

# **Adaptive Management Plan for Kiawah Island**

## **Phase I- Threshold Identification**

### **November 2020**



**Report Prepared by the Adaptive Management Task Force**

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## **EXECUTIVE SUMMARY**

The Kiawah Island Community Association (KICA), with the support of the Town of Kiawah, established a task force to initiate the development of an Adaptive Management Plan (AMP) to assist Kiawah in addressing the impacts of sea level rise, climate change and flooding on the island. This plan includes a structured process that identifies goals and objectives, implements management decisions, and carefully monitors the system. In the case of sea level rise and climate change impacts on Kiawah Island, the goals are to address unacceptable impacts on quality of life. These unacceptable conditions are “*thresholds*”, situations that we never want to reach.

During this first phase of work, the AMP Taskforce organized focus groups, a community survey, a commercial entity survey, and conducted interviews with key stakeholders in the Kiawah community. The results of this work verified that property owners are concerned about the impact of sea level rise, climate change and flooding on their quality of life. Property owners felt the many situations involving flooding were of equal importance and described a holistic view of addressing this on Kiawah. The feedback from this community engagement facilitated the identification of threshold areas. Key recommendations for next steps include for the Town and KICA to:

1. Accept and refine the threshold conditions that resulted from this effort.
2. Commit to developing a fully functioning AMP, proceed with the things they need to do in order to establish this, and ensure that this plan is institutionalized on behalf of the Kiawah community.
3. Continue to collect information on and improve our understanding of the Kiawah environment, including supporting research programs that add to our knowledge base.
4. Monitor and annually report key information to the Kiawah community and other stakeholders.

## **BACKGROUND INFORMATION**

In the spring of 2017, the Town of Kiawah formed a subcommittee of the Environmental Committee to study the impacts of sea level rise, climate change and flooding on the island. As a barrier island, Kiawah is exposed to the trends affecting the regional coastline. Rising sea levels have been documented for the Charleston area and flooding has become increasingly common during both storms and higher tides. Kiawah has been affected by heavy flooding of roads and low-lying areas during major rainstorms and surges associated with storms and king tides.

The subcommittee submitted its report to the Town Council in September 2018. This report, *Flood Mitigation and Sea Level Rise Adaptation for Kiawah Island, SC* (<https://www.kiawahisland.org/floodandsealevelrise/>), was the result of 18 months of study into the challenges of sea level rise, as well as the environmental consequences of increasing periods of drought broken by periods of intense rainfall.

The 2018 report concluded that “Kiawah Island .... will face significant flooding challenges during the next 30 years. Both drought and intense rainfall events are projected to become more frequent.” The underlying cause of these environmental changes is the continuing warming of the atmosphere and the oceans. This rise in temperature has led to an increase in sea level, primarily due to the melting of glaciers and ice sheets and secondarily from the thermal expansion of the oceans. Since the report was submitted to the Town in 2018, reports from NOAA and other sources indicated that the global mean sea level has continued to increase. This provides evidence that these changes in the climate are continuing to grow.

To meet these challenges, the 2018 Town study provided over one hundred recommendations for how the island could respond. The report also proposed that the Town and the Kiawah Island Community Association (KICA) should develop an Adaptive Management Plan (AMP) to provide a flexible long-term planning process under conditions of high uncertainty.

Both the Town and KICA responded positively to the report and undertook a variety of proactive actions in response to the recommendations. These actions have included:

- The Town has added actions on sea level rise to the Town's Comprehensive Plan, and KICA has added sea level rise to their Strategic Plan.
- KICA hired a Resiliency Specialist to coordinate the community's various strategies to address sea level rise, flooding, and other environmental issues that challenge the quality of life and sustainable living in a coastal community.
- KICA formed a Water Management Task Force to develop plans to solve existing flooding problems in several areas and identify funding. These plans were approved overwhelmingly by members of the Association.
- The Town has Installed a new tide gauge and weather station to improve monitoring capabilities.
- With support from the Town, the Kiawah Conservancy has undertaken projects to improve the knowledge about Kiawah's salt marshes and groundwater.

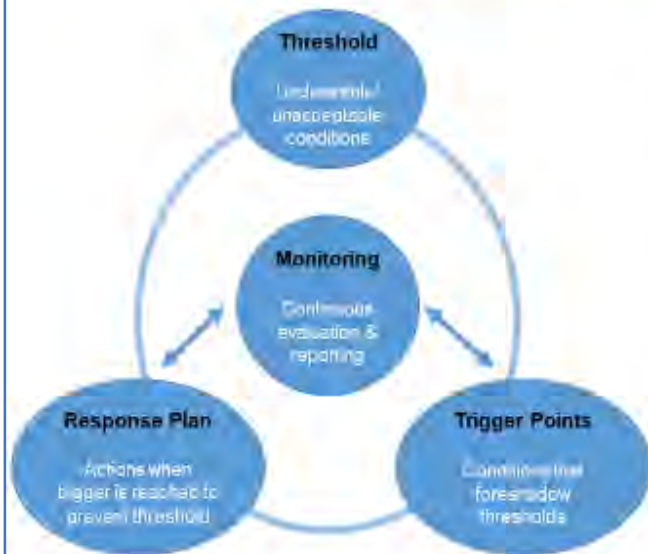
### **Adaptive Management Plan**

In January 2020, Mayor Weaver asked several individuals who had worked to develop the 2018 report to review the accomplishments to date and recommend what should be done next. In addition to Mayor Weaver and some Town staff, Jimmy Bailey (COO) and Lucas Hernandez (Resilience Specialist) from KICA participated. While some significant recommendations from the report had been undertaken by both the Town and KICA, the Adaptive Management Plan (AMP) approach to comprehensive, long-range planning for issues arising from sea level rise and climate changes had not been created or institutionalized. The Town and KICA decided that work should begin on building the basis for an AMP by gathering input from Kiawah property owners on their concerns about sea level rise and climate change. A task force under KICA's auspices, supported by the Town, was approved to guide this initial phase of development of an AMP to monitor conditions on Kiawah that may require intervention. The overall goal is to have a fully functioning Kiawah Island AMP as soon as feasible.

There is a great deal of uncertainty associated with exactly when sea levels will reach certain heights and what both the predicted and unforeseen impacts of climate change may be for Kiawah Island. In such an environment, some decisions and actions need to be taken now while others can be postponed. For this reason, an Adaptive Management Plan was proposed, which is a structured, iterative process that identifies goals and objectives, implements management decisions, and carefully monitors the system. The monitoring information is used to learn about the system, thereby reducing uncertainty, and to revise and improve on management strategies. This process improves long-term management outcomes.

In the case of sea level rise and climate change impacts on Kiawah Island, the goals are to define unacceptable conditions that impact 1.) public infrastructure (e.g., stormwater management, road accessibility, community amenities), 2.) private property (e.g., residence protection, landscaping resilience, property values), and 3.) the environment (e.g., beach, marsh, forests). These unacceptable conditions are **thresholds**, situations that we never want to reach. In order to provide ample warning that a threshold is being approached, we need to identify **trigger points**, essentially conditions that when reached provide warnings that actions need to be undertaken. The threshold and trigger points need to be quantified in terms of the frequency and the duration of events. To know when a trigger point is reached requires one or more indicators that can be systematically monitored through an institutionalized **monitoring program**. Monitoring provides valuable information for decision-makers and for all property owners to learn how sea level rise and climate change are impacting the island. If a trigger point is reached, the appropriate responsible entity implements a management action or **response plan**, either to prevent the threshold from being reached or to implement actions to adapt to that threshold. Once enacted, it is important to continue monitoring the indicators to determine whether the response plan is working. If not, the response must be modified based on the new knowledge obtained. A generalized diagram of this process is shown in the following figure.

## Sea Level Rise Adaptive Management Plan



- **Threshold** - the time at which the quality of life, economic viability, infrastructure, or aspirations of Kiawah are negatively impacted by an undesirable or unacceptable condition.
- **Trigger Point** - the time at which a condition is reached that forewarns of an impending threshold and causes decisions to be made in response.
- **Monitoring Program** - institutionalized actions that measure and track parameters to indicate when a trigger point is reached; review and adjust as necessary.
- **Response Plan** - the preplanned action to be taken when a trigger point is reached in order to prevent a threshold from being reached.

An adaptive management approach allows decision-makers to plan for, prioritize, and stagger investments in adaptation options. Identifying trigger points and thresholds helps them to know when to take action and when to revisit decisions or prior actions. This adaptive management approach does not lock a community into one path for decades with investments that might waste resources and prove to be futile. Instead, it allows decision-makers to learn from past actions and to incorporate new information that may become available in the future.

Adaptive management provides an approach to address sea level rise, with implementation spread out over time, and allows for capital development, community support, and new options to develop. Should it become necessary, Kiawah will be ready to respond with pre-considered plans. Regular monitoring of actions already taken as well as actual changes as trigger points are approached allows decision-makers to establish and re-establish schedules and to take advantage of new options that may develop without shutting off alternative pathways. Because of the uncertainty of dealing with sea level rise and climate change, adaptive management permits comprehensive, long-range

planning so that decision-makers know when to take action and are prepared to do so. Just as important, however, adaptive management guards against the unnecessary expenditure of resources to fix hypothetical problems that do not yet exist or may never develop. **Appendix A** contains further detail on the steps to establish a full Adaptive Management Plan.

**A fully functioning Adaptive Management Plan for Kiawah could be in place and functioning by early 2022.**



## **PROCESS FOR PHASE I**

There were two major goals for Phase I of this project to develop an Adaptive Management Plan (AMP) for Kiawah:

- to engage the community in identifying conditions related to sea level rise, flooding, and climate change that they find unacceptable.
- to assess the point at which the quality of life, economic viability, infrastructure, or aspirations of Kiawah are negatively impacted by an undesirable or unacceptable condition.

Information was obtained by conducting two virtual focus groups and a community wide survey. To augment information provided by property owners key stakeholders were also interviewed or surveyed.

### **Virtual Focus Groups**

Although the initial plan was to hold face-to-face focus groups, virtual focus groups were utilized due to the Covid-19 outbreak. All 32 individuals who volunteered were accepted into one of two virtual groups, held on separate days, and reflected a reasonably good balance of property owners across the island. The smaller break-out groups were balanced with full time/part time owners, people who rent their properties, and people with differing geographical locations on the island. Volunteers were expected to read the materials provided, which included the 2018 Sea Level Rise report, and a *Naturally Kiawah* article on sea level rise. The time commitment for the readings and virtual focus groups was approximately 5 hours per participant.

On each day of the focus groups a brief overview of the project was given, and then the group of 15 to 16 participants divided into 3 smaller groups to facilitate discussion. After a brainstorming exercise in the break-out groups, participants worked on identifying unacceptable conditions. The format for these statements was consistent across all break-out groups: "It would not be ok if...because....", and comments were transcribed verbatim. When the larger group of 15 to 16 participants reconvened, these statements

were reviewed and any additional information and themes noted. A total of 54 statements were received from the 2 virtual focus groups.

### **Development of Threshold statements**

The 54 statements generated from the facilitated group activity were refined into 17 threshold areas for use in the community survey, culling out redundancies and identifying items that reflected overall themes instead of thresholds. A standard set of answers to assess property owners' tolerance for various flooding scenarios was developed.

### **Community Survey**

The survey was developed using the threshold areas with duration and frequency indicators, except for the environment content where a level of concern scale was utilized. A general statement of concern about flooding, sea-level rise and climate change was included as a possible benchmark question that could be utilized in future surveys. The announcement inviting property owners to participate included a statement of purpose of the survey as well as links to relevant information, including the sea level rise report and a *Naturally Kiawah* article on sea level rise.

The survey was sent to virtual focus group participants and Taskforce members for testing and review. Following updates, the survey was also sent to the KICA Board and Mayor Craig Weaver. Upon review, the quantifiable indicators for the threshold areas were eliminated and replaced with a level of concern. A question with ranking of the areas of concern was added and the Taskforce relabeled thresholds "quality of life concerns."

Raw data from the survey can be found in **Appendix B** and discussion of the results can be found in the "Findings and Information Collected" section of this report.

## Interviews and Additional Surveys

To supplement information received from property owners, key stakeholders were interviewed or surveyed by the Taskforce. This additional information was used to help inform survey thresholds, conclusions and next steps. Themes and results from these interviews and surveys can be viewed in the “Findings and Information Collected” section of this report.

Interviews with representatives from the Kiawah Golf Resort and Kiawah Development Partners were completed by a team of Taskforce members. Interviewees were sent a list of questions to ensure a focus for the interviews. A short survey was also sent to the Kiawah Conservancy and answers consolidated by Lee Bundrick for the Taskforce.

To gain input from commercial entities a survey was developed and sent to a total of 73 companies that sell, rent and manage properties on Kiawah, including Regimes. This short survey focused on what these companies were hearing from prospective buyers and renters, as well as current property owner customers. Survey results are summarized in Findings and Information Collected section of this report.

