Estimating undisclosed flood risk in real estate transactions

Financial Implications for single-family home buyers in New Jersey, New York, and North Carolina

Commissioned by Natural Resources Defense Council (NRDC)

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Executive Summary

PURPOSE OF REPORT

The Natural Resources Defense Council (NRDC) is a not-for-profit organization that engaged Milliman, Inc. (Milliman), an independent actuarial consulting firm, to study the potential amount of undisclosed flood risk in New Jersey, New York, and North Carolina (the study area) by estimating the total number of homes damaged by prior flooding.

BACKGROUND

Like most states, those in the study area generally do not have laws that effectively require that flood damages be disclosed in real estate transactions. Homes that have experienced flooding in the past are more likely to experience flood damages in the future, meaning buyers of previously damaged homes can unknowingly purchase homes that are at an increased risk of flooding relative to the average home. Milliman estimates that less than 4% of homeowners in the United States have any flood insurance coverage,[1] potentially leaving unsuspecting buyers of previously damaged homes to be substantially more at risk of paying out of pocket for unexpected flood damages. Additionally, these home buyers could be less likely to purchase flood insurance without the awareness that a home had previously flooded, and those who do purchase insurance may be subject to higher premiums to insure their homes than they had anticipated.

KEY FINDINGS

Milliman's analysis for NRDC was developed using the KatRisk SpatialKat Flood and Storm Surge Models (KatRisk Model), flood exposure and loss data from the National Flood Insurance Program (NFIP) OpenFEMA Policy and Claim data (OpenFEMA), and single-family home property characteristics from the Milliman Market Basket (Market Basket). The analysis methodology is described fully in the Scope, Methodology, and Data section below.

Five key findings from this analysis are as follows:

1. In New Jersey, New York, and North Carolina, 28,826 homes were purchased in 2021 that were estimated to have been previously flooded. For 2021, This represents 6.6% of all homes sold in these states, and average annual costs due to flooding of $16 million in North Carolina, $18 million in New Jersey, and $23 million in New York for these high-risk properties. These states, like many other states, have disclosure laws that do little to require this information to be disclosed to a home buyer. See the table in Figure 2 below.
2. The analysis found that over a 15-year period the average buyer of a previously flooded home can expect to incur $18,164 in damages due to flood in North Carolina, $25,175 in New Jersey, and $46,887 in New York. Over a 30-year period those homeowners should expect to incur $36,328 in North Carolina, $50,351 in New Jersey, and $93,774 in New York, See the table in Figure 5 below.
3. The expected future annual losses for a home with prior flood damage are significantly higher than the average of all homes, regardless of flood damage, in each state. The average home in New Jersey, New York, and North Carolina with prior flood damage has an average annual loss (AAL)[2] of $1,873, compared to $83 for the average home. New York has the largest discrepancy between the average home, $104, and previously

[1] Evans, D.D., Hunley, L.A., & Katz, B. (January 28, 2022). Unpriced Costs of Flooding: An Emerging Risk for Homeowners and Lenders. Milliman Insight. Retrieved July 15, 2022, from https://www.milliman.com/en/insight/unpriced-costs-of-flooding-an-emerging-risk-for-homeowners-and-lenders.
[2] Average annual loss is the long-term average loss in a given year due to flooding.

flooded homes, $3,125. This represents a significant and potentially undisclosed financial risk to a home buyer over the duration of occupancy for homeowners. See the table in Figure 4 below.

4. Climate change is expected to increase flood damages through higher average sea levels and changes in precipitation patterns. This will likely adversely impact average AALs for homes that have already been flooded more than the average home in each state. For example, in New Jersey the average AAL for all homes with prior flood damage increases by $1,705, or 101% from the Standard scenario to the High scenario. The climate scenarios used are based on the Representative Concentration Pathway (RCP) 4.5 and 8.5 scenarios. See the Scope, Methodology, and Data section below for more details. This compares to an increase of only $36, or 30%, for the average home in the state. Similar large increases are estimated in the other two states. Over the duration of occupancy, these costs can become significant expenses for homeowners. See the table in Figure 4 below.

5. There is substantial variability in average AAL for homes with flood damages by geography. Geographic results are presented in this study by metropolitan statistical area (MSA).[3] The overall range of AAL for flooded homes across all three states is $19 to $13,000. For the High scenario (i.e., the scenario that reflects increased risk due to climate change), this range increases to $21 to $21,417 average AAL for homes with prior flood damage. This range shows that the financial impact could be even more substantial for homes in certain areas. See Exhibit 1 for complete results by geography.

Scope, methodology, and data

The scope of Milliman's analysis is to estimate the total number of single-family homes with flood damage in the study area between 2010 and 2021, as well as the risk of future flood damages for these homes relative to the average home. Milliman used the National Flood Insurance Program (NFIP) OpenFEMA Policy and Claim data as a starting point to determine historical flood damages. While this is the largest public data source for historical flood damages, it presents two significant challenges to this scope:

1. The OpenFEMA data only provides loss information for homes that had an NFIP policy at the time of loss, and for which the loss exceeded the policy deductible. The latter is a minor concern given flood losses tend to be of high severity. The former must be accounted for given that relatively few homes purchase NFIP policies (or any flood insurance policy), as evidenced by the fact that only 3.5% of the homes in the study area had an NFIP policy in 2021.

