	0.029***	0.029***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
% Mortgage	0.129***	0.130***	0.228***	0.229***	0.235***	0.235***
	(0.002)	(0.002)	(0.004)	(0.004)	(0.004)	(0.004)
% Owner Costs	-0.003***	-0.003***	-0.004***	-0.004***	-0.002***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Distance to Coast in Miles (log)	0.000*	-0.000	-0.005***	-0.005***	-0.003***	-0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.135***	0.138***	0.746***	0.749***	0.296***	0.296***
	(0.011)	(0.011)	(0.017)	(0.018)	(0.021)	(0.021)
Adj. R2	0.029	0.030	0.046	0.046	0.049	0.049
N	1,416,389	1,416,389	1,416,389	1,416,389	1,416,389	1,416,389

Table G-17. Lookback Period and Building Permit

	(1)	(2)	(3)	(4)
Dependent Variable = log of (building permit / population)				
Lookback Period: More than 5 Years	-0.827			
	(0.638)			
Lookback Period: 5 Years or More		-1.014*		
		(0.529)		
Lookback Period: 2-5 Years			-0.552	
			(0.598)	
Lookback Period: More than 5 Years			-1.191	
			(0.723)	
Lookback Period: 2-5 Years				-0.552
				(0.602)
Lookback Period: 6-10 Years				-1.113
				(0.849)
Lookback Period: More than 10 Years				-1.411
				(0.905)
Constant	-3.178***	-2.739***	-2.814***	-2.814***
	(0.302)	(0.393)	(0.450)	(0.453)
F	1.680	3.678*	1.370	1.098
Adj. R2	0.027	0.035	0.035	0.036
N	74.000	74.000	74.000	74.000

Appendix H A Deeper Dive into the Effects of Lookback Periods on Housing Prices and Tax Values

H.1 Discussions and Implications for the Effects of Lookback Periods on Real Estate

The contrasting findings between Tables G-10 and G-112 reveal a nuanced two-stage decision process in how communities approach lookback periods. The first decision is whether to implement a lookback period at all (Table G-10), while the second is determining its length for communities that choose to have one (Table G-11). The seemingly contradictory results actually tell a coherent story about how communities balance different priorities.

Communities with more properties in Special Flood Hazard Areas (SFHA) are more likely to implement lookback periods, but when they do, they tend to keep them shorter. This pattern suggests a practical balancing act: these high-risk areas recognize the need for historical review of flooding issues but may want to maintain housing market liquidity given their vulnerable status. Similarly, we see that coastal proximity has opposite effects at different stages - coastal communities are more likely to have lookback periods, but among communities with lookback periods, those further inland tend to have longer ones. This might indicate that coastal areas prefer to rely on a broader mix of flood risk management tools alongside shorter lookbacks.

The economic factors tell an equally interesting story. While median household income doesn't significantly influence whether a community has a lookback period, wealthier communities that do adopt them tend to implement longer ones. This could reflect greater administrative capacity and less concern about housing market friction in more affluent areas. Property values show an intriguing pattern - areas with higher house values are more likely to have lookback periods but prefer shorter ones when they do. This suggests a careful balance between protecting property values through some historical review while maintaining market dynamism through shorter review periods.

These patterns make sense when we consider the different pressures communities face. High-risk areas (coastal, SFHA) appear to prioritize having some form of historical review but keep it shorter, possibly to balance risk management with market function. Meanwhile, lower-risk areas that choose to implement lookback periods tend to make them longer, perhaps because they can afford the additional market friction. This creates a logical pattern where the initial adoption decision is driven primarily by risk factors, while the length decision is influenced more by economic and administrative capacity factors.

The overall picture that emerges is one of communities making sophisticated policy choices based on their specific circumstances, rather than taking a one-size-fits-all approach to flood risk management. The apparent contradictions in the findings actually reflect the complex balancing act between risk management, market efficiency, and administrative capacity that communities must navigate when designing their flood-related policies.

The analysis of lookback period policies also reveals important selection patterns that inform our empirical strategy for house prices. As shown in Table 2, the presence of lookback periods is primarily driven by fundamental community characteristics such as population size, population density, and geographic location relative to flood risks. These basic demographic and geographic factors explain most of the variation in whether communities adopt lookback periods at all. However, when we examine communities that have already adopted lookback periods (Table 3), we observe that the length of these periods is associated with a much broader set of socioeconomic factors. This pattern suggests that communities with and without lookback periods are systematically different, making it methodologically preferable to focus our subsequent analysis on communities that have already adopted these policies.

Moreover, focusing on communities with existing lookback periods allows us to better understand the economic implications of policy stringency. Table 3 provides preliminary evidence of the relationship between lookback periods and housing markets. Among communities with lookback policies, we find that areas with higher house values tend to have shorter lookback periods (coefficient ranging from -5.77 to -6.64, significant at the 1% level). This strong negative association suggests that communities may be sensitive to the potential market frictions created by longer lookback periods. The relationship appears robust across different model specifications and remains significant even after controlling for various community characteristics including income levels, demographic composition, and geographic factors.