### AMP Taskforce Timeline

Taskforce Approved by Town and KICA	July 7, and 13, 2020
Key Interviews	August 2020
Virtual Focus Groups	August 13 and 18, 2020
First Survey review	September 11, 2020
Survey rewrite review	October 5, 2020
Survey out to community	October 7 to 21, 2020
Report completed	November 23, 2020
Report out to Town/KICA	December 1 and 7, 2020

## **FINDINGS AND INFORMATION COLLECTED**

### **Themes from Focus Group Discussions**

A number of themes came out of the focus group discussions. These themes provide insight into the perspectives of property owners about the ways in which sea level rise, climate change and flooding could make Kiawah a place where they no longer want to live, visit or maintain an investment property. Three general observations stood out:

- The 2018 “Flood and Sea Level Rise Adaptation Report” was well accepted and offered useful recommendations for how the island should respond to the challenges of sea level rise and other environmental changes that might impact Kiawah.
- Participant concerns varied depending on how long they had been property owners, how much time they spent here, and on where their property was located.
- Flooding can be tolerated up to a certain point. People can learn to live with flooding until a breaking point is reached. At this point flooding is no longer an inconvenience but becomes a quality of life and safety issue. Without adaptation measures property owners will begin to choose to sell their properties and look elsewhere to live or invest.

The following descriptions reflect overarching themes from the group discussions that participants provided when developing threshold areas.

#### **The Holistic Nature of Kiawah**

A major theme that came through in the group discussions is that *the unique combination of natural environment, careful planning and recreation opportunities is key to Kiawah’s attraction as an investment, second home and full-time residence as well as a place to visit*. These are defining characteristics of Kiawah that are hard to duplicate. The key elements of the Kiawah environment are the setting with natural vegetation, extensive salt marshes, wide beaches, maritime forests, the presence of extensive bird and animal life, and world class amenities. The loss of any of these elements will seriously degrade

the Kiawah experience and likely cause current owners to reconsider their decision to keep property and change the attractiveness for potential investors. The challenges of sea level rise, climate change and flooding need to be approached in a holistic way that considers all of these elements. The adaptation plans should not just focus on individual pieces but on all of these issues.

### **The Importance of Coordination of Actions**

The need for coordinated planning and actions by the island's key organizations was another theme in the focus group's discussions. The two main governance bodies on the island, the Town and KICA, will need to work together closely in facing long-term challenges. The differences in their areas of responsibilities should not hinder the work on providing the needed actions on adaptation.

The Kiawah Island Golf Resort and the Kiawah Development Partners also play key roles in planning and implementation of adaptation actions. The Kiawah Island Golf Resort controls a significant amount of land and a number of properties on the island. The Kiawah Development Partners are still actively developing areas on the island either directly or through other groups. They will need to take into account how these developments may affect flooding as well as Kiawah's environment. The Kiawah Development Partners also manage the Architectural Review Board (ARB) and will need to ensure the ARB's policies are supportive of adaptation strategies.

The focus groups also highlighted the importance of transparency in the actions of all of the major entities on the island. There will need to be clear information about the strategies, actions and costs to adapt to sea level rise, climate change and flooding. One participant said that property owners need to be given clear information about "what is being done that makes people want to stay here."

The focus groups noted the need to coordinate Kiawah's actions with the surrounding governments, especially Charleston County, the City of Charleston and other island communities. If the access to Kiawah is not maintained, then the investment in some of

Kiawah's adaptation actions may be undercut. The focus groups wanted to be assured that Kiawah has effective plans for quickly dealing with major hurricane damage, such as the loss of bridges and road blockage

### **Flooding Concerns**

Several themes about flooding concerns emerged from the focus group discussions. The most common was the impact from flooding on mobility and access. The participants noted that flooding can make roads impassable and property owners, their guests and service providers will not be able to freely use the roads. The participants indicated that an unacceptable situation on Kiawah was determined not just by the severity and duration of an event or situation but also by how often it occurred. Concern was expressed about the ability of fire, EMS and police services to freely access properties on the island in the case of an emergency. The limitation on mobility and access was specifically mentioned as an area where inconvenience can become a safety issue for people on the island. Standing water that does not drain quickly was noted as a threat to vehicles through engine damage and corrosion as well as a potential threat to the infrastructure of the roads.

Another theme related to flooding was the impact on water and electric utilities and internet services. Prolonged outages of these services due to equipment damage caused by flooding was mentioned as a potential safety issue.

Private property damage was another theme in the discussions. Flood water can enter garages and damage personal property, especially vehicles in the garage. Flood waters can also damage landscaping, requiring replacement. There was concern about the lack of monitoring and regulation of property owner actions that create negative impacts on the island and neighboring properties. Repeated damage to properties can result in expensive repairs and possibly higher insurance rates.

Concern was also expressed about the impact of flooding on island amenities including the golf courses, tennis courts, leisure trails and beaches. Flooding can make these amenities, which are a key aspect of the Kiawah experience, unusable and inaccessible.

### **Environment Issues**

The focus groups also discussed the importance of Kiawah's environment as a defining aspect of life on the island. There was particular concern about the health of the marsh and its ability to serve the function of sustaining wildlife and providing storm surge protection in a future of higher sea levels. The importance of determining who is responsible for the health of the marsh was also mentioned as a key concern. While the beach is very important, focus group participants seemed reassured by the Town's Beach Management Plan and expressed few immediate concerns about the beach.

### **Themes from Interviews and Short Surveys**

The need for collaboration, robust plans, comprehensive solutions, ways to protect property and businesses, being strategic and ensuring that there were resources to do what is necessary—these were areas of agreement based on feedback received from stakeholder groups who provided input for this Phase I of the Adaptive Management Plan (AMP) project.

The AMP was identified as the next step in the 2018 SLR report from the Town of Kiawah. With some initiatives underway, Mayor Weaver asked what the next steps should be to put a plan like this in place for Kiawah. He wanted to know what the community thinks. Up to this point it has been a one-way dialogue from the experts, and he was hopeful to augment this with feedback from property owners on areas of their highest concern. Mayor Weaver said there are also links to the recent HR&A Market Study and what brings people to Kiawah—the “Brand”—natural environment, quality of life, and potential for investment. He added that while we can measure flooding, changes to the natural habitat are gradual and unless we are monitoring these, changes might be missed until it is too late to intervene.

A similar theme was echoed by Roger Warren, President of the Kiawah Island Golf Resort. Kiawah needs someone with the appropriate level of expertise to understand the island and what needs to be done, at what expense, look at the locations and options, and then find the resources available to do what is necessary. He also highlighted the Ocean Course, a “Jewel of the island”, as a large concern whose loss would impact not only the Resort but the whole Island. He mentioned the issues that the course has faced in several areas with erosion. Ultimately, the Resort is focused on delivering the business and experience they now provide and promise guests, rooted in access to facilities and the island.

Maintaining access to primary roads and efficiency of the master drainage system were also mentioned by Mark Permar, Kiawah Development Partners, along with integrating new building and development practices that support the natural environment of the island. Increasing property owner's awareness of how their improvements impact neighboring properties is another item on his list. He looks forward to “bold moves” to solve environmental challenges, continuous improvements to water management and drainage, and solutions that solve multiple issues at once.

Finally, the Kiawah Conservancy acknowledged the changing nature of the areas currently in preservation due to sea level rise. Standing water from intense storm events, rain and high tides could potentially impact the roots of canopy trees and, as a result, will negatively affect the ecological integrity of the area. Continued engagement efforts with property owners and entities on the island, with proactive measures and planning, are also mentioned.

### **HR&A Housing Market Study**

The Town of Kiawah Island partnered with HR&A, an industry-leading real estate and economic development consulting firm, to assess the long-term health of Kiawah's housing market in August 2020. This study was aimed at understanding the factors that influence property values and how Kiawah Island compares to similar communities.



HR&A found that the combination of natural environment and world class amenities are key in differentiating Kiawah from other similar communities. Sea level rise, climate change, and flooding were also identified as key themes when a buyer chooses to purchase a home on Kiawah Island. Learning how to mitigate these negative perceptions and demonstrate that proactive action plans are in place will provide Kiawah with a competitive edge over other coastal communities.

### **Commercial Entity Survey**

To round out information provided by interviews a brief survey was developed and sent to all rental agencies, property management companies, and real estate agencies documented by both KICA and the Town of Kiawah. A total of 49 rental agencies/property management companies and 20 real estate agencies were contacted to respond to this survey. Of the full list of 75 contacts, 22 responses were received, a response rate of roughly 29%. The response numbers are fairly low for real estate and rental agency groups and may not be representative of all the experiences that commercial entities have with clients on the island.

Across all respondents:

- The majority of responses from commercial entities on the island (73%) indicated that they do not receive questions about climate change and the impact of sea level rise on Kiawah Island.
- The two categories of most frequently asked questions to commercial entities were about tropical storms (68%) and hurricanes (95%).

Real Estate:

- There were 5 out of a possible 21 responses from entities that identified as selling real estate.
- The majority of responses indicated that clients have not stopped purchasing property that may be more vulnerable to flooding, such as those on the marsh or in pre-identified flooding areas.
- Buyers asked about previous flooding and/or storm events “somewhat often” when deciding to buy on Kiawah.

- Flooding in the garage or under the home had the most influence on the decision to buy.
- When selling undeveloped lots, the real estate group indicated that flooding and storm surge do not often impact the decision to buy.

#### Rental Agencies:

- There were 8 out of a possible 39 responses from entities that identified as rental agencies.
- The answers provided were inconclusive due to the small sample size.

#### Property Management:

- There were 19 out of a possible 25 responses from entities that identified as property management groups.
- The property management group responded that owners and renters are not asking for improvements or changes due to concerns about flooding or sea level rise. Thus, they rarely need to intervene or make suggestions to remedy these kinds of issues.

#### Comparative Analysis:

- When looking at the combined total of responses from both rental and property management groups, 56% indicated that they did not often have to intervene during a weather event on behalf of owners or renters.
- The majority of clients have not asked about climate change and sea-level rise on Kiawah Island, but they do ask about hurricanes, tropical storms, and general flooding.

## Community Survey

### Demographics

The survey received 1564 completed responses, which is a response rate of about 17% of potential property owners. The demographics reflect a fairly good distribution of types of property and location, residency status and years on Kiawah. Highlights of the demographic percentages are listed below with a complete break out in **Appendix B**.

- The locations of properties were listed as: pond (29%); golf (24%), wooded lot (23%), marsh (18%), ocean (13%) and river (6%). (More than one location was permitted)
- The majority indicated that they consider Kiawah a secondary residence (54%)
- Nearly 70% indicated they own a single-family home, with 21% villas/condos
- More than half have owned property for more than 11 years
- More than a third said they were on Kiawah less than 3 months, with about a quarter indicated more than 9 months in a single year
- While 59% said they had not been impacted by flooding on Kiawah
  - 55% who owned property on the marsh indicated that they had been impacted by flooding
  - 47% of the people on the river experienced flooding
  - 51% of people who owned property for more than 20 years experienced flooding
  - Almost 70% of people who are on the island for 9 months or more each year also indicated that they had been personally impacted by flooding

### Survey Results

A high level of concern about flooding, sea level and climate change is reflected in responses to the survey questions. The results of the survey have been analyzed and broken down into various categories of concern. The responses are presented in three categories where the two highest levels of concern, extremely concerned and moderately concerned, are combined. The weighted average of all the responses to a question are also presented. Graphs of each question from the survey, as well as questions analyzed by demographics, can be viewed in **Appendix B**.

### **Very High Level of Concern (greater than 70% highly and moderately concerned)**

Seventy-three percent (73%) of the respondents indicate that they have a very high level of concern *about erosion to the beach and damage to the dune system*. This level of concern is consistent across all demographic categories. Six percent (6%) of the responses indicated that they were not concerned about this issue.

### **High levels of Concern (50-70% highly and moderately concerned)**

Sixty-eight percent (68%) of respondents indicate they are highly concerned about *losing access to utility services (electricity, water, internet, etc.)* due to flooding. The level of concern is highest among owners by the marsh, and owners who are permanent residents. Seven percent (7%) said they are not concerned.

Sixty-eight percent (68%) of respondents indicate they are highly concerned about *damage to the health of our salt marshes* due to sea level rise and climate change. The level of concern is highest among respondents who live near the marsh. Four percent (4%) of the respondents said they are not concerned.

Sixty-seven percent (67%) of respondents indicate they are highly concerned about *damage to the maritime forest from saltwater intrusion and loss of freshwater resources*. The high level of concern is consistent across all of the demographic categories. Eight percent (8%) of respondents said they are not concerned.

Sixty-seven percent (67%) of respondents indicate they are highly concerned that flooding could *increase the cost of ownership such as maintenance, repairs, assessments, etc.* This level of concern is consistent across all demographic categories. Eight percent (8%) of respondents said they are not concerned.

Sixty-five percent (65%) of respondents indicate that they are highly concerned about the *long-term impacts on their life on Kiawah due to future predicted levels of flooding, sea level rise, and climate change*. This level of concern is consistent across all of the

demographic categories. Nine percent (9%) of the respondents indicated that they are not concerned.

Sixty-five percent (65%) of respondents indicate they are highly concerned that *rising water levels will cause damage to wildlife habitat*. This level of concern is consistent across all demographic categories. Nine percent (9%) of respondents indicate that they are not concerned.

Fifty-eight percent (58%) of respondents indicate they are highly concerned about *flooding that could result in damage to private property such as garages, vehicles, HVAC units, etc.* This level of concern is highest among respondents who live near the marsh and the river. Ten percent (10%) of respondents are not concerned.