2. The exact locations of homes are not known, presenting a major challenge to estimating future flood damages for damaged homes, given that this estimate is highly sensitive to the geographic location and unique property features of the homes (e.g., elevation, distance to bodies of water, etc.).

To overcome these challenges, Milliman relied upon a flood model to simulate past flood events and a proprietary data set on single-family properties to produce estimates for homes not covered by the NFIP. Specifically, we relied upon the KatRisk SpatialKat Flood and Storm Surge Models (KatRisk Model), a fully probabilistic flood model capable of simulating both past and estimated future flood events. The KatRisk Model was applied to the Milliman Market Basket (Market Basket), a data set representing approximately 10% of single-family homes in New Jersey, New York, and North Carolina to simulate recent major flood events in the study area.

The KatRisk Model was used to obtain estimates of flood damages to individual single-family homes for 13 prior, simulated flood events that occurred after 2010 and impacted New Jersey, New York, or North Carolina (event losses). These events were:

- Hurricanes and tropical storms Earl, Sandy, Andrea, Arthur, Ana, Hermine, Matthew, Harvey, Irma, and Florence
- Louisiana floods of 2016
- Colorado floods of 2013

[3] MSA is defined by the U.S. Office of Management and Budget and used by the Census Bureau to define geographic areas with high population density.

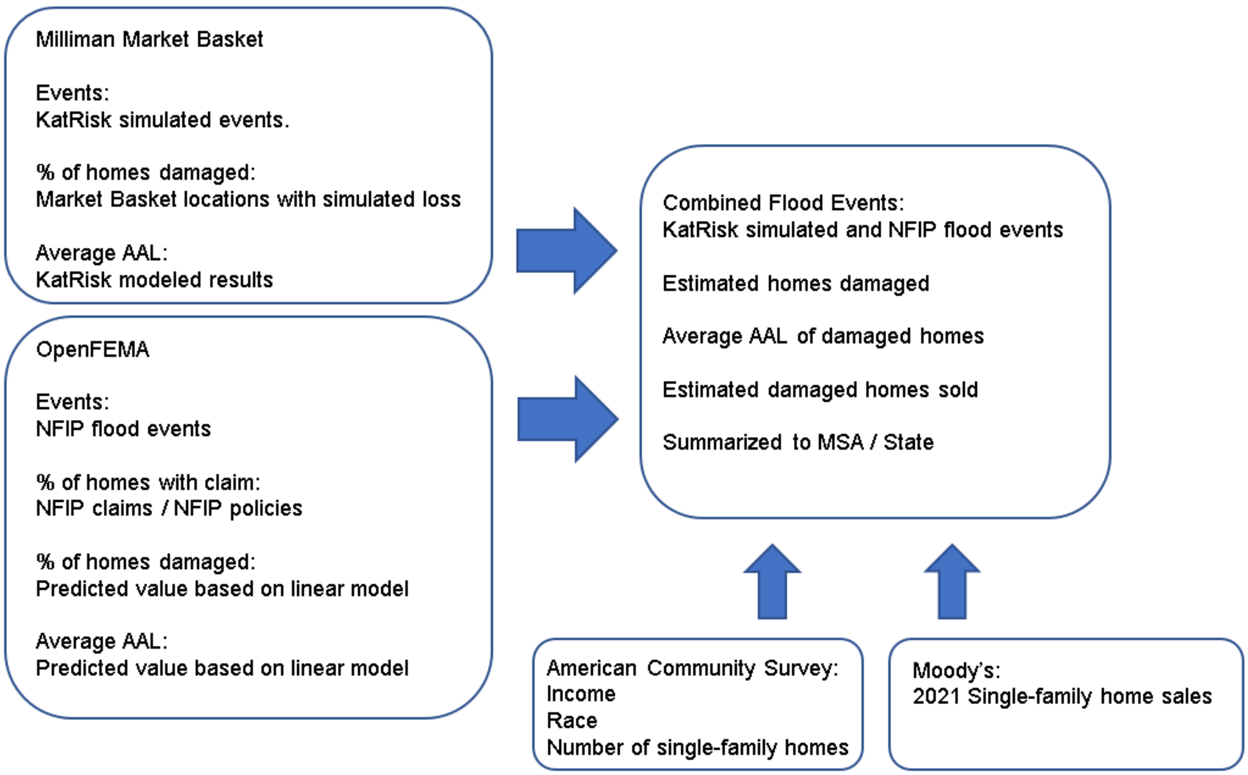
- Mississippi floods of 2011[4]

Additionally, for all homes in the Market Basket, AALs were obtained. Both event losses and AALs were provided assuming current climate conditions (the Standard scenario) as well as two additional climate scenarios:

- A Medium scenario based on the Representative Concentration Pathway (RCP) 4.5 scenario, which is a reasonable estimation of what will happen if, on average, global economies are able to stabilize and begin to reduce greenhouse gases in the near future.
- A High scenario based on the RCP 8.5 scenario, which is generally considered to be close to a worst-case scenario wherein global economies progress with a "business as usual" approach.

For more information on the KatRisk Model, Market Basket, and Medium and High climate scenarios, please see https://www.soa.org/globalassets/assets/files/resources/research-report/2020/soa-flood-report.pdf.