H.2 Examining Longer Lookback Periods

Lookback periods contribute to reducing future flood losses by ensuring that properties in hazardous areas meet current flood plain management standards. This effort aligns with FEMA's mission to mitigate disaster impacts and is rewarded with flood insurance premium discounts in CRS communities. However, as evidenced in this real estate study, the economic costs of longer lookback periods—such as reduced property values, diminished property tax revenues, and lower renovation rates—pose a challenge for balancing resilience with economic vitality. Communities must weigh these benefits and costs to ensure that resilience measures do not inadvertently hinder local economic growth or property improvements.

Our analysis reveals two major costs to the real estate market:

- Property Value Loss: Communities with longer lookback periods (e.g., 2–5 years or more than 5 years) experience significant reductions in property values, which can negatively affect the local tax base. The property value reductions of 4.2% and 6% for these categories result in annual property tax losses, which translate to $1.69 billion in lost revenue over 15 years for Florida.

- Renovation Disincentives: Homeowners are less likely to undertake renovations in communities with longer lookback periods, likely due to the cumulative tracking of improvements under the 50% rule. This disincentive may lead to aging housing stock and missed opportunities for increasing the resilience of structures against wind and other hazards.

Other possible challenges could be related to consumer understanding of lookback periods, including lack of disclosure at property sales and confusion about the differentiation between improvement types (e.g., hardening a home vs. aesthetic improvements). These issues may reduce compliance and undermine the intended benefits of the CRS program.

Lookback periods represent only one aspects of many contributors to earning CRS credit points. Our study demonstrates that their design requires refinement to maximize benefits without imposing excessive costs on communities.

H.2.1 Consideration of Housing Values and Tax Revenues

This analysis quantifies the economic impact of lookback periods on house values and property tax revenues using parcel-level evidence, which provides greater granularity and rigor by incorporating both parcel- and community-level controls. Our baseline results, shown in Table 13, Model (1), indicate that compared to properties in communities with lookback periods of less than 2 years, those in communities with a 2–5-year lookback period have house values that are, on average, 4.2% lower. Properties in communities with lookback periods exceeding 5 years' experience a larger reduction of 5.7% in house values.

Table H-1 shows our calculations (in the bold font). Assumptions are summarized in the table notes.

Table H-1. Cost-benefit Calculations

Lookback period =	Less than 2 years	2-5 years	More than 5	Combined
	(1)	(2)	(3)	(2) & (3)
Number of SFRs[1]	221,230	536,355	658,804	
Median House Value[1]	$369,186	$394,400	$305,000	
% Value Reduction[2]	base group	4.2%	5.7%	
Effective Tax Rate[3]		0.71%	0.71%	
Property Value Loss Per House		**$17,291**	**$18,436**	**$17,922**
Annual Property Tax Loss Per House		**$123**	**$131**	**$127**
Property Value Reduction (Total)		**$9,274,126,622**	**$12,145,607,147**	**$21,419,733,770**
Annual Property Tax Loss (Total)		**$65,846,299**	**$86,233,811**	**$152,080,110**
Population[1]	919,853	2,596,741	2,210,984	4,807,725
Per Capita Losses		**$25**	**$39**	**$32**
Per Capita Losses (%)[4]		**1.56%**	**2.4%**	**1.95%**
Long-term Calculation (15-Year Present Value)				
Discount Rate[5]		7%	7%	7%
Property Value Growth[6]		3%	3%	3%
Property Tax Loss		**$732,104,663**	**$958,780,918**	**$1,690,885,581**
Per Capita Property Tax Loss		**$282**	**$434**	**$352**

Note:
1. Estimated from our SFR sample.
2. Estimated from Model (1) of Table 13.
3. Based on estimates from Tax Foundation and Harris and Moore (2013).
4. Calculated using the average per capita revenue from property tax of $1,624 (Urban Institute, 2024).
5. The authors' assumption.
6. In Florida, the "Save Our Homes" (SOH) amendment caps the annual growth of homestead property assessments at the lesser of 3% or the percentage change in the Consumer Price Index (CPI).

H.2.2 Per House Effects

Given the median house value is $394,400 in communities with 2–5 year lookback periods and the coefficient estimates of -4.2%, the value reduction per house is $17,291 (=$394,400/(1-4.2%) – $394,400). Similarly, the value reduction per house is $18,436 (=$305,000/(1-5.7%) – $305,000) for communities with longer lookback periods. On average, the reduction per house is $17,922.

The resulting annual property tax loss per house is $123 in communities with 2–5-year lookback periods and $131 for communities with longer lookback periods. Table H-2 shows that the average annual loss in property tax per house is $127.