**Moderate level of concern (30-50% highly concerned and moderately concerned)**

Forty-nine percent (49%) respondents indicate they are concerned that *flooding could result in road closures that prevent them from going about daily activities*. Levels of concern are highest among those living in marsh and golf properties and those who live here more than 9 months out of the year. Five percent (5%) of respondents indicate that this is not of concern.

Forty-nine percent (49%) of the respondents indicated that they are concerned that flooding could result in their being *unable to use island amenities such as leisure trails, beaches, golf and tennis*. This concern is consistent across all of the demographic areas. Eleven percent (11%) of the respondents indicate that this is not of concern.

Forty-four percent (44%) of the respondents indicated that flooding could result in *damage to their landscaping*. This concern is highest for respondents living on the marsh and river and also to those who spend more than six months on the island. Seventeen percent (11%) of the respondents indicate that this is not of concern.

Forty-two percent (42%) of respondents indicate that they are concerned about the *permanent loss of their property due to rising water levels in the marsh, ponds, or the ocean*. Respondents who live on the marsh indicate a much higher level of concern about permanent loss of property. Twenty percent (20%) of respondents indicate that this is not a concern for them. An additional 131 respondents indicate this concern does apply to them.

Forty percent (40%) of respondents indicate they are concerned *that standing water on roadways could damage your vehicles and infrastructure*. Respondents living on the marsh express the highest level of concern. Eleven percent (11%) of respondents indicate that this is not of concern to them.

### **Weighted score of questions**

Participants in the focus groups and survey identified areas of concern as interrelated and difficult to differentiate, preferring a holistic view. The results from the ranking question did not provide clear preferences. Arranging the level of concern questions by a weighted score (1 to 5) also resulted in a minimal differentiation in the order of concern among these items, validating feedback received from respondents about all of these items being of concern. There is no significant difference among these rankings and they should not be interpreted as rankings of priorities.

<b>Question area- concerns about:</b>	<b>Weighted Score</b>
<b>erosion to the beach and damage to our dune system</b>	3.95
<b>losing access to utility services (electricity, water, internet, etc.)</b>	3.84
<b>damage to the health of our salt marshes</b>	3.79
<b>an increase in the cost of ownership</b>	3.77
<b>damage to our maritime forest</b>	3.74
<b>long-term impacts on your quality of life on Kiawah</b>	3.72
<b>damage to wildlife habitat</b>	3.68
<b>damage to your private property</b>	3.55
<b>road closures that prevent you from going about your daily activities</b>	3.46
<b>being unable to use island amenities</b>	3.28
<b>standing water on the road</b>	3.09
<b>damage to your landscaping</b>	3.08
<b>permanent loss of land on your property due to rising water levels</b>	3.08

## **THRESHOLD CONDITION IDENTIFICATION**

A principal objective for the Adaptive Management Plan Task Force was to identify threshold conditions that will negatively impact the quality of life on Kiawah as a first step in the preparation of an Adaptive Management Plan (AMP). The Task Force was not able to develop specific threshold statements because the final survey design did not provide enough specific information. The information developed through the virtual focus groups, interviews and surveys did, however, permit the identification of threshold areas that the Town and KICA can use to define specific thresholds for the AMP.

Kiawah's attractiveness for property owners and visitors is driven by multiple features including the natural environment, amenities, and local cultural attractions. This holistic view of the island showed up in both the virtual focus groups and the community survey. An AMP must include a broad view of the island's features in defining a set of thresholds.

A threshold is defined as:

*The time at which the quality of life, economic viability, infrastructure, or aspirations of Kiawah are negatively impacted by an undesirable or unacceptable condition.*

Effective thresholds need the following characteristics:

- Quantifiable– with metrics based on the specifics of the threshold
- Measurable– capable of being monitored
- Actionable – actions to avoid reaching a threshold that are identifiable and technically and economically feasible

Based on the work of this Task Force, the following conditions have been identified for consideration as thresholds for the AMP.

### ***Flooding – Roads***

Flooding on roads was identified in the virtual focus groups and in the community survey as a key condition that can affect the quality of life on Kiawah. The amount of flooding,

the duration of flooding and frequency of flooding should all be considered in defining a specific threshold condition. Three levels of flooding can be defined as:

- Standing water that is passable but deep enough to risk damage to low profile vehicles.
- Flooding that makes roads impassable for normal vehicles, which impedes the ability to get on and off the island and to move around on the island.
- Flooding that makes roads impassable for emergency and high-profile vehicles such that they cannot reach all parts of the island.

A decision will have to be made on whether three thresholds are necessary or if one threshold will suffice to trigger a response.

***Flooding -- Disruption of Utilities – either by a single event or cumulative***

The community survey showed that disruption of utilities is a major concern for property owners. Thresholds in this area will need to consider the duration and frequency of flooding event and the cumulative effects of flooding. Thresholds need to be developed for the following utility services conditions:

- Potable and wastewater systems may cease to function or will have operations degraded.
- Electric service may cease to function or exposure to water may degrade the reliability of service.
- Internet services may cease to function or may be degraded and become unreliable.

Since these utilities are controlled by outside entities, the development and implementation of the AMP will require close coordination between the Kiawah entities and the companies controlling the infrastructure on the island.



***Flooding – Damage to property owner’s property – either by a single event or cumulative***

The virtual focus groups and the community survey highlighted the concerns about the damage caused by flooding to property owner’s houses, personal contents and landscaping as well as the cost of repairing this damage. Thresholds for this area will need to consider the level, duration and frequency of flooding.

The Town and KICA will share responsibility with property owners in dealing with the issues.

***Flooding – Loss of access to island amenities***

The virtual focus groups, the community survey, and interviews recognized the importance of the island amenities to the quality of life on the island. These amenities range from the leisure trails, beach boardwalks, golf courses, and tennis courts, all of which could be degraded by flooding. Setting threshold conditions for amenities will have to consider the extent, duration and frequency of flooding. The diversity of this category will require coordination and action by all the entities on the island.

***Sea level rise and climate change damage to natural environment***

The risk of damage by sea level rise, climate change and flooding was identified as a major concern by both the virtual focus groups and the community survey. This reinforces the role that the natural environment plays in defining the holistic view of Kiawah. Threshold conditions need to be considered for each of the natural environment areas. Concerns are that:

- the **beach and dune system** may be exposed to increasingly higher tides as sea levels rise, potentially causing loss of beach space and erosion of the protective dunes. The Town’s Beach Management Plan can provide a basis for defining thresholds.
- **salt marsh areas** may be reduced due to inundation by sea water as sea levels rise, affecting the ability of the marshes to absorb surge tides. The reduction in

salt marshes may impact the important role of salt marshes as nursery areas for marine life. The decrease in the salt marshes may increase the loss of property for individual owners. Definition of threshold conditions for the salt marshes will require better understanding of the natural dynamics and definition of responsibilities for taking action.

- the **maritime forest** on Kiawah may be adversely affected by greater periods of drought, stronger storms and advancing saltwater levels. The forest and vegetation are important to providing habitat for wildlife. Definition of threshold conditions for the maritime forest will require better understanding of the natural dynamics affecting these areas and definition of responsibilities among the island's entities.
- **lush vegetation** is a defining part of the "Kiawah Brand". Many coastal communities have good beaches and great amenities but what sets Kiawah apart is its lush vegetation, extensive and beautiful marshes, and the presence of extensive bird and animal life. A threshold condition might relate to noticeable, negative change in beauty on the approach to the island and in the marsh and vegetation as it is seen from the Kiawah Island Parkway and Governor's Drive.

## **OVERALL CONCLUSIONS**

1. There is a high level of concern and interest within the Kiawah community about the impacts of sea level rise, climate change and flooding on the island. This is supported by the focus groups, interviews and survey results.
2. The amount of time spent annually on Kiawah and years of property ownership are directly related to higher levels of concern.
3. A holistic "package" brought property owners to Kiawah, and the stress/loss of that "package" at some point could cause them to leave. A reduction in that "package" could also damage the "Kiawah Brand" that attracts people to come here. This was also supported by the Town HR&A Market Study that said a resilience strategy for Kiawah will help maintain its appeal.
4. The HR&A's Market Study outlined additional findings from their work that is consistent with that of the AMP Task Force. By putting in place a process to monitor the environmental factors that influence the health of our natural and built environment, establishing a strategic plan, and building a solid line of communication between entities, Kiawah can mitigate the effect that climate change and sea level rise perceptions will have on the real estate market.
5. Particularly high levels of concern were expressed about possible damage to the natural environment on Kiawah, especially the beach and dunes, salt marsh and natural vegetation.
6. Tolerance for personal inconveniences is greater than for safety disruptions (such as emergency vehicle access & ability to get to hospital). Some of the impacts of SLR and flooding are an inconvenience, while others represent a safety risk.
7. Unacceptable situations on Kiawah are determined not just by the severity and duration of an event or situation but also by how often it occurs.
8. It is important that environmentally positive practices are supported, encouraged and monitored.

9. All of the entities on the island need to work together within the framework of an AMP. They also need to work with Charleston County, the surrounding islands, and state and federal agencies.
10. Kiawah has already begun to address the challenges posed by flooding, as reflected by the acceptance of the 2018 SLR report.

## **NEXT STEPS AND RECOMMENDATIONS**

- 1) The Town and KICA should commit to developing a fully functioning Adaptive Management Plan, proceed with the things they need to do in order to establish this, and ensure that this plan is institutionalized on behalf of the Kiawah community.
- 2) Move quickly to finalize Phase I: finalize the definition of threshold conditions by identifying frequency, duration and other indicators.
- 3) Move quickly to Phase II: leaving it to organizations (led by the KICA Resilience Specialist and consisting of KICA and Town of Kiawah employees and others assigned to the group) to refine the Thresholds, develop Trigger Points and Indicators (preferably with some additional property owner input), the Monitoring program, and identify any existing Response Plans applicable to a Threshold.
- 4) Move to Phases III and IV after Phase II is complete (see **Appendix A** for details).
- 5) Develop and institute a community education program that evolves with new information. This could include quarterly written updates to the community, as well as seminars on particular issues related to the impact of sea level rise, climate change and flooding on Kiawah.
- 6) Provide an annual report to the community and stakeholders that will provide information on key parameters and actions taken.
- 7) Consider an annual survey to accompany the annual report to update property owners' perceptions of sea level rise, climate change and flooding.
- 8) Continue to collect information on and improve our understanding of the Kiawah environment:
  - Support Kiawah Conservancy, KICA and Town research programs that add to our knowledge base.
  - In most areas of the Environment, we are at an early stage of understanding of where we are and what kind of change is occurring. After this is better understood, Thresholds for unacceptable conditions and changes that are affecting (or can affect) property owners can be identified.

- Much of the understanding of the beach is in place with the Town's Beach Management Plan. The Town staff can take this knowledge and experience in monitoring the beach and its changes (and intervening on occasion) to establish Thresholds (and Trigger Points). These can then be reviewed with the property owners.

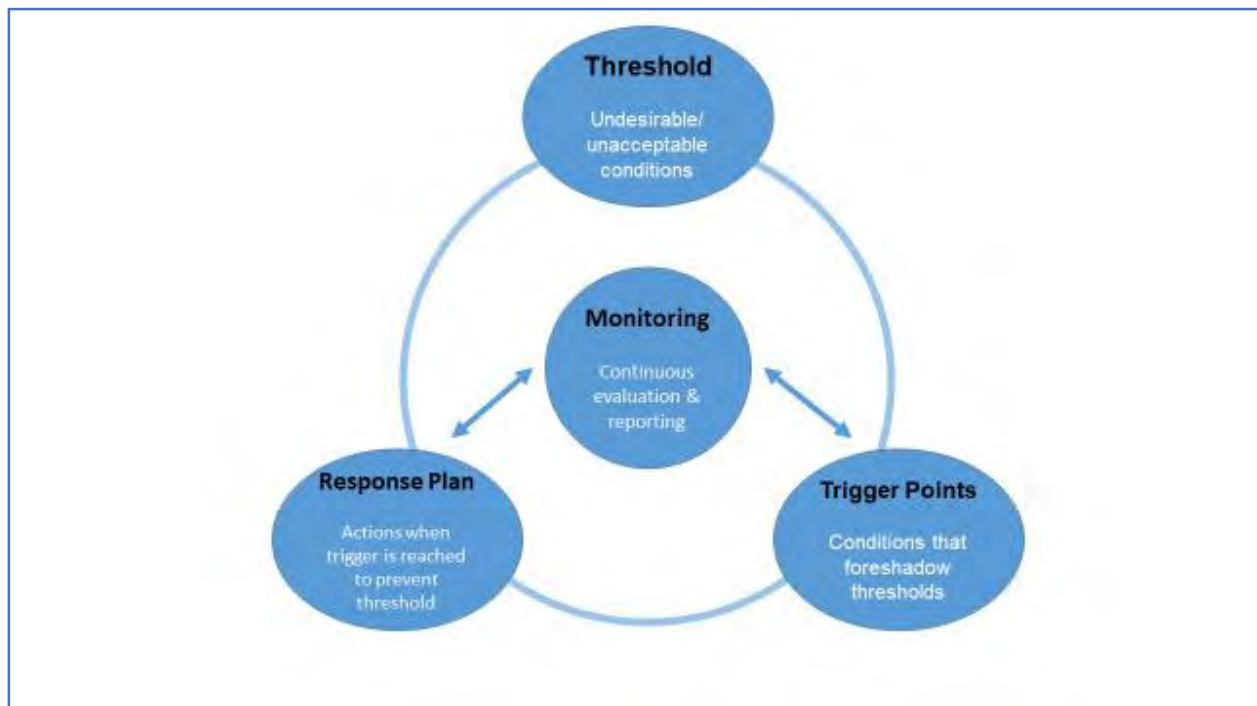
## APPENDIX A

### Development of an Adaptive Management Plan

In July 2020, a group of property owners presented recommendations for the development of an Adaptive Management Plan (AMP) to the Kiawah Island Community Association (KICA) Board and the Kiawah Island Town Council. Both the Board and the Town Council approved the initiation of the process to develop an AMP. The four phases involved in the development of a full adaptive management plan are:

- Establishment of Thresholds
- Definition of Trigger Points
- Development of Response Plans
- Implementation/institutionalization of the Adaptive Management Plan and a Monitoring Program.