FIGURE 1: DATA DIAGRAM OF ANALYSIS



For each of the simulated events, the number of total homes damaged was estimated, as well as the AAL for each of the damaged homes. In addition to these 13 events, Milliman estimated that there are another 24 flood events that occurred in our study area between 2010 and 2021 based on the OpenFEMA data.[5] For each of these remaining events, the percentage of NFIP policies that had a claim was calculated and used to predict the total number of damaged homes and AAL of damaged homes. Using the simulated events at the metropolitan statistical area (MSA) level, we found a statistically significant relationship between the total number of homes damaged and the percentage of NFIP policies that had a claim in the same event. Specifically, as the percentage of NFIP policies with a claim increases, so does the percentage of all homes that had any flood damage. This relationship is expected and provides a validation of the model results. We also found a statistically significant relationship between the percentage of NFIP

[4] While these three events were focused on the states in which they are named, damages occurred in other states, including those within the study area.

[5] A flood event was defined for the purpose of this analysis as a 10-day period with at least 162 claims. Along with the historical modeled events, 97% of NFIP claims are captured in the analysis.

policies with a claim and the average AAL of homes with flood damage at the MSA level in the simulated events. As the percentage of NFIP policies with a claim increases, the average AAL of homes with flood damage decreases. This relationship makes intuitive sense as, in general, flood events that only impact a few homes will tend to impact the most flood-prone homes within an area. As the severity of the event increases, relatively less flood-prone homes are damaged, which marginally decreases the average AAL of damaged homes. Despite this negative relationship, damaged homes in an event are estimated to have AAL significantly higher than the statewide average.

Once the number of damaged homes was estimated for all flood events in the study area from 2010 to 2021, the number of homes damaged was summed across all events and to the MSA level. As homes were subject to repetitive damage across flood events over the period analyzed, an adjustment was applied to estimate the number of unique homes with flood damage based on the number of total claims. This adjustment factor was calculated as the statewide ratio of unique NFIP claim locations relative to total NFIP claims from 2010 to 2021. The estimate of damaged homes by MSA from 2010 to 2021 was then calculated by multiplying the number of homes damaged across all events at the MSA level by the adjustment factor.

When showing estimates of home sales, we used Moody's home sales data combined with our estimates of homes with prior flood damages to estimate the number of homes sold in 2021 with prior flood damages. This estimate was calculated as the percentage of single-family homes damaged between 2010 and 2021 multiplied by estimated single-family homes sales by MSA.

Highlights of analysis

Homes that have a previous flooding event are more likely to have another flood loss, and the average loss associated with those homes is significantly higher. In New York, the average AAL for all homes is $93.18 (Figure 4 below) compared to $3,125.83 (Figure 4) for homes with prior flood damage. New Jersey and North Carolina also see substantial differences in AAL between the average home and homes with prior flood damage: $61.49 versus $1,210.94 for North Carolina and $103.86 versus $1,678.38 for New Jersey.

The implication of these differences is that someone who is purchasing a home with prior flood damages, but is unaware of the damages and believes the home has average flood risk, might be underestimating their flood risk by a factor between 15 and 32. The table in Figure 2 shows the number of home sales in 2021 that are estimated to have had previous flood damages along with other summary statistics related to the study. The total cost due to flooding these homes is $16.7 million in North Carolina, $18.2 million in New Jersey, and $23.6 million in New York. Without proper flood disclosure, the new home buyer would not know the risk and potential lifetime cost associated with the home.

FIGURE 2: SUMMARY STATISTICS ON NUMBER OF SINGLE-FAMILY HOMES

State	Total Single-Family Homes[6]	Single-Family Homes With NFIP Claim (since 2010)	Estimated Single-Family Homes With Flood Damages[7]	Estimated Home Sales With Flood Damages	Total Cost of Flooding
North Carolina	2,794,715	25,652	290,542	13,237	$16,678,123
New Jersey	2,050,882	66,147	120,306	7,944	18,268,516
New York	3,451,832	54,106	135,216	7,645	23,566,217

The table in Figure 3 illustrates the recent magnitude of flood damages. During the study period, the National Flood Insurance Program (NFIP) has paid out $8.1 billion dollars in flood claims in New Jersey, New York, and North Carolina. The average payment for New York is $56,745, which is the highest of the three states, and North Carolina

[6] Based on 2019 American Community Survey (ACS) data.
[7] Homes sales based on Moody's 2021 single-family home sales data.

has the lowest average payment of $30,562. These dollar values represent a serious flood risk but are also an incomplete picture of flood damages as they only represent insured damages. Damages where homeowners were not insured by the NFIP, or where the insurance did not provide complete protection for flooding, are not considered in these statistics

FIGURE 3: SUMMARY STATISTICS ON NUMBER OF SINGLE-FAMILY HOMES

State	Total NFIP Paid Claims	Average NFIP Paid Loss[8]
North Carolina	$912,626,763	$30,562
New Jersey	3,870,775,993	50,891
New York	3,690,493,795	56,745

Under current climate conditions, the differences between the average home and a home that has been flooded are stark. With climate change, these differences increase further. The percentage increase in AAL for homes with prior flood damage under the Medium scenario compared to the Standard scenario is between 21% (North Carolina) and 30% (New Jersey). This is in contrast to only increasing by 10% to 12% for the average home in the study states. Under the High scenario, both New Jersey and New York have twice the estimated AAL for damaged homes relative to the Standard scenario. North Carolina would see a still significant 68%, increase for these homes under the High Scenario. Overall, the effect of climate change will adversely impact homeowners whose homes have already been flooded significantly more than the average homeowner in each state.