Table H-2. Calculation of Average Annual Loss in Property Tax, Per House

Lookback Period	Medium House Value	Value Reduction	Value Loss Per House	Annual Property Tax Loss per House
2-5 years	$394,400	4.20%	$17,291	$123
> 5 years	$305,000	5.70%	$18,436	$131
Combined		-	$17,922	$127

H.2.3 Aggregate Property Value Effects

Communities with lookback periods of 2–5 years' experience a 4.2% reduction in house values, while those with lookback periods exceeding five years see a 5.7% reduction. This leads to total property value losses of approximately $9.27 billion and $12.15 billion, respectively, across the affected houses, as shown in Table H-3.

Table H-3. Calculation of Property Value Loss, by Lookback Period

Lookback Period	Number of SFRs	Median House Value	Value Reduction	Property Value Loss
< 2 years	221,230	$369,186	Base group	Base group
2-5 years	536,355	$394,400	4.20%	$9.27 billion
> 5 years	658,804	$305,000	5.70%	$12.15 billion
Combined Impact	1,416,389	-	-	$21.42 billion

H.2.4 Annual Property Tax Impact

Using Florida's effective property tax rate of 0.71% (below the national average of 0.99%), we estimate:

- Annual tax revenue loss of $65.85 million in communities with 2-5 year lookback periods
- Annual tax revenue loss of $86.23 million in communities with >5 year lookback periods
- Combined annual tax revenue loss of $152.08 million

H.2.5 Per Capita Effects

The per capita annual property tax loss is $25 in communities with 2–5 year lookback periods and $39 for communities with longer lookback periods. On average, the per capita property tax loss across all communities is $32.

When compared to Florida's per capita property tax revenue of $1,624 (derived from the combined state and local general revenue of $205 billion in FY 2021), these losses represent 1.56% and 2.40% of per capita property tax revenue for communities with 2–5 year and over 5-year lookback periods, respectively. The differences are shown in Table H-4.

Table H-4. Comparison of Annual Losses Per Capita, by Lookback Period

Lookback Period	Population	Annual Loss Per Capita	% of Per Capita Property Tax
2-5 years	2,596,741	$25	1.56%
> 5 years	2,210,984	$39	2.40%
Combined	4,807,725	$32	1.95%

H.2.6 Long-term Impact Analysis

In Florida, the "Save Our Homes" (SOH) amendment caps the annual growth of homestead property assessments at the lesser of 3% or the percentage change in the Consumer Price Index (CPI). Using this cap, we calculate the 15-year present value (PV) of property tax losses under the following assumptions:

- A discount rate of 7%.
- Property value growth of 3% annually.

The long-term PV of property tax losses is as follows:

- $732.10 million for communities with 2–5 year lookback periods.
- $958.78 million for communities with longer lookback periods.
- A combined total of $1.69 billion.

Error! Reference source not found. provides a comparison of the PV of the per capita property tax losses across communities with different lookback periods. Over 15 years, the PV of per capita property tax losses is $282 for communities with 2–5-year lookback periods and $434 for those with longer lookback periods. Averaged across all communities, the per capita PV loss is $352.

Table H-5. Comparison of Per Capita PV Loss, by Lookback Period

Lookback Period	PV of Tax Losses	Per Capita PV
2-5 years	$732.10 million	$282
> 5 years	$958.78 million	$434
Combined	$1.69 billion	$352

Appendix I Flood Plain Managers Survey Instrument

Floodlain Manager Survey

We appreciate your help in an important research project we are conducting at Florida State University for the Florida Office of Insurance Regulation. The purpose of our study is to understand the implications of certain rules about substantial improvements to property that have been established in some Florida communities. Specifically, we are interested in the impact of **lookback periods** on property development activities in flood hazard areas and decisions to purchase flood insurance coverage. A lookback period is a period of time in which all improvements to a property may be aggregated for the purposes of determining if the total improvements exceed 50% of the property value.

The following survey should take approximately 10-15-minutes. You will be asked to answer a series of questions about participation in the National Flood Insurance Program's **CRS** program, along with the implementation of lookback periods in your community, if such periods have been established. We will be focusing on your experience as a flood plain manager, including the determination of properties in flood hazard areas and, if relevant, how lookback periods have affected development activity.

We know that your time is valuable. If necessary, you will be able to leave the survey and return to finish it when it is more convenient.

Note that you will not be paid to take part in this study and your responses will be anonymized for our research. For more details about the study, please refer to the Information Sheet that was included in the email, or contact Dr. Patricia Born, pborn@business.fsu.edu, 850-644-7884.

In which Florida community/city do you work?

Does your community participate in the National Flood Insurance **Community Rating System** Program?

- Yes
- No

Were you involved in community flood plain management when the decision was made to participate in the CRS program?

- Yes
- No

Does your community have a lookback period for substantial improvements for properties that are located in a flood plain? (We recognize that this is not likely for communities that do not participate in the NFIP CRS Program.)

- Yes
- No

Does your community have a lookback period for substantial improvements for properties that are located in a flood plain?