A generalized diagram of the Adaptive Management Plan process is shown below.



## **Phase I – Gather Community Input for Threshold Establishment**

The KICA Board and Town Council asked this group of property owners to start with a portion of Phase I, the establishment of thresholds, by engaging with property owners to identify their concerns about sea level rise, climate change and flooding. KICA designated the group as a task force in early July 2020.

Since Thresholds are primarily value judgements, their identification should reflect the diversity of community values. Active involvement of property owners in this process not only reflects their perspectives, but also provides validation for the Thresholds of greatest concern. This community input was achieved by two virtual workshops of property owners followed by a community survey. In addition, input was obtained from commercial entities active on Kiawah. The results of the surveys were compiled, edited, and are presented in this report to KICA and Town decision-makers. This community input about concerns and their degree of impact on the community provides the basis for Threshold establishment.

### **Later Phases of Development of the Adaptive Management Plan**

Designing and operating the later Phases will be the responsibility of various island entities: KICA, the Town, the Conservancy, and perhaps others that are most appropriate for dealing with a particular threshold issue.

**Phase I: Completion of Thresholds** should be done primarily by professional staff, perhaps with a few property-owner volunteers. Thresholds require quantification (duration and frequency that property owners can tolerate) and some of these can be set now based on the feedback of this report. In some areas, we are at an early stage of understanding (where, when and how things are changing). After a better understanding, Thresholds for unacceptable conditions/changes that are affecting (or can affect) property owners can be identified.



**Phase II: Identification of Trigger Points** will take the identified thresholds and, for each one, define one or more trigger points that will alert the island if it is approaching a threshold. The trigger points have to be defined such that they provide ample warning for a response plan to be activated in time to prevent the threshold from being reached. Establishing trigger points and designing monitoring programs is highly quantitative – what is possible to measure and track? It will require technical expertise and therefore should be done primarily by professional staff, perhaps with a few property-owner volunteers. Outside experts from the private sector, academia, and government may also have to be consulted. Phase II should require about nine months to develop.

**Phase III: Development of Response Plans** will identify what the responsible entity will do should a Trigger Point be reached. In some cases, the response might be clear from the outset and can be quite specific. In other cases, the response plan may have to remain general because the details of the situation when a Trigger Point is reached are unpredictable. Response Plans need to be flexible so that they can be reviewed periodically and revised in light of new information and new technologies. No final commitment to a plan is ever made until the point at which it is activated. It is important to envision Response Plans as clearly as possible given the present circumstances for two reasons: 1.) Comprehensive long-range planning is only possible if the responsible entities have at least a general notion of how they might respond to future situations. Doing so reduces repetitive waste and permits coordinated use of resources. 2.) If the responsible entity has a plan ready when a Trigger Point is reached, the elected officials and professional staff, none of whom may have been present when the plans were developed, do not have to start from scratch. They at least have good guidance so that they can react quickly and effectively while acknowledging that the situation at the time must dictate specific actions. Development of the initial Response Plans should take about three months.

**Phase IV: Implementation of the Adaptive Management Plan and a Monitoring Program** will establish and institutionalize the plan going forward. Working through Phases II and III is estimated to require about 12 months. The coordination of both the

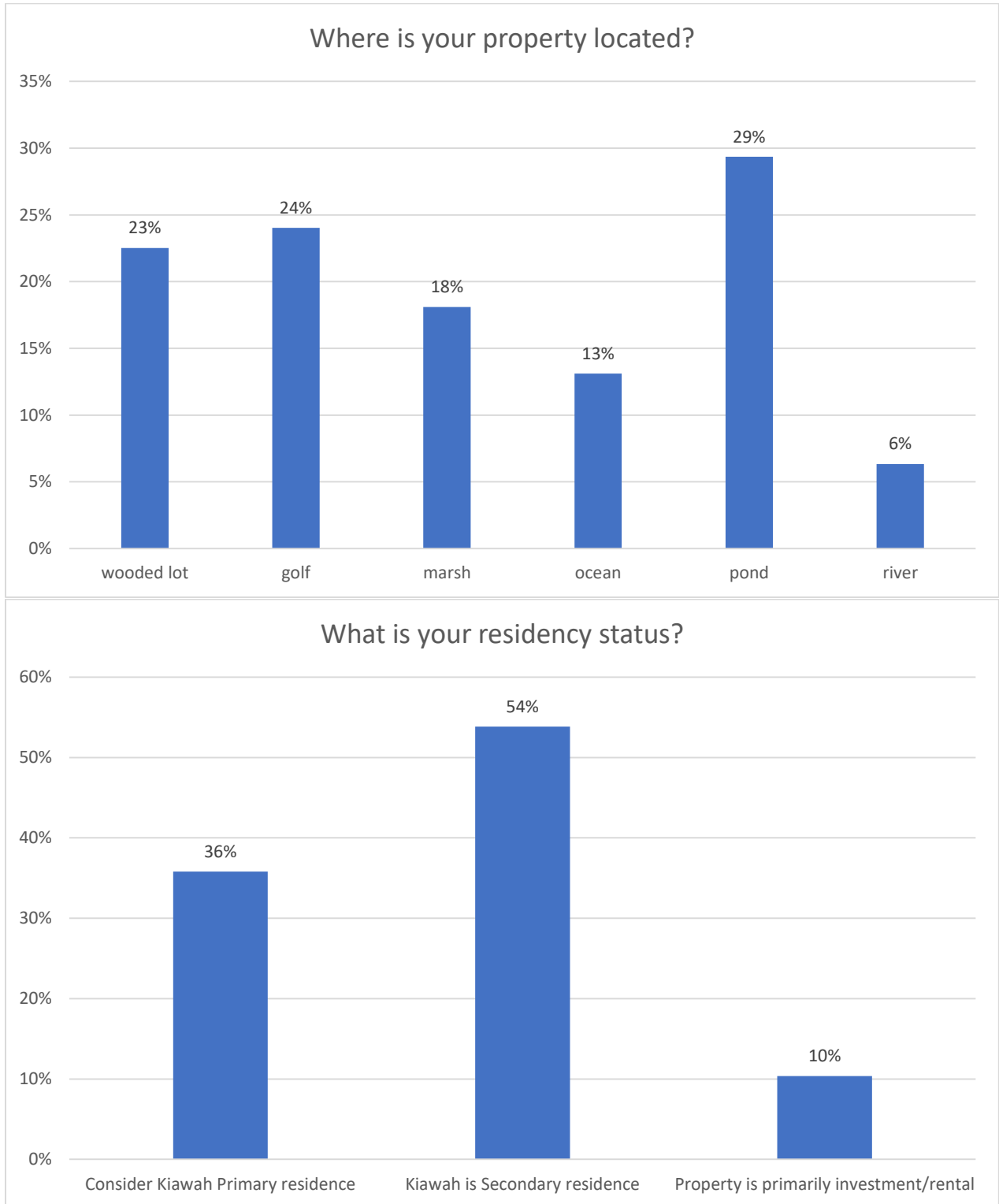
development steps and the ongoing operation of the program should be the responsibility of the KICA Resilience Specialist, with the full support of both the KICA Board and the Town Council adopting the program as continuing policy.

Going forward each of the responsible entities, probably specific staff within KICA, the Town, and the Conservancy, will operate their monitoring programs. The data on the monitored indicators will be submitted to the Resilience Specialist who will maintain an accessible database. Annually the Resilience Specialist will produce an *Indicators and Thresholds* report that is disseminated to all decision-making officials and posted online for all property owners. If a Trigger Point is reached, the appropriate Response Plan will be reviewed and activated. In addition to tracking trends towards Trigger Points, production of this report will also enable responsible entities to evaluate the effectiveness of actions already implemented.

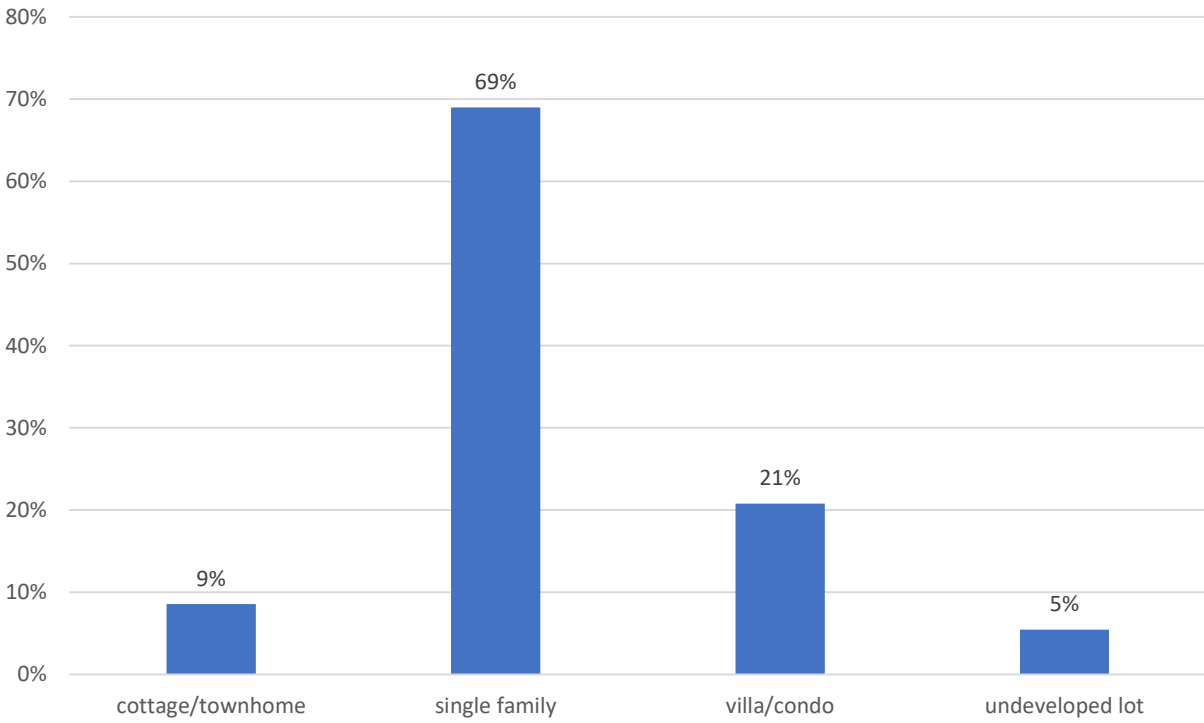
Periodically, on timetables that may differ for different indicators, the responsible entities should review their Thresholds, Trigger Points, Monitoring Programs, indicator tracking, and Response Plans. Revisions to any of these elements of an adaptive Management Plan should be undertaken whenever necessary or advantageous. Because each threshold plan is monitored by staff of one of the responsible entities, it should be the responsibility of those staff to ensure that all components of their program are reviewed regularly.