FIGURE 4: AVERAGE ANNUAL LOSS BY STATE AND SCENARIO

	Standard Scenario		Medium Scenario		High Scenario	
State	AAL All Homes	AAL Damaged Homes	AAL All Homes	AAL Damaged Homes	AAL All Homes	AAL Damaged Homes
North Carolina	$61.49	$1,210.94	$67.86	$1,467.27	$81.72	$2,034.20
New Jersey	103.86	1,678.38	116.76	2,180.50	139.82	3,383.77
New York	93.18	3,125.83	104.91	3,991.47	125.48	6,289.45

The total cost of flood damage over the life of a 15-year or 30-year period is expected to be a significant amount for a home with previous flood damage. For example, if a home in New York is occupied for 15 years, we would expect an average flood cost of $46,887 over the 15-year period ($46,887 = 15 * $3,125) for a previously flooded home in New York. Whereas the average home in New York would see only $1,397 in flood costs over the same time period of 15 years ($1,397 = 15 * $93.18). This difference in flood costs highlights the importance of flood disclosure laws so that home buyers have a clear picture of the potential financial burden from flooding.

[8] The average paid claim amount is calculated from OpenFEMA for single-family homes, excluding negative values, and capping values at $380,000.

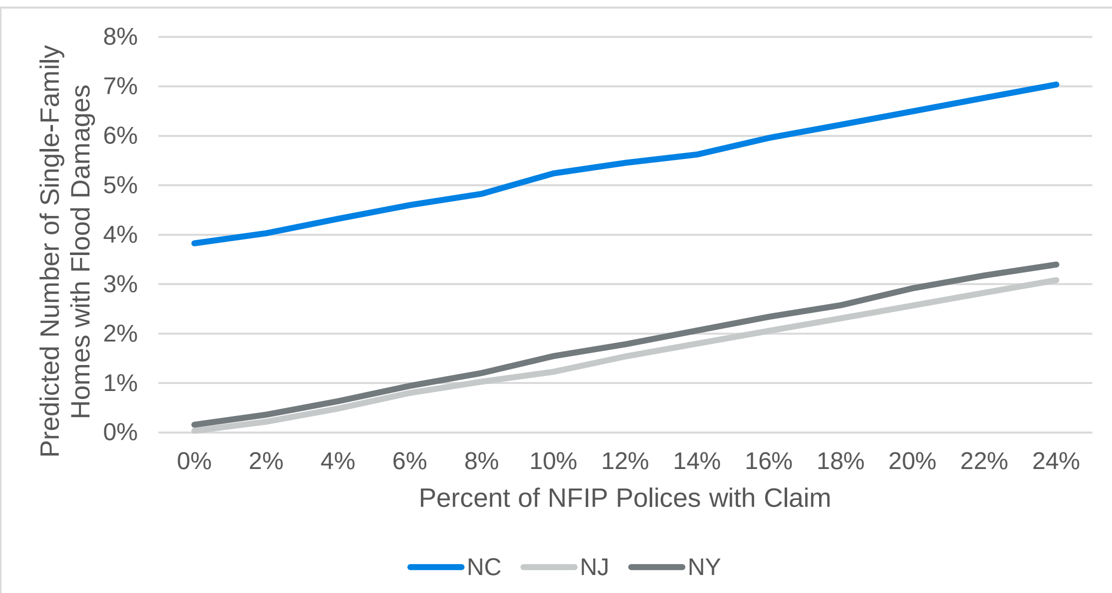
FIGURE 5: AVERAGE FLOOD COST BY STATE FOR STANDARD SCENARIO OVER 15 OR 30 YEARS

	Average Flood Cost 15 Year			Average Flood Cost 30 Year		
State	Standard Scenario	Medium Scenario	High Scenario	Standard Scenario	Medium Scenario	High Scenario
North Carolina	$18,164	$22,009	$30,512	$36,328	$44,018	$61,025
New Jersey	25,175	32,707	50,756	50,351	65,415	101,513
New York	46,887	59,872	94,341	93,774	119,774	188,683

DAMAGED HOMES AND AVERAGE ANNUAL LOSS PREDICTIONS

Our analysis relies on multiple linear models to predict the percentage of damaged homes and the average AAL in previous NFIP events we identified. We found significant relationships between the percentage of NFIP policies with a claim and our target variables along with significant state differences. Figure 6 shows the predicted trend line relationship between the percentage of NFIP policies with a claim and the percentage of homes damaged. The state effect for North Carolina is significantly higher compared to New Jersey and New York, indicating North Carolina has more flood-damaged homes than the other two states.