- Yes
- No

The next few questions are specific to how substantial improvements to property and the lookback period are managed.

What is length (in years) of that lookback period?

Are you getting credit in the CRS Program for having a lookback period?

- ◯ Yes
- ◯ No
- ◯ I Don't Know

You indicated that your community does not have a lookback period for substantial improvements to property that is located in a flood plain. To the best of your knowledge, has a lookback period ever been considered? What factors led to the decision to not enact a lookback period?

Who in your community is responsible for ensuring that properties that do not currently meet current flood related building codes are not violating the substantial improvement percentages during the lookback period? (e.g. - permit office, property appraiser, etc.)

What steps are taken to ensure that the substantial improvement percentages are not violated during the lookback period?

Besides considering the establishment of a lookback period, what other activities (that you are not currently getting credit for) have you considered (or are you considering) to increase the CRS credit points for your community, if any? Are you aware of other mitigation efforts that you have not undertaken that earn CRS credit points that may be easier or less costly to implement than a lookback period?

Are property improvements and associated improvement values that occur during a lookback period easily tracked and accessible, or does it require significant manpower?

- ○ Easily Tracked and Accessible (Automated System)
- ○ Easily Tracked and Accessible (Minimal Manpower)
- ○ Significant manpower is needed to track property and values

If tracking the value of substantial improvements involves significant manpower, what department(s) handle the burden of tracking? Select all that apply. (e.g., building permits, property appraisers, flood plain management)?

- ☐ Flood plain managers
- ☐ Building permit department
- ☐ Property appraisers
- ☐ Other (describe)
- ☐ I don't know

Does your office become involved in the building permitting process in your community? If so, at what point?

To the best of your knowledge, how many building permits are denied (per year) because the permit would constitute a violation of the substantial improvement percentages during the lookback period? (number only)

- ◯ 0-10
- ◯ 11-20
- ◯ 21-40
- ◯ 41-100
- ◯ 100+
- ◯ I don't know

We would like to know more about how the lookback period affects other building plans submitted by homeowners. Consider each of the following:

Do you think the lookback period limits incentives for residents to harden their structures from wind damage?	Yes ◯ No ◯
Do you think it limits the effectiveness of programs like My Safe Florida Homes?	Yes ◯ No ◯
Do you think it limits homeowners from undertaking projects that are necessary for other insurance purchases (e.g., the HO insurer wants a new roof for HO insurance)?	Yes ◯ No ◯
Do you think it limits homeowners from undertaking upgrades to modernize houses and increase home values overall?	Yes ◯ No ◯

If you are personally aware of any of these situations arising in your community, please provide some brief details or examples:

If we have further questions or need clarification, may we contact you?

- ◯ Yes
- ◯ No

If we have further questions or need clarification, may we contact you?

- ◯ Yes
- ◯ No

Thank you for allowing us to contact you. Can you please fill out your preferred contact information below?

Email

Phone Number

Name

Are you familiar with others in your community (permit reviewers, property appraisers, etc.) that are involved in the determination of substantial improvements and/or the lookback process that we should contact?

- ○ Yes
- ○ No

Please provide contact information for others in your community (permit reviewers, property appraisers, etc.) that are involved in determination of substantial improvements and/or the lookback process.

(Note: additional space provided)

Appendix J Survey of Flood Plain Managers: Technical Details

A sample of 470 flood plain managers in Florida were surveyed related to the flood risk of their area, the participation in the NFIP CRS program, and information related to lookback or cumulative substantial review periods. Initial surveys were sent on 9/25/24 and responses were collected through 11/11/24. Of the 470 surveys sent, we received usable responses from 86.[49] Tables J-1 through J-6 provide a summary of responses by county.

Table J-1. Survey Responses by County

County	Number of Responses		County	Number of Responses
Palm Beach	9		Charlotte	1
Miami-Dade	7		Citrus	1
Broward	6		Escambia	1
Orange	4		Flagler	1
Brevard	3		Gadsden	1
Flagler	3		Glades	1
Volusia	3		Hardee	1
Bay	2		Highlands	1
Collier	2		Indian River	1
Duval	2		Lee	1
Franklin	2		Leon	1
Jackson	2		Liberty	1
Lake	2		Manatee	1
Levy	2		Marion	1
Pasco	2		Monroe	1
Pinellas	2		Nassau	1
Polk	2		Okaloosa	1
Putnam	2		Osceola	1
Santa Rosa	2		Saint Lucie	1
Sarasota	2		Seminole	1
Alachua	1		St. Johns	1
Bradford	1		Suwanee	1
Calhoun	1			

[49] 16 Surveys were dropped due to incomplete data.