## **APPENDIX B**

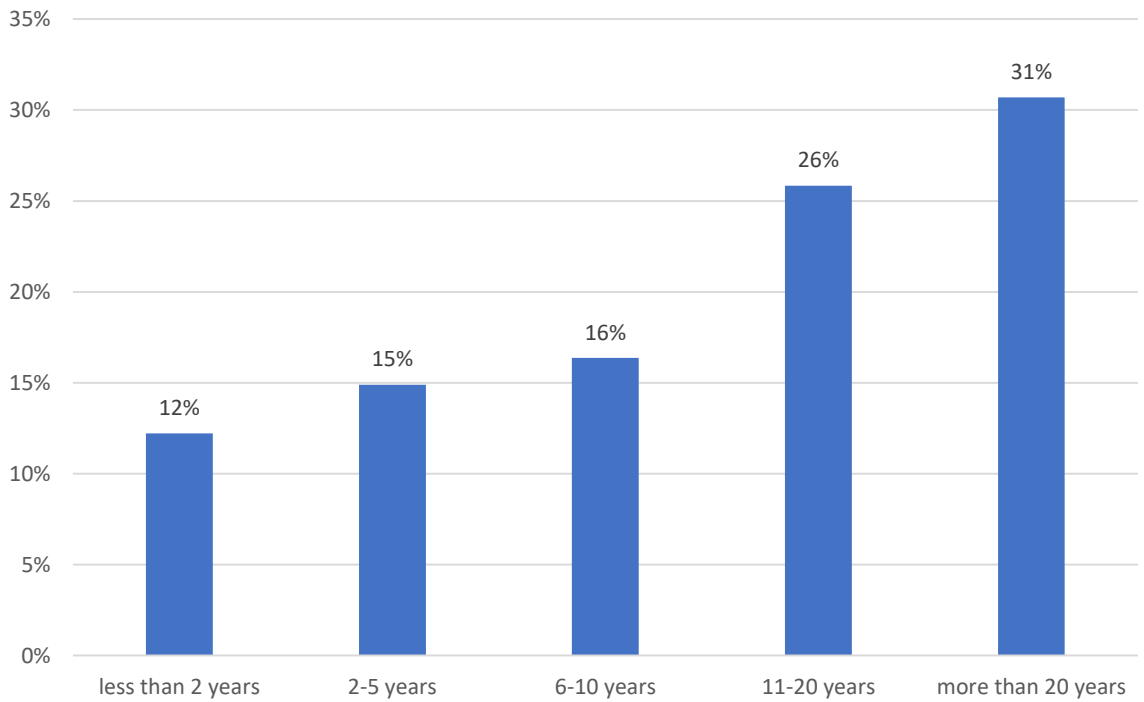
### **Raw data from the survey**



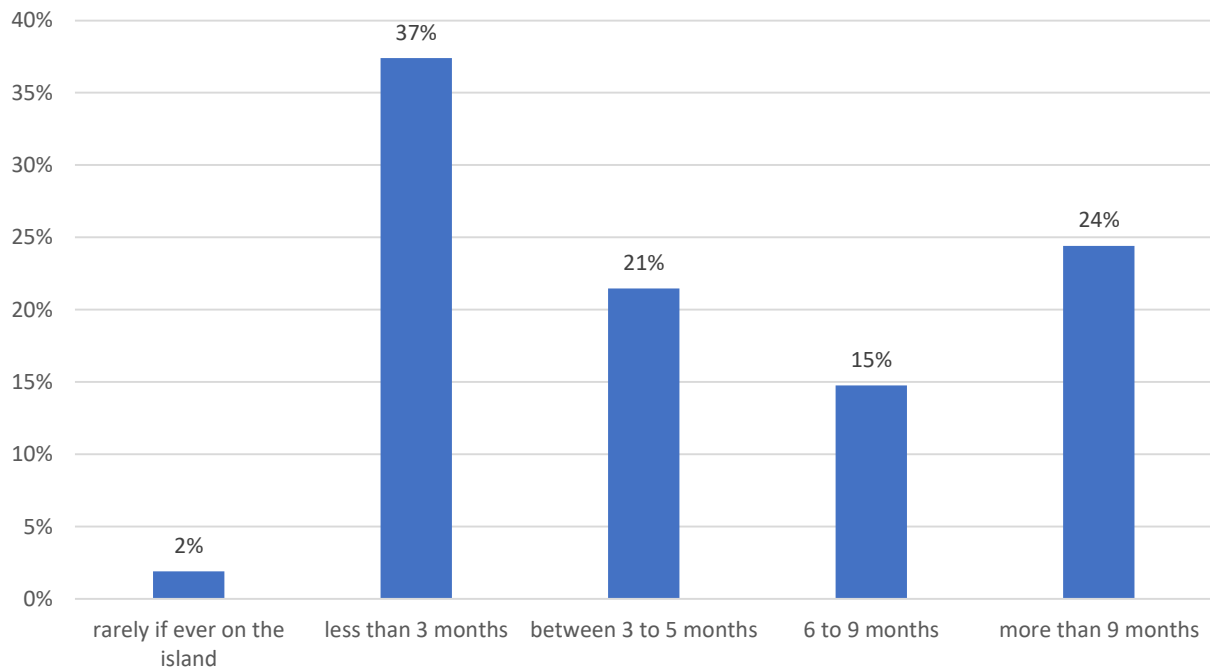
### What type of property do you own?



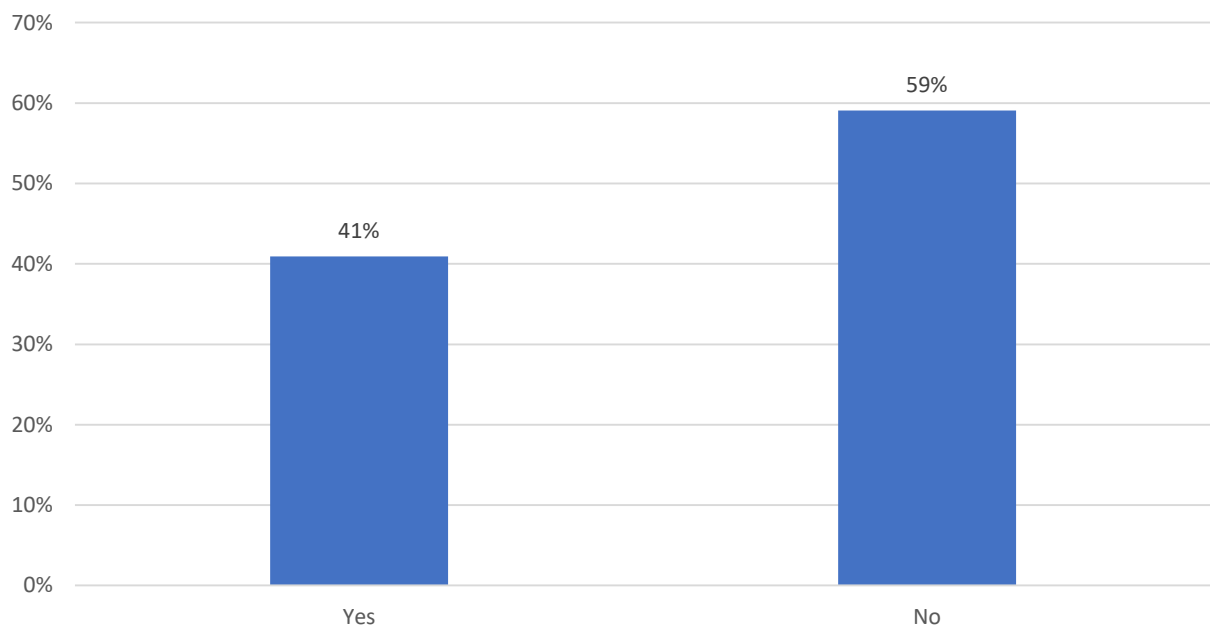
### How many years total have you owned property on Kiawah?



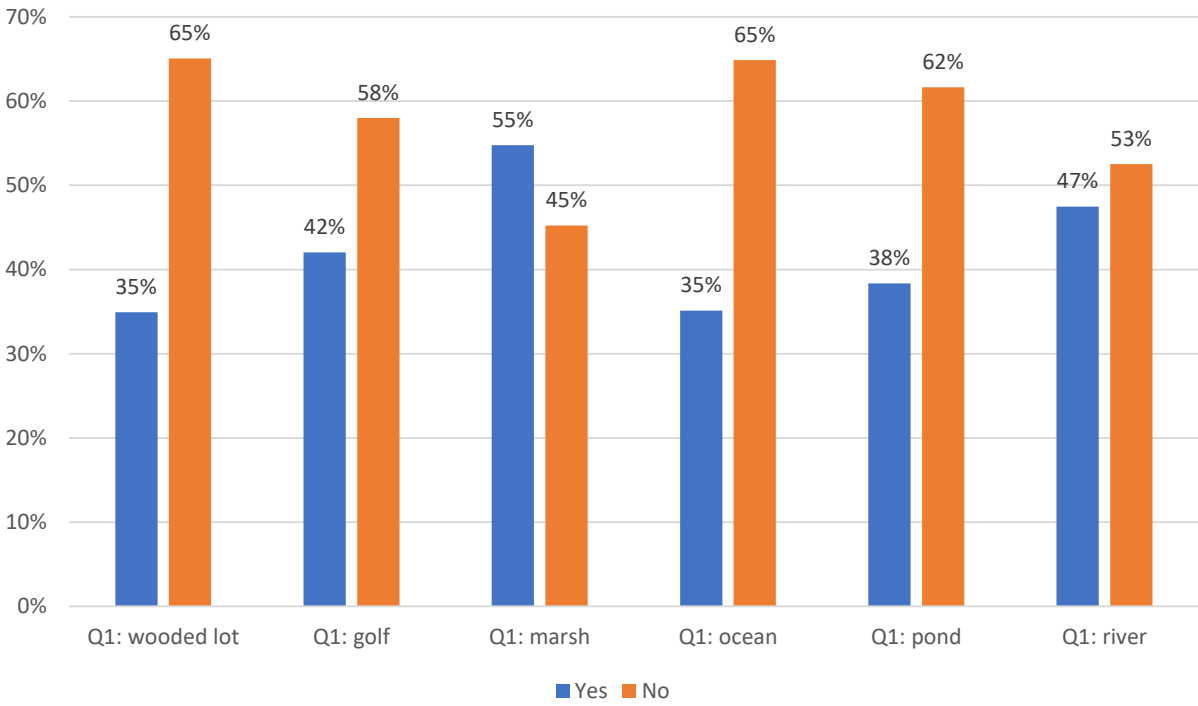
### How much total time do you typically spend on Kiawah in a year?



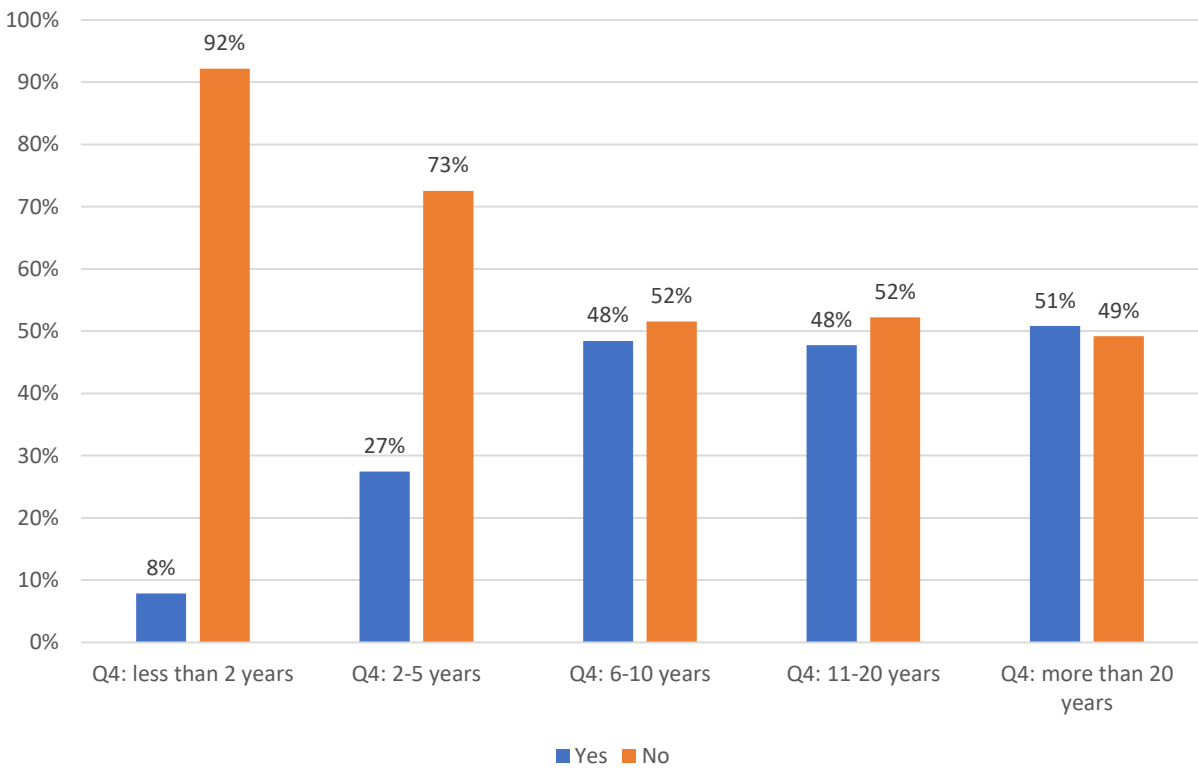
### Have you personally been impacted by flooding, for example: including limitation in your ability to move about the island, a loss of utility services, and/or damage to your property (home/car)?