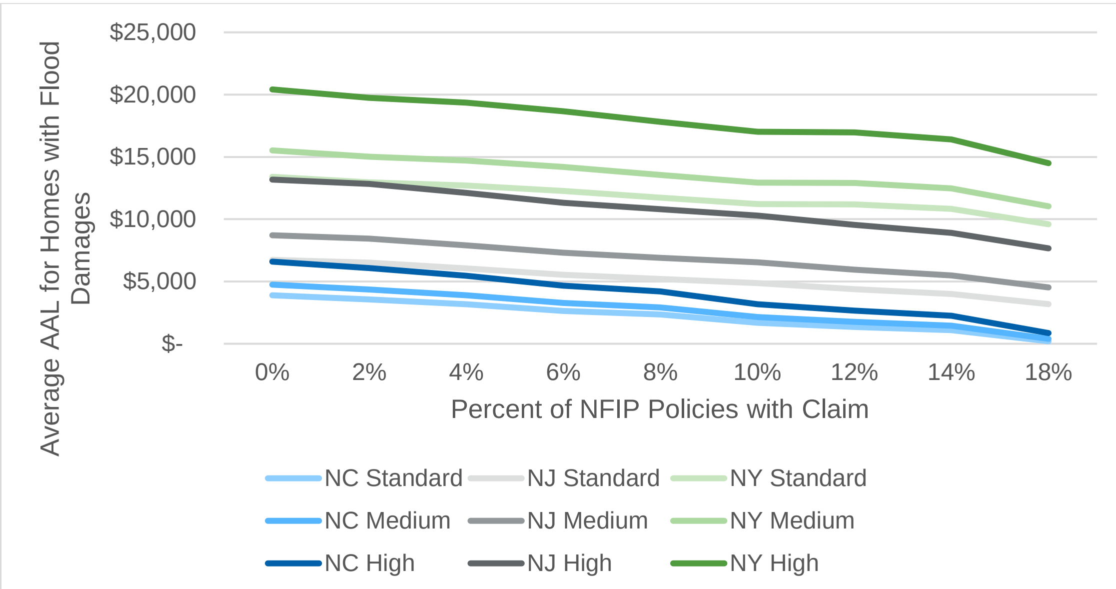
FIGURE 6: PERCENTAGE OF HOMES WITH PRIOR FLOOD DAMAGE BY NFIP CLAIM PERCENTAGES



Three models were developed to predict average AAL for each of the climate scenarios. Each model predicts the average AAL for a climate scenario, Standard, Medium, and High, predicted by the percentage of NFIP claims and the state. This structure allows the effects to vary between the scenarios, resulting in a representative estimate for each climate change scenario. It also is intuitive that the effect for the percentage of NFIP policies with a claim would vary between the different climate scenarios. This interacting effect between claim percentage and scenario can be seen in Figure 7 by the lines not being parallel.

Figure 7 shows the trend line for each scenario and for each state. The overall relationship between AAL and percentage of NFIP policies with a claim is decreasing. This relationship is expected because of the nature of large flood events compared to small events. The highest-risk homes are more likely to be flooded, so if a small event occurs it is most likely the highest-AAL homes would be affected. This leads to the average cost of future losses for homes damaged in those small events to be higher. As expected, the Medium and High climate scenarios have larger average AALs than the Standard scenario. This underscores the substantially larger impact of climate change on homes with prior flood damages.

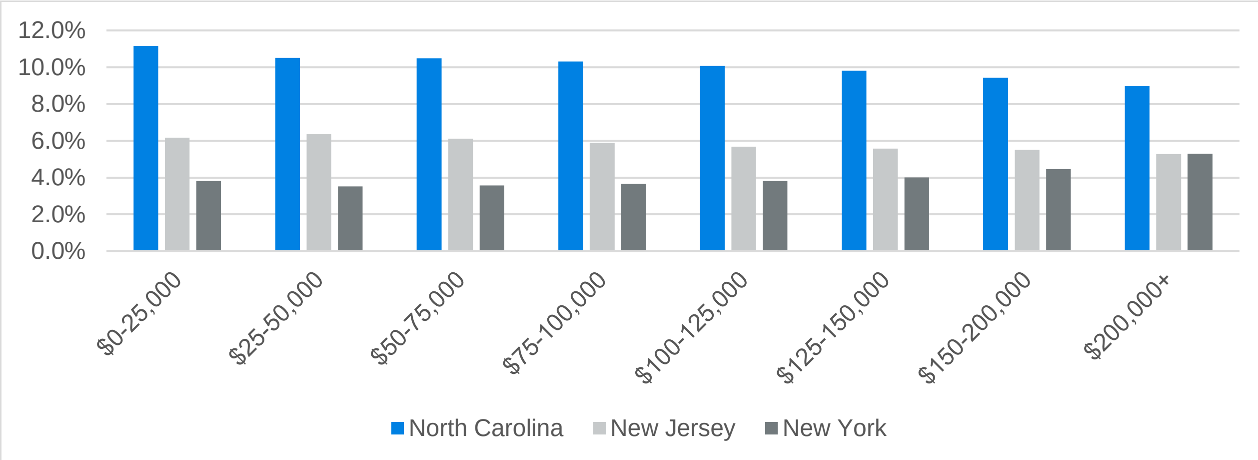
FIGURE 7: AVERAGE ANNUAL LOSS BY NFIP CLAIM PERCENTAGES



It is also estimated that climate change will have a significant impact on the cost of flood risk over the long term. We estimate the 30-year cost of flooding in our current climate scenario to be $56,213 on average for previously flooded homes in the study area. This cost estimate is calculated by multiplying the AAL for the respective state and scenario by a factor of 30. Under the Medium climate scenario, we estimate this cost will rise by 25% to $70,453, which is seen as a likely scenario given the current trends in addressing climate change. The 30-year cost close to doubles under the High scenario, to $105,892. These numbers are significantly higher than the 30-year cost for the average home, which is $2,469 for the Standard scenario, rising only to $3,294 for the High scenario.