Table J-2. Original Flood Plain Managers and Lookback Periods

Table J-2		Does your community have a lookback period for substantial improvements for properties that are located in a flood plain?	
		Yes (66%)	No (34%)
Were you involved in community flood plain management when the decision to participate in the CRS program was made?	Yes (22%)	**9** (13%)	**6** (9%)
	No (78%)	**35** (52%)	**17** (25%)

n = 67

Table J-3. CRS Participation and Lookback Period

Table J3		Does your community have a lookback period for substantial improvements for properties that are located in a flood plain?	
		Yes (52%)	No (48%)
Does your community participate in the National Flood Insurance Community Rating System Program?	Yes (78%)	**44** (51%)	**23** (27%)
	No (22%)	**1** (1%)	**18** (21%)

n = 86

Table J-4. CRS Credit and Lookback Periods

Table J4		What is the length (in years) of the lookback period in your community?						
		No Answer	1	2	3	5	10	More than 10
Are you getting credit in the CRS Program for having a lookback program?	Yes	~	**2** (4%)	**1** (2%)	~	**10** (23%)	**6** (14%)	**1** (2%)
	No	~	**3** (7%)	**1** (2%)	~	**2** (4%)	~	~
	Unsure	**2** (4%)	**7** (16%)	**1** (2%)	**1** (2%)	**6** (14%)	**1** (2%)	~

n = 44

Table J-5. Ease of Tracking Improvements and Lookback Periods

Table J5		What is the length (in years) of the lookback period in your community?						
		No Answer	1	2	3	5	10	More than 10
Are property improvements and associated improvement values that occur during a lookback period easily tracked and accessible or does it require significant manpower?	Easily Tracked (Automated)	**1** (2%)	**2** (4%)	**~**	~	**2** (4%)	**~**	**~**
	Easily Tracked (Minimal Manpower)	**1** (2%)	**7** (16%)	**3** (7%)	~	**11** (25%)	**4** (9%)	**~**
	Significant Manpower (30%)	~	**3** (7%)	~	**1** (2%)	**5** (11%)	**3** (7%)	**1** (2%)

n = 44

Table J-6. Permit Denials and Lookback Periods

Table J6		What is the length (in years) of the lookback period in your community?						
		No Answer (4%)	1 (27%)	2 (7%)	3 (2%)	5 (41%)	10 (16%)	More than 10 (2%)
To the best of your knowledge, how many permits are denied (each year) because the permit would constitute a violation of the substantial improvement percentages during the lookback period?	No Answer (23%)	**1** (2%)	**3** (7%)	~	~	**4** (9%)	**2** (4%)	~
	0-10 (61%)	**1** (2%)	**6** (14%)	**2** (4%)	**1** (2%)	**13** (30%)	**4** (9%)	~
	11-20 (11%)	~	**1** (2%)	**1** (2%)	~	**1** (2%)	**1** (2%)	**1** (2%)
	21-40 (4%)	~	**2** (4%)	~	~	~	~	~

n = 44

Table J-7. Impact of Lookback Period and Lookback Period

Table J7		What is the length (in years) of the lookback period in your community?						
		No Answer (4%)	1 (27%)	2 (7%)	3 (2%)	5 (41%)	10 (16%)	More than 10 (2%)
Do you believe the lookback	Yes	~	**5** (11%)	**1** (2%)	**1** (2%)	**5** (11%)	**3** (7%)	**1** (2%)

period limits the ability of homeowners to harden their homes against wind damage?	No	**2** (4%)	**7** (16%)	**2** (4%)	~	**13** (30%)	**4** (9%)	~
Do you believe the lookback period limits the effectiveness of programs like *My Safe Florida Homes*?	Yes	~	**6** (14%)	**1** (2%)	**1** (2%)	**5** (11%)	**2** (4%)	~
	No	**2** (4%)	**6** (14%)	**2** (4%)	~	**13** (30%)	**5** (11%)	**1** (2%)
Do you believe the lookback period limits the ability of homeowners to undertake necessary projects for other insurance purchases?	Yes	~	**5** (11%)	**2** (4%)	**1** (2%)	**4** (9%)	**4** (9%)	**1** (2%)
	No	**2** (4%)	**7** (16%)	**1** (2%)	~	**14** 32%)	**3** (7%)	~
Do you believe the lookback period limits the ability of homeowners to undertake projects to modernize or increase the value of their homes?	Yes	**1** (2%)	**7** (16%)	**2** (4%)	**1** (2%)	**5** (11%)	**6** (14%)	**1** (2%)
	No	**1** (2%)	**5** (11%)	**1** (2%)	~	**13** (30%)	**1** (2%)	~

n = 44

Appendix K Florida Homeowners Survey Instrument

Florida Homeowners Survey

We appreciate your help in an important research project we are conducting at Florida State University for the Florida Office of Insurance Regulation. The purpose of our study is to understand the implications of certain rules about substantial improvements to property that have been established in some Florida communities. Specifically, we are interested in the impact of **lookback periods** on property development activities in flood hazard areas and decisions to purchase flood insurance coverage. A lookback period is a period of time in which all improvements to a property may be aggregated for the purposes of determining if the total improvements exceed 50% of the building value.