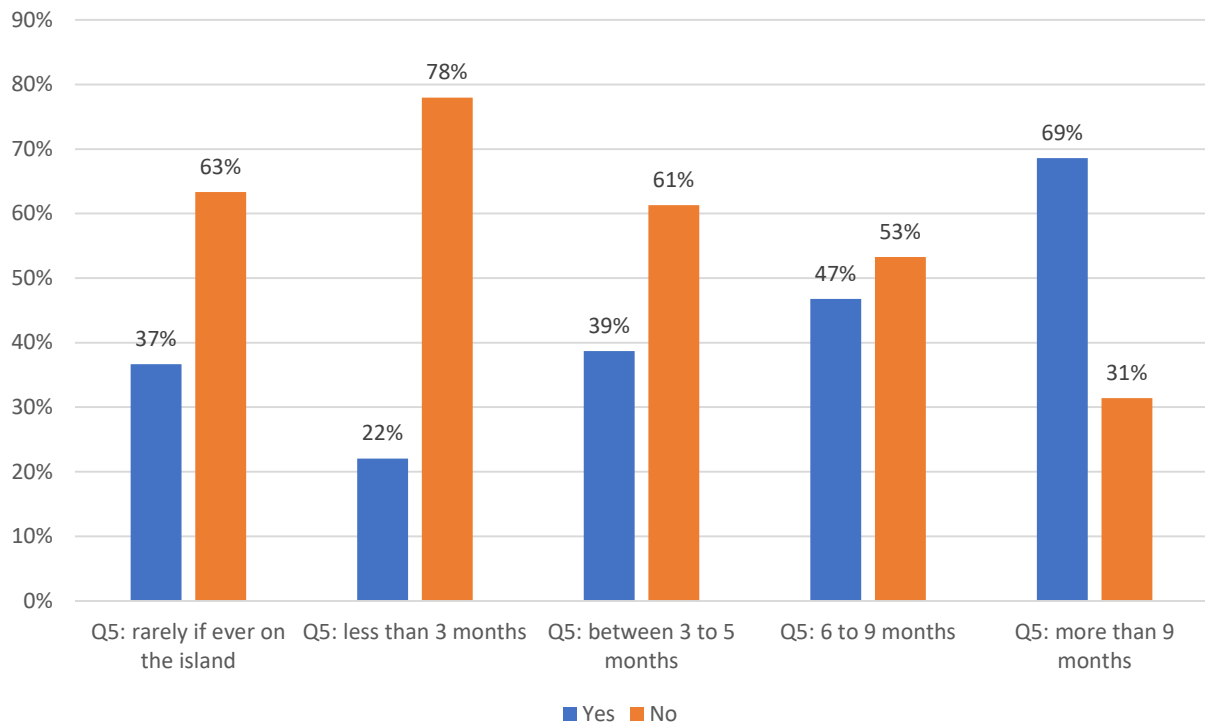
### Personally Impacted by Flooding vs. Location of Property



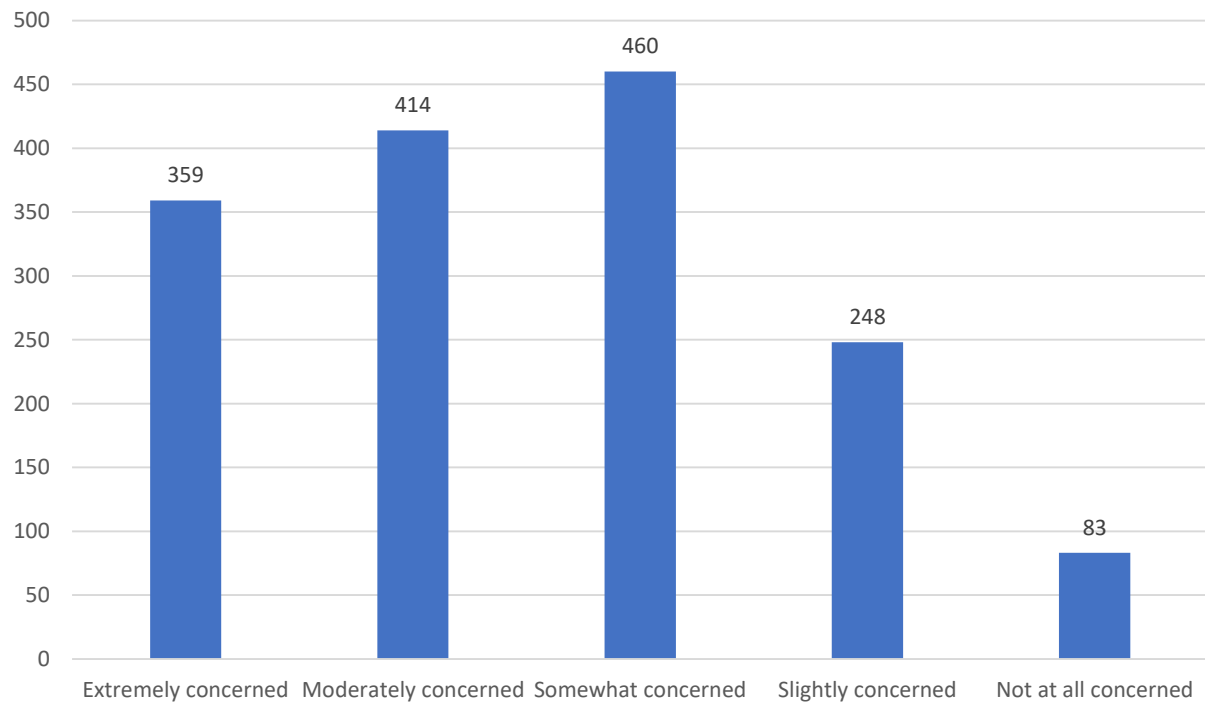
### Personally Impacted by Flooding vs. Years on Kiawah



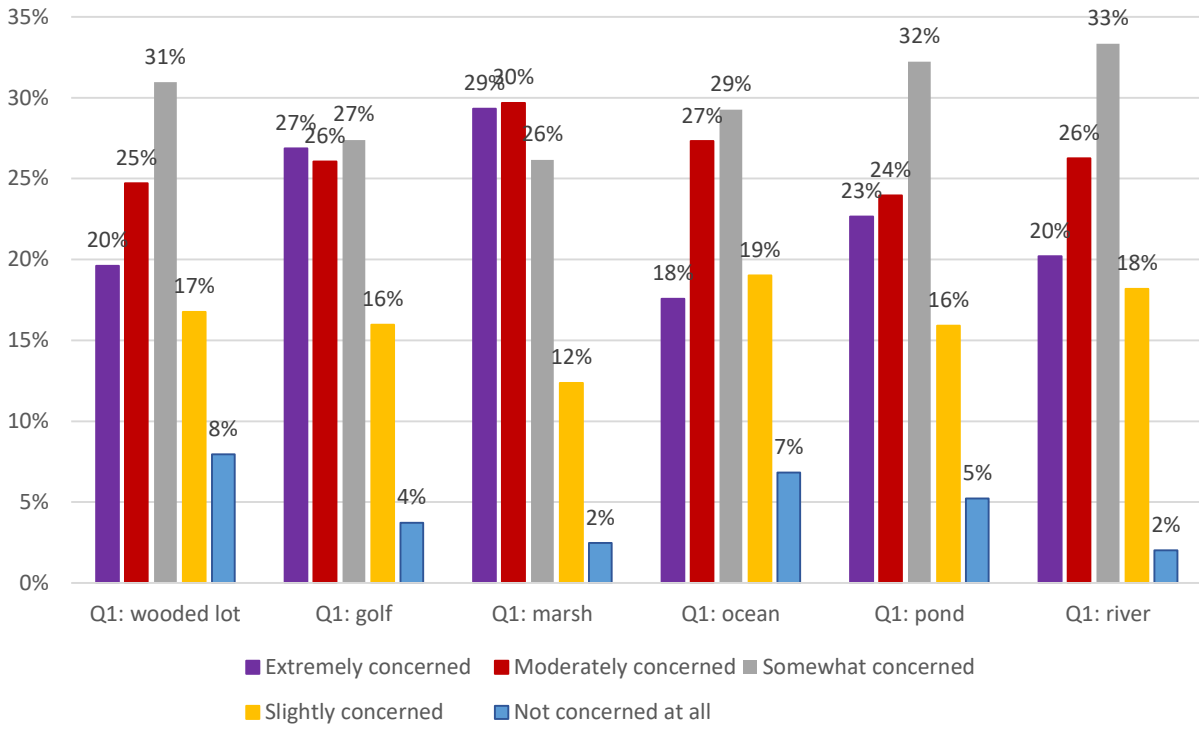
### Personally Impacted by Flooding vs. Time Spent on Kiawah



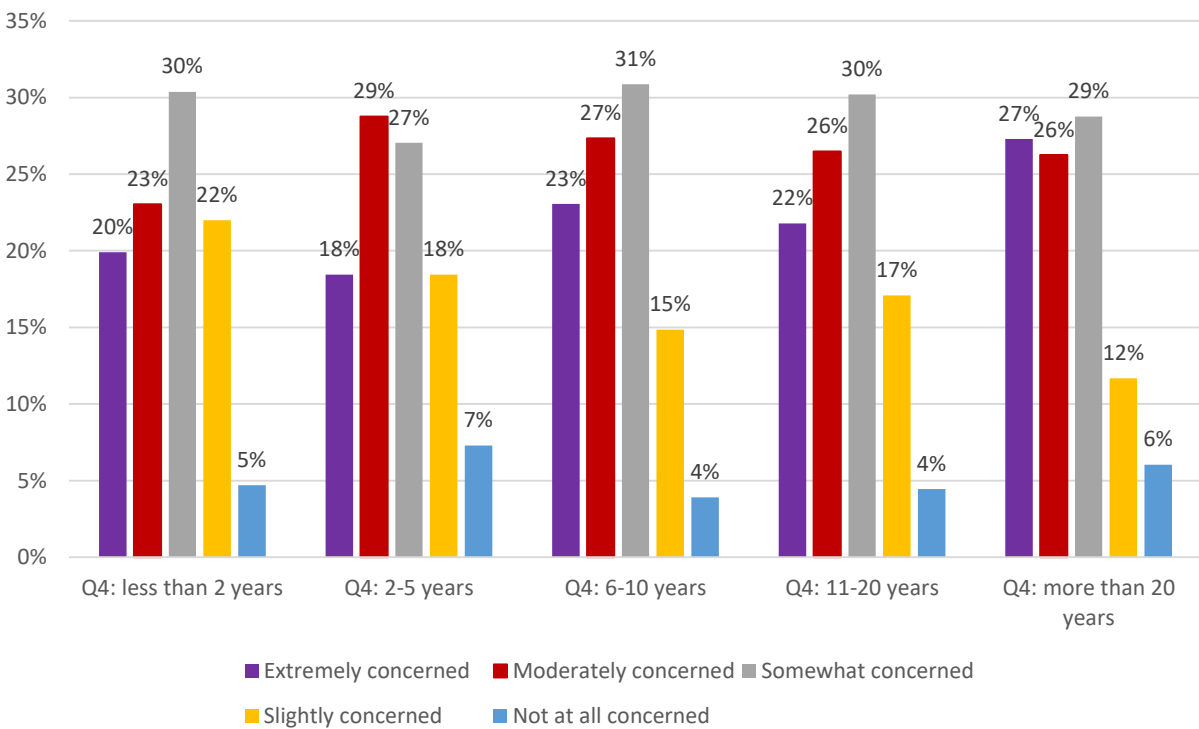
### How concerned are you that flooding could result in road closures that prevent you from going about your daily activities?