DEMOGRAPHIC TRENDS

FIGURE 8: PERCENTAGE OF HOMES WITH PRIOR FLOOD DAMAGE BY INCOME



We also reviewed demographic trends (see Exhibit 2, Page 1) and found differing trends by state. The American Community Survey (ACS) five-year study provides demographic information by income. The ACS data along with our estimates of flood-damaged homes creates an estimate of the damaged homes in each income bracket. As shown in Figure 8, the percentage of homes damaged in floods by income bracket has differing trends from state to state. The trend for North Carolina is decreasing from the lowest income bracket, 11.1%, to the highest income bracket, 9.0%. New Jersey has a flatter slope to its decreasing trend, 6.2% to 5.5%. The opposite trend is seen in New York, 3.8% to 4.5% for the lowest to highest income brackets.

Limitations

Use of report

The data and exhibits in this report are provided to support the conclusions contained herein, limited to the scope of work specified by NRDC, and may not be suitable for other purposes. Milliman is available to answer any questions regarding this report or any other aspect of our review.

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Data reliances

In performing the services we relied on data and other information obtained from OpenFEMA, KatRisk, and other sources. Beyond the scope of work as previously described, we will not audit, verify, or review the data and other information for reasonableness and consistency. Such a review is beyond the scope of our assignment. If the underlying data or information is inaccurate or incomplete, the results of our analysis may likewise be inaccurate or incomplete. In that event, the results of our analysis may not be suitable for the intended purpose.

Variability of results

Any projection of future loss relativities involves estimates of future contingencies. While our analysis is based on sound actuarial principles, it is important to note that variation from the projected result is not only possible, but, in fact, probable. While the degree of such variation cannot be quantified, it could be in either direction from the projections. Such uncertainty is inherent in any set of actuarial projections.

Model reliances

Our analysis is based in part on the KatRisk SpatialKat Flood Model. To the extent that the selected model is biased, the resulting rates will be biased. An analysis based on different catastrophe models would likely produce a different result.

Uncertainty

Differences between our projections and actual amounts depend on the extent to which future experience conforms to the assumptions made for the analyses. It is certain that actual experience will not conform exactly to the assumptions to be used in these analyses. Actual amounts will differ from projected amounts to the extent that actual experience is better or worse than expected.

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Natural Resources Defense Council
Undisclosed Flood Risk

Estimated Homes Sold with Prior Flood Damage, and AAL Per Home with Flood Damage
North Carolina, New Jersey, New York