The following survey should take approximately 10-15-minutes. You will be asked to answer a series of questions about your knowledge of the National Flood Insurance Program's **Community Rating System** program, along with the implementation of **lookback periods** in your community, if such periods have been established. We will be focusing on your experience as a homeowner, including how lookback periods may have affected your home improvement activity.

We know that your time is valuable. If necessary, you will be able to leave the survey and return to finish it when it is more convenient.

Note that your responses will be anonymized for our research. For more details about the study, please refer to the Information Sheet that was included in the email, or contact Dr. Patricia Born, pborn@business.fsu.edu, 850-644-7884.

In which Florida community/city do you live?

Is your home located in a designated flood hazard area (i.e., do you live in a flood plain?)?

- ○ Yes
- ○ No
- ○ I don't know

Do you know if your community participates in the National Flood Insurance Community Rating System program?

- ○ Yes
- ○ No
- ○ I don't know

Do you purchase flood insurance through the National Flood Insurance Program?

- ○ Yes
- ○ No

Do you know that, depending on the National Flood Insurance Program community, some homeowners can receive a discount on flood insurance within or outside the special flood hazard area?

- ○ Yes
- ○ No

A **lookback period**, also known as a substantial improvement period in the National Flood Insurance Program (NFIP), refers to a designated timeframe during which improvements or repairs to a property are evaluated to determine if they meet the substantial improvement criteria, potentially impacting flood insurance requirements and compliance with flood plain management regulations. Are you familiar with lookback periods and their rules?

- ○ Yes
- ○ No

Have you ever applied for a building permit for you current home?

- ○ Yes
- ○ No

If so, how long ago (in years) was your most recent permit application?

If not, was concern relating to the NFIP lookback period one of the reasons you did not apply for the building permit?

- ○ Yes
- ○ No

Have you ever been denied a building permit because of the regulations surrounding the NFIP lookback period?

- ○ Yes
- ○ No

Have you ever delayed or forgone improvements because of the regulations surrounding the NFIP lookback period?

- ○ Yes
- ○ No

To show that you are paying attention, please select "All of the above".

- ○ Fun
- ○ Exciting
- ○ Strong
- ○ Attractive
- ○ Happy
- ○ All of the above

Appendix L Survey of Homeowners: Technical Details

Table L-1. Number of Responses by County

County	Responses	County	Responses
Alachua	6	Manatee	5
Bay	5	Marion	6
Bradford	1	Martin	3
Brevard	20	Miami-Dade	42
Broward	35	Monroe	1
Calhoun	1	Nassau	2
Charlotte	6	Okaloosa	7
Citrus	3	Orange	27
Clay	4	Osceola	10
Collier	5	Palm Beach	33
Columbia	4	Pasco	21
Duval	28	Pinellas	346
Escambia	13	Polk	23
Flagler	1	Putnam	3
Franklin	1	Santa Rosa	3
Hardee	1	Sarasota	9
Hendry	1	Seminole	15
Hernando	6	St. Johns	4
Highlands	1	St. Lucie	8
Hillsborough	36	Sumter	2
Holmes	1	Suwannee	1
Indian River	3	Union	1
Jackson	4	Volusia	13
Lake	7	Walton	1
Lee	16	Washington	1
Leon	7		

Table L-2. Respondents Who Purchase Flood Insurance, by County

County	Yes	No	Total	%
Alachua	0	0	0	0%
Bay	1	1	2	50%
Bradford	0	0	0	0%
Brevard	2	5	7	29%
Broward	13	5	18	72%
Calhoun	1	0	1	100%
Charlotte	1	1	2	50%
Citrus	1	0	1	100%
Clay	1	0	1	100%
Collier	2	0	2	100%
Columbia	1	0	1	100%
Duval	3	2	5	60%
Escambia	0	1	1	0%
Flagler	0	0	0	0%
Franklin	0	0	0	0%
Hardee	1	0	1	100%
Hendry	0	1	1	0%
Hernando	0	0	0	0%
Highlands	1	0	1	100%
Hillsborough	8	6	14	57%
Holmes	0	0	0	0%
Indian River	0	0	0	0%
Jackson	2	0	2	100%
Lake	1	0	1	100%
Lee	3	2	5	60%
Leon	1	0	1	100%

County	Yes	No	Total	%
Manatee	2	0	2	100%
Marion	0	1	1	0%
Martin	0	0	0	0%
Miami-Dade	19	7	26	73%
Monroe	1	0	1	100%
Nassau	0	0	0	0%
Okaloosa	1	0	1	100%
Orange	4	0	4	100%
Osceola	3	0	3	100%
Palm Beach	4	3	7	57%
Pasco	2	3	5	40%
Pinellas	58	65	123	47%
Polk	1	0	1	100%
Putnam	1	1	2	50%
Santa Rosa	0	0	0	0%
Sarasota	1	1	2	50%
Seminole	1	0	1	100%
St. Johns	1	0	1	100%
St. Lucie	4	0	4	100%
Sumter	1	0	1	100%
Suwannee	0	0	0	0%
Union	1	0	1	100%
Volusia	4	2	6	67%
Walton	0	0	0	0%
Washington	0	0	0	0%