### Flooding Causing Road Closures vs. Location of Property

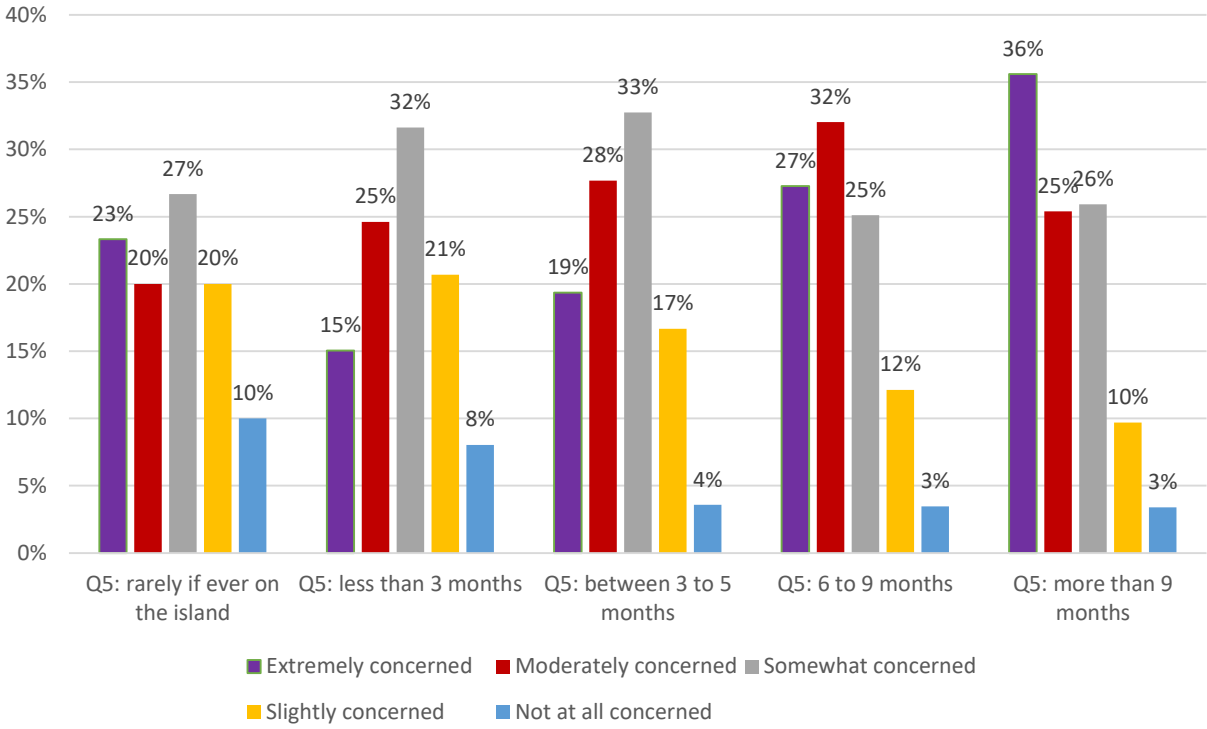


### Flooding Causing Road Closures vs. Years on Kiawah

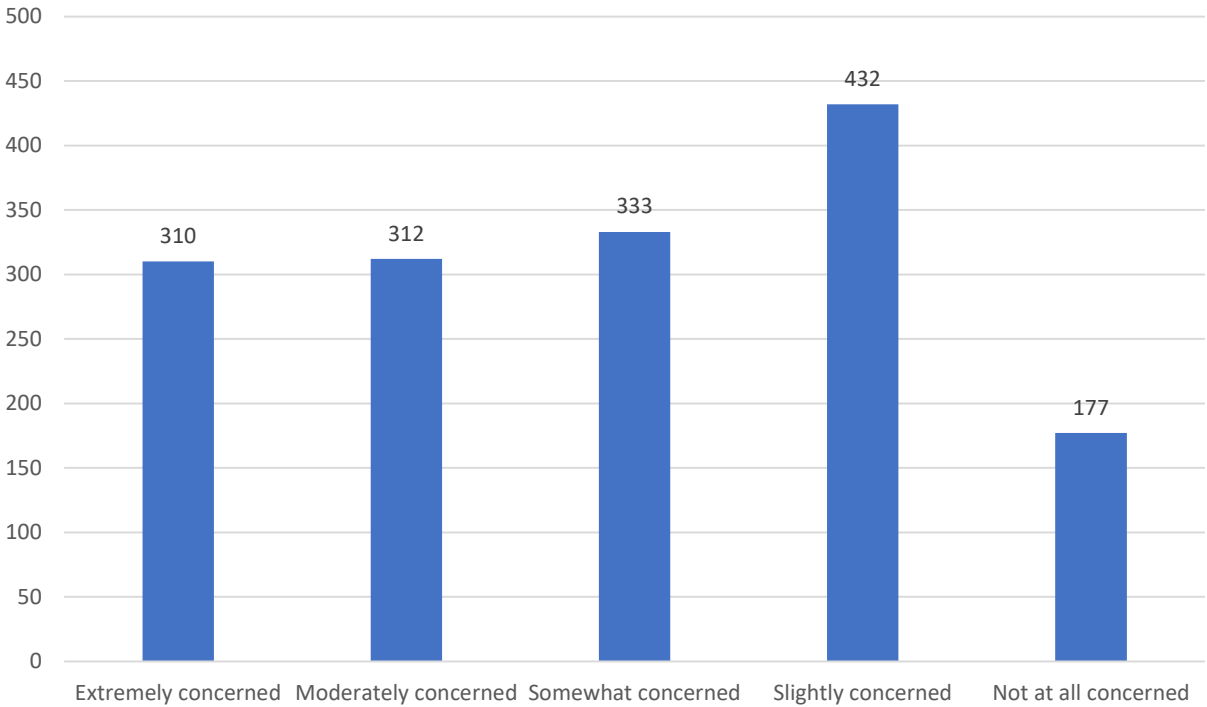




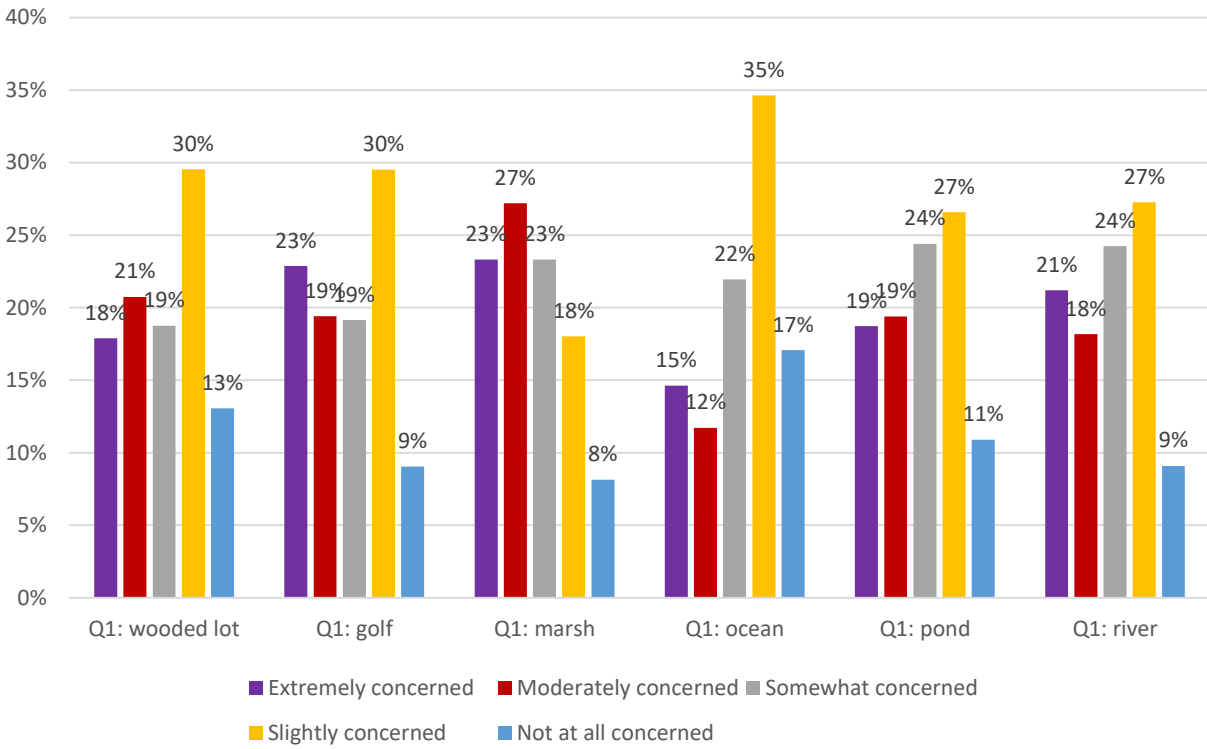
### Flooding Causing Road Closures vs. Time Spent on Kiawah



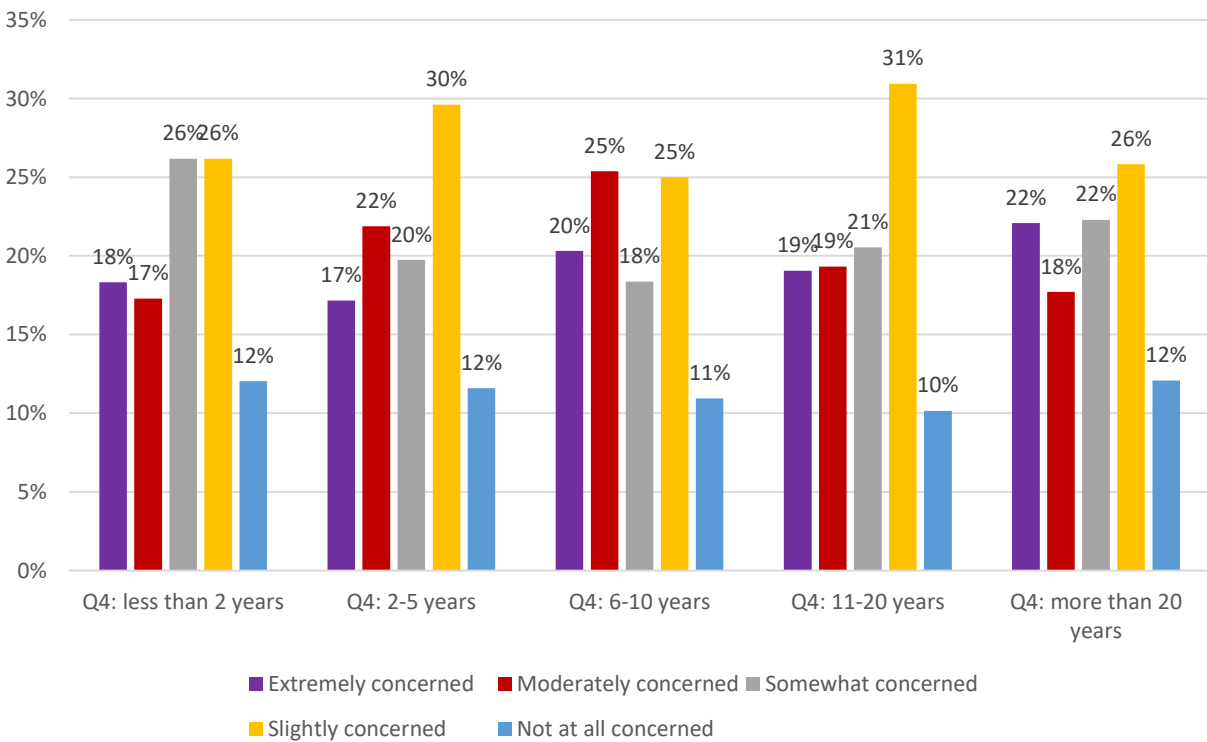
### How concerned are you that standing water on roadways could damage your vehicles and infrastructure?



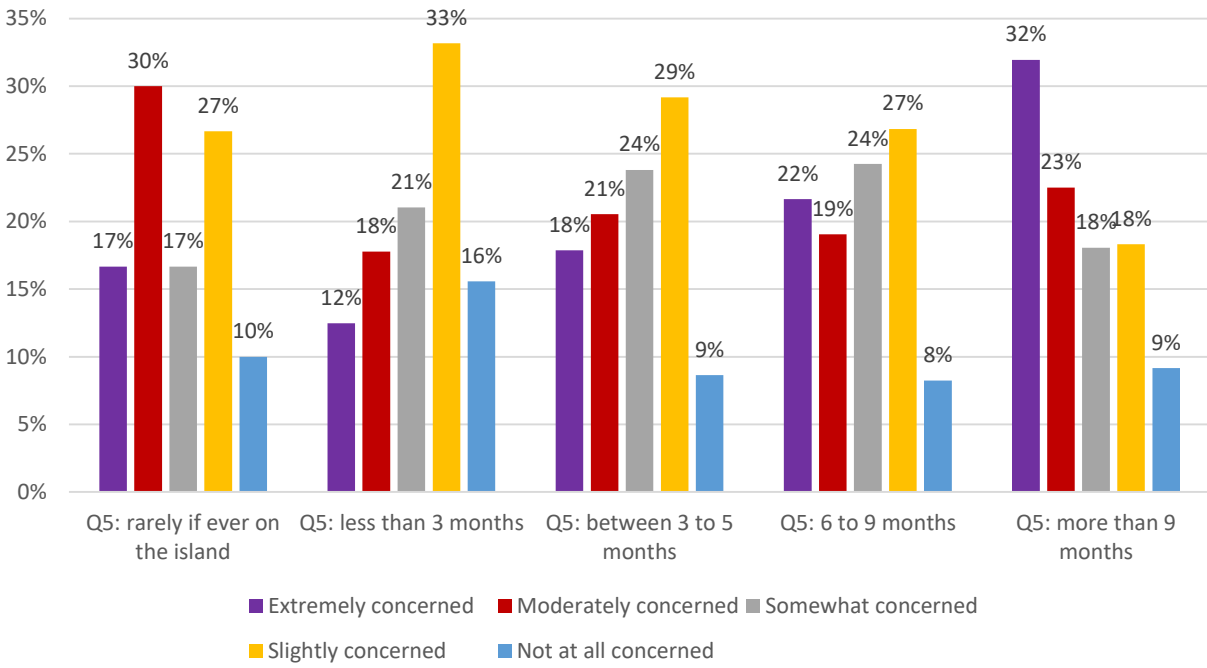
### Concern About Standing Water on Roads vs. Location of Property



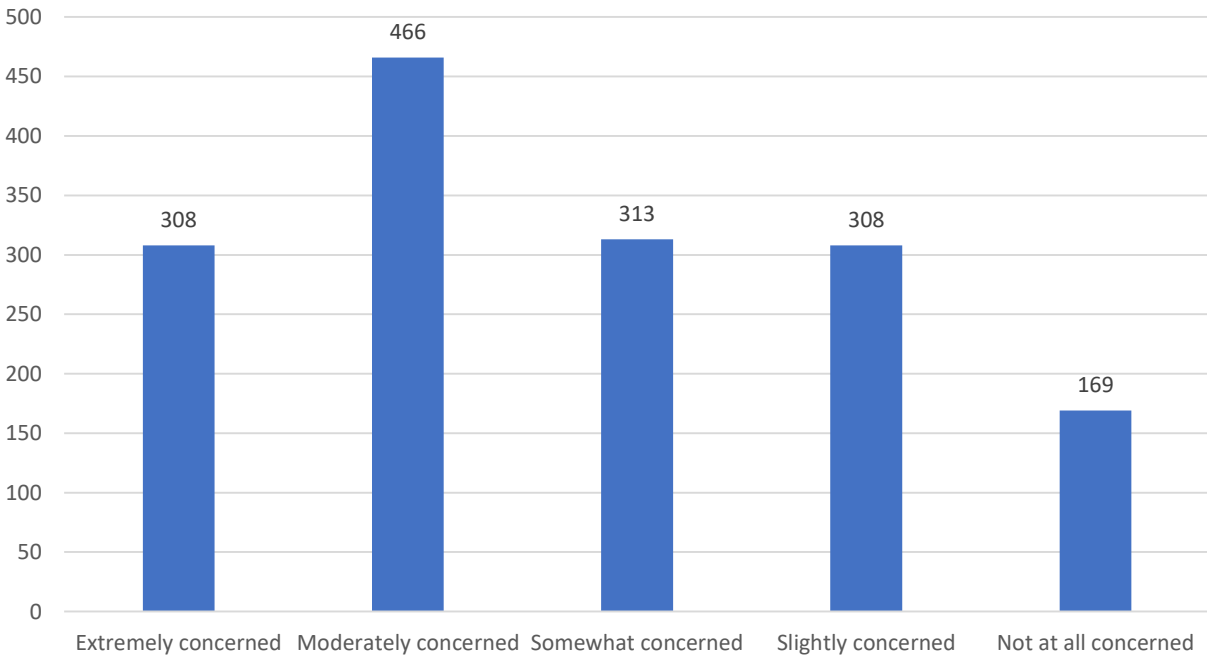
### Concern About Standing Water on Roads vs. Years on Kiawah