(1) State	(2) Metropolitan Statistical Area	(3) Single-Family Homes Note (1)	(4) Single-Family Homes Prior Flood Damage Note (2)	(5) Percent of Homes with Prior Flood Damage = (4) / (3)	(6) Total Home Sales Note (3)	(7) Homes Sales Prior Flood Damage = (5) x (6)	(8) Average AAL Standard Prior Flood Damage Note (4)	(9) Average AAL Standard All Homes Note (5)	(10) Dollar Difference Standard = (8) - (9)	(9) Average AAL Medium Prior Flood Damage Note (4)	(10) Average AAL Medium All Homes Note (5)	(11) Dollar Difference Medium = (9) - (10)	(10) Average AAL High Prior Flood Damage Note (4)	(11) Average AAL High All Homes Note (5)	(12) Dollar Difference High = (10) - (11)
NC	Albemarle	18,700	1,375	7.4%	906	67	$190	$24	$166	$201	$25	$175	$219	$27	$191
NC	Asheville	131,099	3,040	2.3%	7,098	165	2,139	59	2,079	2,627	62	2,565	3,704	69	3,635
NC	Boone	14,124	681	4.8%	684	33	3,138	122	3,015	3,761	130	3,631	5,099	143	4,956
NC	Brevard	10,985	127	1.2%	532	6	2,346	92	2,253	2,924	97	2,827	4,191	107	4,084
NC	Burlington	45,591	942	2.1%	1,309	27	1,730	24	1,707	2,077	25	2,052	2,810	27	2,784
NC	Charlotte-Concord-Gastonia	590,033	57,569	9.8%	34,988	3,414	472	40	433	545	41	503	700	45	656
NC	Cullowhee	15,176	90	0.6%	735	4	3,889	212	3,678	4,742	221	4,521	6,588	244	6,344
NC	Durham-Chapel Hill	169,458	4,732	2.8%	7,414	207	1,363	28	1,334	1,622	30	1,592	2,160	31	2,129
NC	Elizabeth City	15,194	1,800	11.8%	736	87	2,312	47	2,265	3,009	62	2,947	4,715	112	4,603
NC	Fayetteville	131,699	34,295	26.0%	3,110	810	249	36	213	289	38	251	367	39	329
NC	Forest City	19,071	451	2.4%	924	22	2,752	36	2,716	3,107	37	3,070	3,891	40	3,850
NC	Goldsboro	29,496	2,245	7.6%	1,306	99	637	37	600	754	38	716	1,000	40	961
NC	Greensboro-High Point	208,332	2,873	1.4%	9,088	125	1,293	16	1,277	1,533	17	1,516	2,036	19	2,017
NC	Greenville	42,407	1,174	2.8%	1,911	53	2,467	57	2,410	2,991	59	2,932	4,120	62	4,058
NC	Henderson	10,649	68	0.6%	516	3	1,762	18	1,744	2,154	19	2,135	2,997	20	2,977
NC	Hickory-Lenoir-Morganton	101,810	2,885	2.8%	4,388	124	2,387	31	2,356	2,938	33	2,905	4,139	36	4,103
NC	Jacksonville	46,790	8,917	19.1%	2,504	477	5,704	171	5,533	6,573	192	6,381	8,389	236	8,153
NC	Kill Devil Hills	13,153	9,035	68.7%	637	438	2,344	365	1,979	3,125	524	2,601	4,838	918	3,920
NC	Kinston	14,082	998	7.1%	682	48	1,181	30	1,151	1,429	31	1,398	1,963	32	1,930
NC	Laurinburg	8,037	6,323	78.7%	389	306	19	19	0	20	20	1	21	20	1
NC	Lumberton	24,248	19,255	79.4%	1,175	933	79	37	43	90	38	52	111	39	72
NC	Marion	11,201	58	0.5%	543	3	2,728	122	2,606	2,828	128	2,700	3,071	145	2,927
NC	Morehead City	21,542	7,993	37.1%	1,043	387	3,253	278	2,974	4,208	372	3,836	6,232	594	5,638
NC	Mount Airy	20,100	113	0.6%	974	5	169	13	156	186	14	172	208	15	193
NC	Myrtle Beach-Conway-North Myrtle Beach	41,765	24,458	58.6%	666	390	1,566	256	1,309	1,880	287	1,592	2,606	362	2,244
NC	New Bern	37,352	10,152	27.2%	1,413	384	1,171	107	1,065	1,472	133	1,339	2,149	194	1,955
NC	Non-MSA	157,871	14,642	9.3%	7,647	709	790	64	725	961	69	892	1,350	79	1,271
NC	North Wilkesboro	19,662	344	1.7%	952	17	1,999	48	1,951	2,288	50	2,237	2,876	54	2,822
NC	Pinehurst-Southern Pines	29,723	4,739	15.9%	1,440	230	270	36	234	305	38	267	370	40	330
NC	Raleigh-Cary	359,121	8,856	2.5%	17,394	429	1,860	62	1,798	2,171	66	2,106	2,796	68	2,728
NC	Roanoke Rapids	20,458	102	0.5%	991	5	2,160	22	2,138	2,632	23	2,609	3,654	24	3,630
NC	Rockingham	11,870	4,590	38.7%	575	222	62	9	53	73	10	63	95	10	85
NC	Rocky Mount	37,604	1,072	2.9%	988	28	2,492	33	2,458	3,021	35	2,986	4,160	36	4,124
NC	Sanford	15,775	2,274	14.4%	764	110	309	38	270	350	41	310	424	43	381
NC	Shelby	25,871	84	0.3%	1,253	4	2,125	15	2,111	2,592	15	2,577	3,610	17	3,593
NC	Virginia Beach-Norfolk-Newport News	14,993	2,600	17.3%	23	4	2,516	56	2,460	3,185	72	3,113	4,770	128	4,643
NC	Washington	13,073	3,874	29.6%	633	188	1,219	91	1,129	1,528	116	1,412	2,227	179	2,048
NC	Wilmington	82,401	41,260	50.1%	4,917	2,462	1,844	279	1,565	2,248	318	1,930	3,188	416	2,772
NC	Wilson	21,384	1,751	8.2%	1,036	85	1,850	32	1,818	2,253	34	2,220	3,125	35	3,090
NC	Winston-Salem	192,815	2,704	1.4%	9,027	127	2,977	18	2,959	3,625	19	3,607	5,028	20	5,008
NJ	Allentown-Bethlehem-Easton	32,586	51	0.2%	1,470	2	6,324	94	6,230	8,227	102	8,125	12,543	107	12,436
NJ	Atlantic City-Hammonton	68,681	13,421	19.5%	5,021	981	249	50	199	385	71	314	800	139	661
NJ	New York-Newark-Jersey City	1,409,265	72,998	5.2%	80,889	4,190	1,886	120	1,766	2,451	134	2,317	3,798	159	3,639
NJ	Ocean City	31,710	22,718	71.6%	3,133	2,245	4,185	623	3,562	5,845	893	4,952	9,763	1,572	8,192
NJ	Philadelphia-Camden-Wilmington	378,038	9,964	2.6%	17,794	469	1,206	79	1,127	1,415	82	1,333	1,882	87	1,795
NJ	Trenton-Princeton	93,029	451	0.5%	4,968	24	5,039	66	4,973	6,713	70	6,643	10,546	74	10,473
NJ	Vineland-Bridgeton	37,573	704	1.9%	1,751	33	825	14	811	1,141	16	1,125	1,878	20	1,858
NY	Albany-Schenectady-Troy	219,839	2,046	0.9%	14,342	134	936	41	894	1,048	44	1,004	1,274	47	1,227
NY	Amsterdam	12,289	295	2.4%	677	16	1,823	61	1,763	2,054	65	1,989	2,547	69	2,477
NY	Auburn	21,985	288	1.3%	1,212	16	3,368	21	3,348	3,879	22	3,857	5,027	23	5,004
NY	Batavia	17,758	2	0.0%	979	0	13,404	17	13,387	15,523	19	15,504	20,417	20	20,397
NY	Binghamton	66,088	1,811	2.7%	2,293	63	1,213	49	1,164	1,372	54	1,318	1,655	55	1,600
NY	Buffalo-Cheektowaga	314,697	112	0.0%	13,042	5	13,258	25	13,233	15,351	27	15,324	20,191	29	20,162
NY	Corning	27,676	1,303	4.7%	1,525	72	591	65	526	649	70	579	719	72	646
NY	Cortland	11,967	1,285	10.7%	660	71	773	114	659	862	127	735	975	136	839
NY	Elmira	24,542	720	2.9%	1,155	34	436	30	407	491	32	459	582	33	549
NY	Glens Falls	38,044	396	1.0%	1,918	20	4,239	43	4,195	4,803	46	4,757	6,089	49	6,041
NY	Gloversville	15,674	150	1.0%	864	8	2,390	41	2,349	2,723	45	2,677	3,423	49	3,375
NY	Hudson	18,593	15	0.1%	1,025	1	12,829	122	12,708	14,846	133	14,713	19,524	142	19,382
NY	Ithaca	21,844	740	3.4%	744	25	1,496	129	1,367	1,679	143	1,536	1,862	150	1,711
NY	Jamestown-Dunkirk-Fredonia	37,987	46	0.1%	2,094	3	12,726	20	12,706	14,724	22	14,702	19,364	23	19,341
NY	Kingston	49,831	95	0.2%	3,331	6	7,438	99	7,339	8,577	107	8,470	11,218	112	11,106
NY	Malone	13,723	411	3.0%	756	23	755	28	726	850	31	819	1,016	32	984
NY	New York-Newark-Jersey City	1,570,967	110,897	7.1%	90,171	6,365	3,284	120	3,165	4,124	134	3,990	6,482	159	6,323
NY	Non-MSA	111,357	2,126	1.9%	6,138	117	1,440	110	1,330	1,611	120	1,491	1,902	125	1,777
NY	Ogdensburg-Massena	29,838	789	2.6%	1,645	43	738	28	710	807	30	777	902	31	871
NY	Olean	22,485	30	0.1%	1,239	2	1,472	42	1,430	1,704	46	1,658	2,238	48	2,190
NY	Ithaca	16,128	552	3.4%	889	30	1,294	129	1,164	1,430	143	1,287	1,602	150	1,451
NY	Jamestown-Dunkirk-Fredonia	19,766	764	3.9%	1,089	42	3,237	20	3,217	3,695	22	3,673	4,753	23	4,730
NY	Kingston	164,658	615	0.4%	9,075	34	11,892	99	11,793	13,751	107	13,644	18,077	112	17,964
NY	Malone	311,137	1,651	0.5%	18,026	96	1,256	28	1,228	1,444	31	1,413	1,853	32	1,820
NY	New York-Newark-Jersey City	9,899	115	1.2%	546	6	2,366	120	2,247	2,687	134	2,553	3,416	159	3,257
NY	Non-MSA	179,580	4,625	2.6%	9,058	233	494	110	384	561	120	442	700	125	575
NY	Ogdensburg-Massena	76,428	3,191	4.2%	4,093	171	5,062	28	5,035	5,809	30	5,779	7,599	31	7,569
NY	Olean	27,052	147	0.5%	1,665	9	6,159	42	6,118	1,704	46	1,658	9,309	48	9,261
		8,297,429	546,064	6.6%	438,587	28,826	$1,874	$83		$2,348	$92		$3,530	$110	$4,599