Table L-3. Awareness of Participation in CRS and Potential CRS credit points

	Do you know if your community participates in the National Flood Insurance Community Rating System program?				Do you know that, depending on the community, some homeowners can receive a discount on flood insurance within or outside the special flood hazard area?		
County	**Yes**	**No**	**I don't know**	**Total**	**Yes**	**No**	**Total**
Alachua	2	3	1	6	2	4	6
Bay	1		4	5	1	4	5
Bradford			1	1		1	1
Brevard	8	1	11	20	4	16	20
Broward	14	7	14	35	13	22	35
Calhoun	1			1	1		1
Charlotte	2		4	6	2	4	6
Citrus		1	2	3		3	3
Clay			4	4	1	3	4
Collier	1		4	5	3	2	5
Columbia	1	1	2	4	1	3	4
Duval	6	5	17	28	10	18	28
Escambia	3	2	8	13	1	12	13
Flagler			1	1		1	1
Franklin		1		1		1	1
Hardee	1			1	1		1
Hendry			1	1		1	1
Hernando		2	4	6		6	6
Highlands			1	1		1	1
Hillsborough	10	10	16	36	17	19	36
Holmes			1	1		1	1
Indian River	1	1	1	3		3	3
Jackson	3		1	4	3	1	4
Lake	2	3	2	7	2	5	7
Lee	5	3	8	16	9	7	16
Leon	1	2	4	7		7	7
Manatee	3		2	5	3	2	5
Marion	2	1	3	6	3	3	6
Martin		2	1	3	2	1	3
Miami-Dade	23	11	8	42	23	19	42
Monroe	1			1		1	1

Nassau			2	2	1	1	2
Okaloosa			7	7	2	5	7
Orange	8	10	9	27	8	19	27
Osceola	3	1	6	10	4	6	10
Palm Beach	14	1	18	33	15	18	33
Pasco	6	4	11	21	8	13	21
Pinellas	101	60	185	346	103	243	346
Polk	5	5	13	23	11	12	23
Putnam			3	3	1	2	3
Santa Rosa	1		2	3	1	2	3
Sarasota	4	1	4	9	3	6	9
Seminole	1	7	7	15	3	12	15
St. Johns		1	3	4		4	4
St. Lucie	4	1	3	8	3	5	8
Sumter	1		1	2	2		2
Suwannee			1	1		1	1
Union	1			1	1		1
Volusia	4	4	5	13	4	9	13
Walton			1	1		1	1
Washington			1	1		1	1
Total	**244**	**151**	**408**	**803**	**272**	**531**	**803**

Table L-4. Responses to Lookback Period Question by County

Are you familiar with lookback periods and their rules?							
County	**Yes**	**No**	**Total**	**County**	**Yes**	**No**	**Total**
Alachua	3	3	6	Manatee	3	2	5
Bay	1	4	5	Marion	1	5	6
Bradford		1	1	Martin	1	2	3
Brevard	4	16	20	Miami-Dade	23	19	42
Broward	12	23	35	Monroe		1	1
Calhoun	1		1	Nassau		2	2
Charlotte	1	5	6	Okaloosa	1	6	7
Citrus		3	3	Orange	8	19	27
Clay		4	4	Osceola	3	7	10
Collier	2	3	5	Palm Beach	13	20	33
Columbia	1	3	4	Pasco	5	16	21
Duval	7	21	28	Pinellas	83	263	346
Escambia	2	11	13	Polk	5	18	23
Flagler		1	1	Putnam	1	2	3
Franklin		1	1	Santa Rosa		3	3
Hardee	1		1	Sarasota	2	7	9
Hendry		1	1	Seminole	3	12	15
Hernando	1	5	6	St. Johns		4	4
Highlands	1		1	St. Lucie	3	5	8
Hillsborough	13	23	36	Sumter	1	1	2
Holmes		1	1	Suwannee		1	1
Indian River	1	2	3	Union	1		1
Jackson	2	2	4	Volusia	4	9	13
Lake	2	5	7	Walton		1	1
Lee	6	10	16	Washington		1	1
Leon		7	7				