Notes:
1. Data from American Community 5-year Survey 2019
2. = (1) x predicted number of damaged homes x adjustment factor. Adjustment factor is unique locations with NFIP claim divided by total NFIP claims.
3. Home sales from Moody's Analytics Baseline Scenario, limited to areas with previous flooding events.
4. Average AAL from KatRisk model, weighted by number of homes with prior flood damage.
5. Average AAL from KatRisk model for all MarketBasket locations, weighted by census single-family homes.

Natural Resources Defense Council
Undisclosed Flood Risk

Number of Single-Family Homes with Prior Flood Damage by Income
North Carolina, New Jersey, New York

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Total Single-Family Homes with Prior Flood Damage	Estimated % of Single-Family Homes with Prior Flood Damage							
State	Note (1)	Income $0-25,000 Note (2)	Income $25-50,000 Note (2)	Income $50-75,000 Note (2)	Income $75-100,000 Note (2)	Income $100-125,000 Note (2)	Income $125-150,000 Note (2)	Income $150-200,000 Note (2)	Income $200,000 or More Note (2)
NC	290,542	11.1%	10.5%	10.5%	10.3%	10.1%	9.8%	9.4%	9.0%
NJ	120,306	6.2%	6.4%	6.1%	5.9%	5.7%	5.6%	5.5%	5.3%
NY	135,216	3.8%	3.5%	3.6%	3.7%	3.8%	4.0%	4.5%	5.3%
Total	546,064	21.1%	20.4%	20.2%	19.8%	19.6%	19.4%	19.4%	19.6%

Notes:
1. Home sales from Moody's Analytics Baseline Scenario, limited to areas with previous flooding events.
2. = damaged SFH in income bucket / total SFH in income bucket