Table L-5. Building Permit Applications by County

County	Yes	No	Total	County	Yes	No	Total
Alachua	2	4	6	Manatee	2	3	5
Bay		5	5	Marion	2	4	6
Bradford		1	1	Martin	1	2	3
Brevard	9	11	20	Miami-Dade	21	21	42
Broward	12	23	35	Monroe		1	1
Calhoun	1		1	Nassau	2		2
Charlotte	4	2	6	Okaloosa	2	5	7
Citrus	2	1	3	Orange	11	16	27
Clay	1	3	4	Osceola	3	7	10
Collier	1	4	5	Palm Beach	14	19	33
Columbia	3	1	4	Pasco	7	14	21
Duval	6	22	28	Pinellas	142	204	346
Escambia	3	10	13	Polk	9	14	23
Flagler		1	1	Putnam	2	1	3
Franklin		1	1	Santa Rosa	1	2	3
Hardee	1		1	Sarasota	4	5	9
Hendry		1	1	Seminole	5	10	15
Hernando	3	3	6	St. Johns		4	4
Highlands	1		1	St. Lucie	6	2	8
Hillsborough	9	27	36	Sumter	1	1	2
Holmes		1	1	Suwannee	1		1
Indian River	2	1	3	Union	1		1
Jackson	3	1	4	Volusia	7	6	13
Lake	2	5	7	Walton		1	1
Lee	6	10	16	Washington		1	1
Leon	2	5	7				

Table L-6. Building Permit Application Denials by County

County	Yes	No	Total	County	Yes	No	Total
Alachua	1	1	2	Manatee	1	1	2
Bay			0	Marion		2	2
Bradford			0	Martin	1		1
Brevard		9	9	Miami-Dade	11	10	21
Broward		12	12	Monroe			0
Calhoun	1		1	Nassau		2	2
Charlotte		4	4	Okaloosa		2	2
Citrus		2	2	Orange	3	8	11
Clay		1	1	Osceola	1	2	3
Collier		1	1	Palm Beach	4	10	14
Columbia	1	2	3	Pasco	1	6	7
Duval	1	5	6	Pinellas	10	132	142
Escambia		3	3	Polk	1	8	9
Flagler			0	Putnam		2	2
Franklin			0	Santa Rosa		1	1
Hardee	1		1	Sarasota	1	3	4
Hendry			0	Seminole	1	4	5
Hernando		3	3	St. Johns			0
Highlands		1	1	St. Lucie	1	5	6
Hillsborough		9	9	Sumter	1		1
Holmes			0	Suwannee		1	1
Indian River		2	2	Union	1		1
Jackson	2	1	3	Volusia	1	6	7
Lake		2	2	Walton			0
Lee		6	6	Washington			0
Leon		2	2				

Table L-7. Homeowners That Delayed/Forgone Improvements Due to Lookback Periods by County

County	Yes	No	Total	County	Yes	No	Total
Alachua	1	1	2	Manatee	1	1	2
Bay			0	Marion		2	2
Bradford			0	Martin	1		1
Brevard	2	7	9	Miami-Dade	12	9	21
Broward	3	9	12	Monroe			0
Calhoun	1		1	Nassau		2	2
Charlotte		4	4	Okaloosa		2	2
Citrus		2	2	Orange	2	9	11
Clay		1	1	Osceola	1	2	3
Collier		1	1	Palm Beach	4	10	14
Columbia	1	2	3	Pasco	2	5	7
Duval	2	4	6	Pinellas	18	124	142
Escambia		3	3	Polk	1	8	9
Flagler			0	Putnam		2	2
Franklin			0	Santa Rosa		1	1
Hardee	1		1	Sarasota	1	3	4
Hendry			0	Seminole	2	3	5
Hernando		3	3	St. Johns			0
Highlands		1	1	St. Lucie	2	4	6
Hillsborough	1	8	9	Sumter	1		1
Holmes			0	Suwannee		1	1
Indian River		2	2	Union	1		1
Jackson	1	2	3	Volusia	2	5	7
Lake		2	2	Walton			0
Lee		6	6	Washington			0
Leon		2	2	**Total**	**64**	**253**	**317**

Table L-8. Homeowners that Did not Apply for a Permit Due to Lookback Periods by County

County	Yes	No	Total	County	Yes	No	Total
Alachua		4	4	Manatee		3	3
Bay		5	5	Marion	1	3	4
Bradford		1	1	Martin		2	2
Brevard		11	11	Miami-Dade	4	17	21
Broward	6	17	23	Monroe		1	1
Calhoun			0	Nassau			0
Charlotte		2	2	Okaloosa		5	5
Citrus		1	1	Orange	1	15	16
Clay		3	3	Osceola	1	6	7
Collier		4	4	Palm Beach		19	19
Columbia		1	1	Pasco	2	12	14
Duval	1	21	22	Pinellas	10	194	204
Escambia		10	10	Polk	1	13	14
Flagler		1	1	Putnam	1		1
Franklin		1	1	Santa Rosa		2	2
Hardee			0	Sarasota		5	5
Hendry		1	1	Seminole		10	10
Hernando		3	3	St. Johns		4	4
Highlands			0	St. Lucie		2	2
Hillsborough	4	23	27	Sumter		1	1
Holmes		1	1	Suwannee			0
Indian River	1		1	Union			0
Jackson		1	1	Volusia		6	6
Lake		5	5	Walton		1	1
Lee	3	7	10	Washington		1	1
Leon		5	5	**Total**	**36**	**450**	**486**