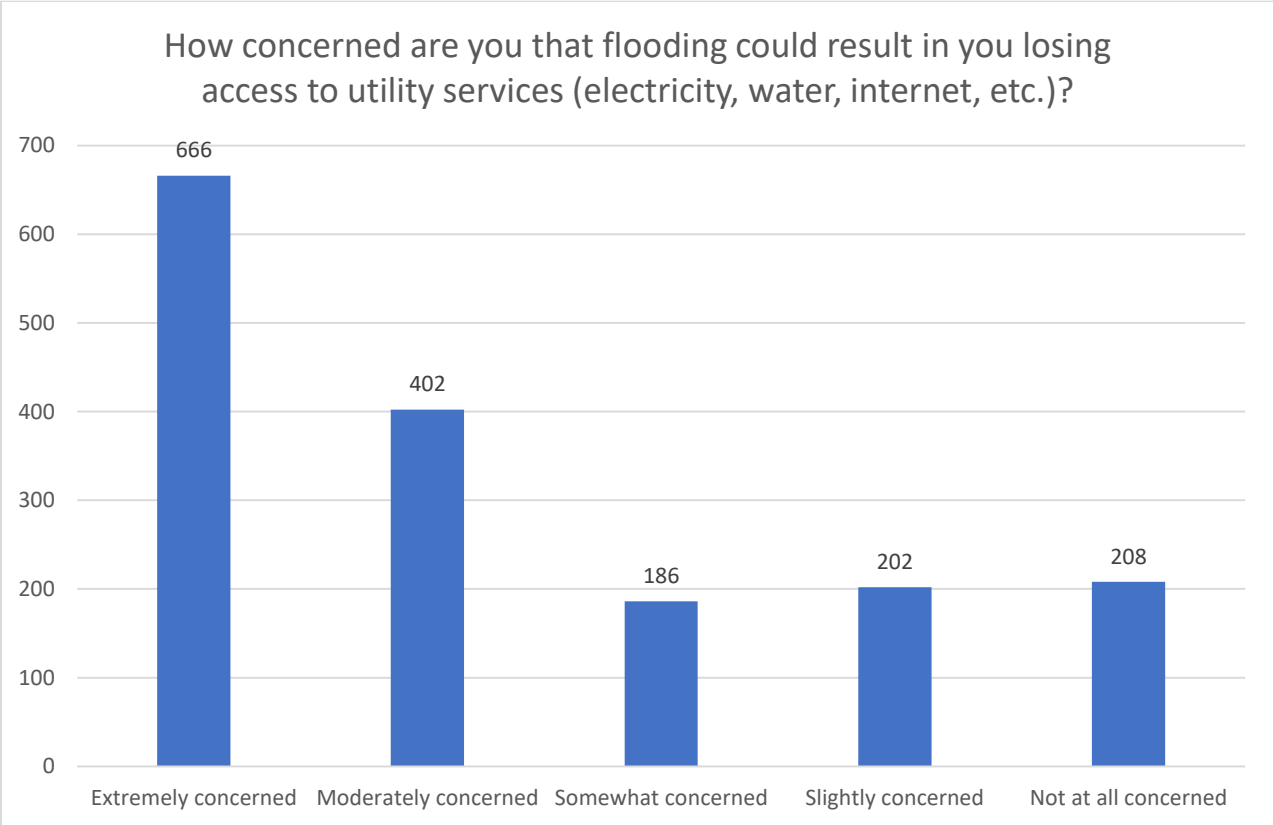
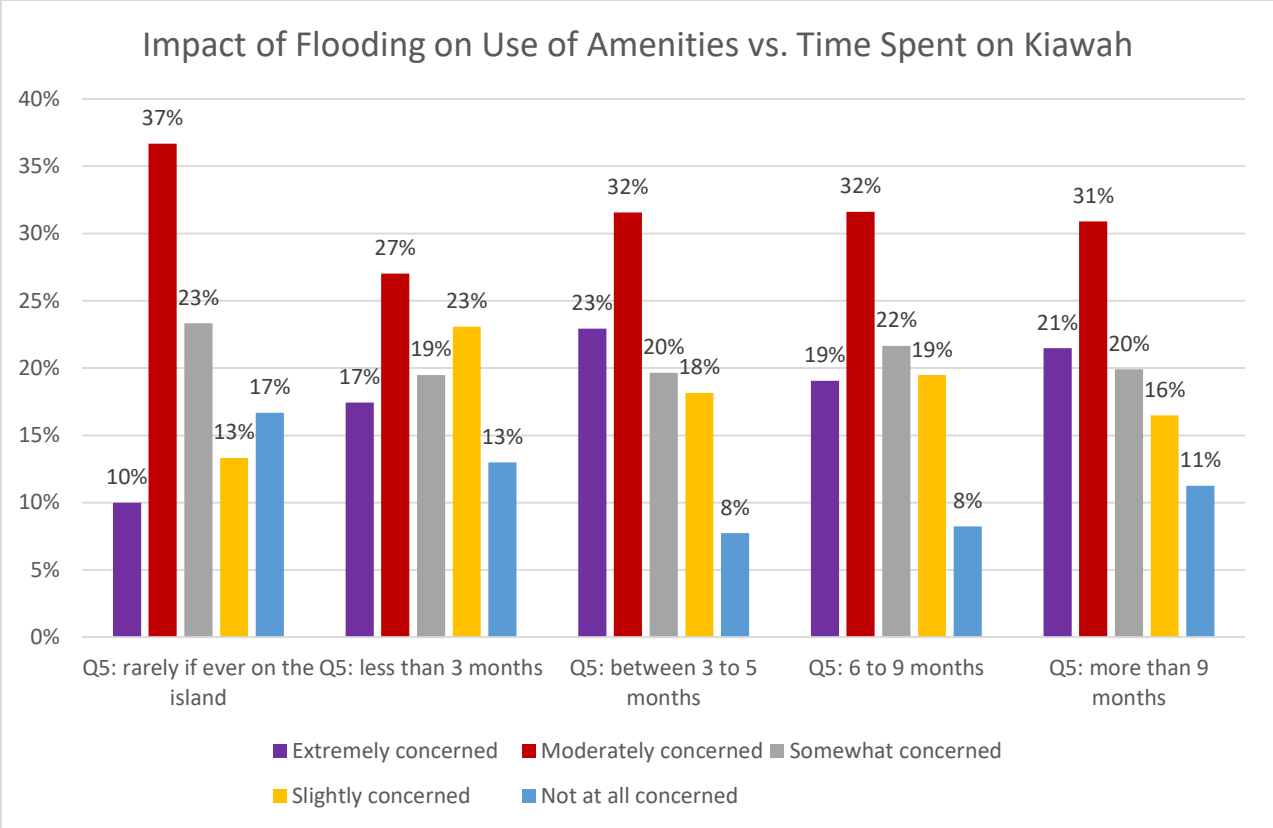


### Concern About Standing Water on Roads vs. Time Spent on Kiawah

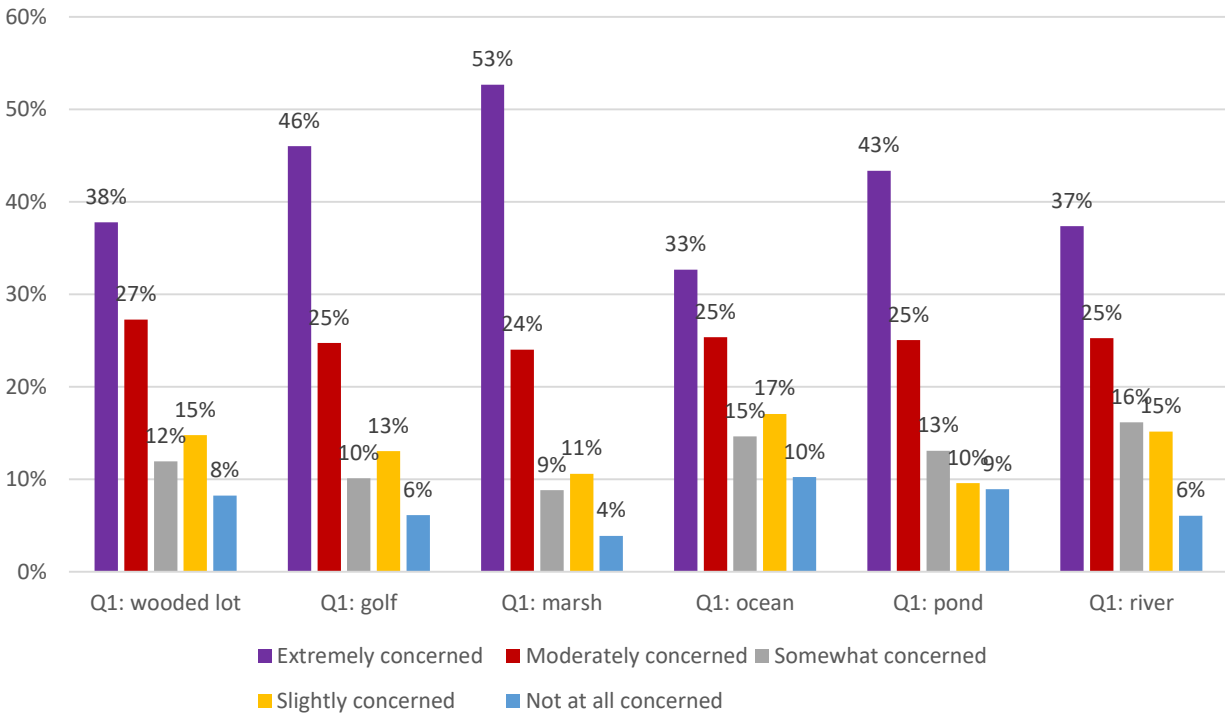


### How concerned are you that flooding could result in you being unable to use island amenities such as leisure trails, beaches, golf and tennis

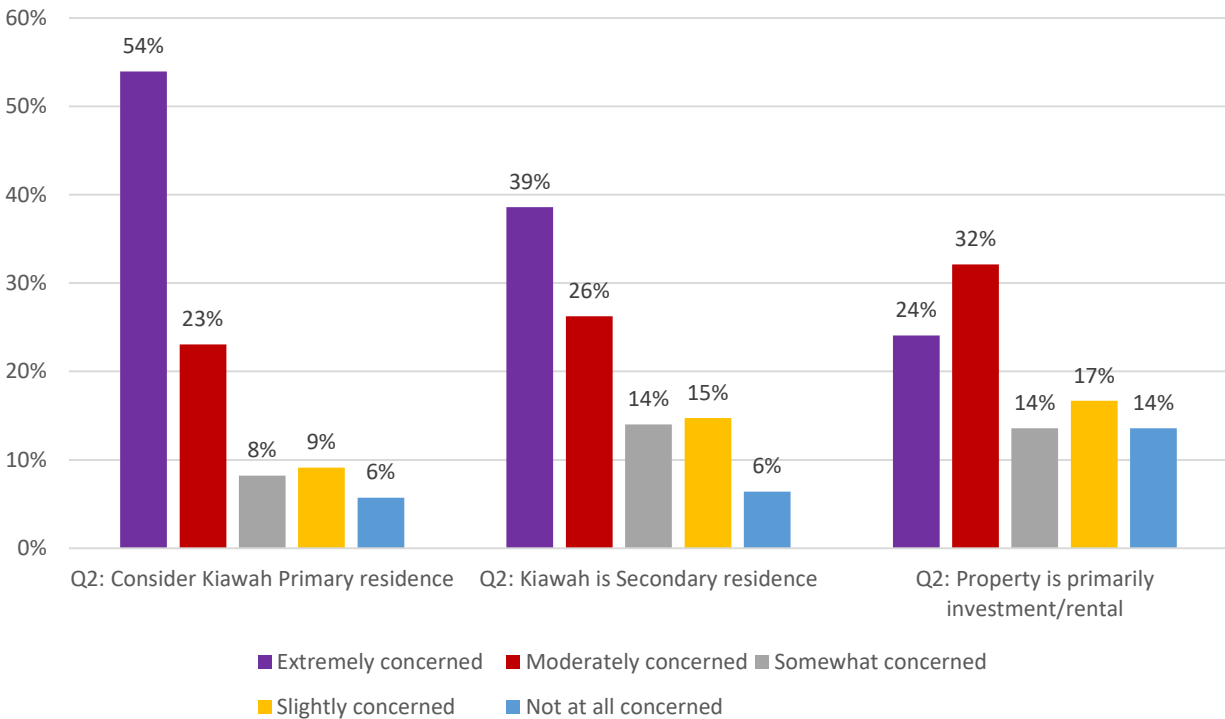




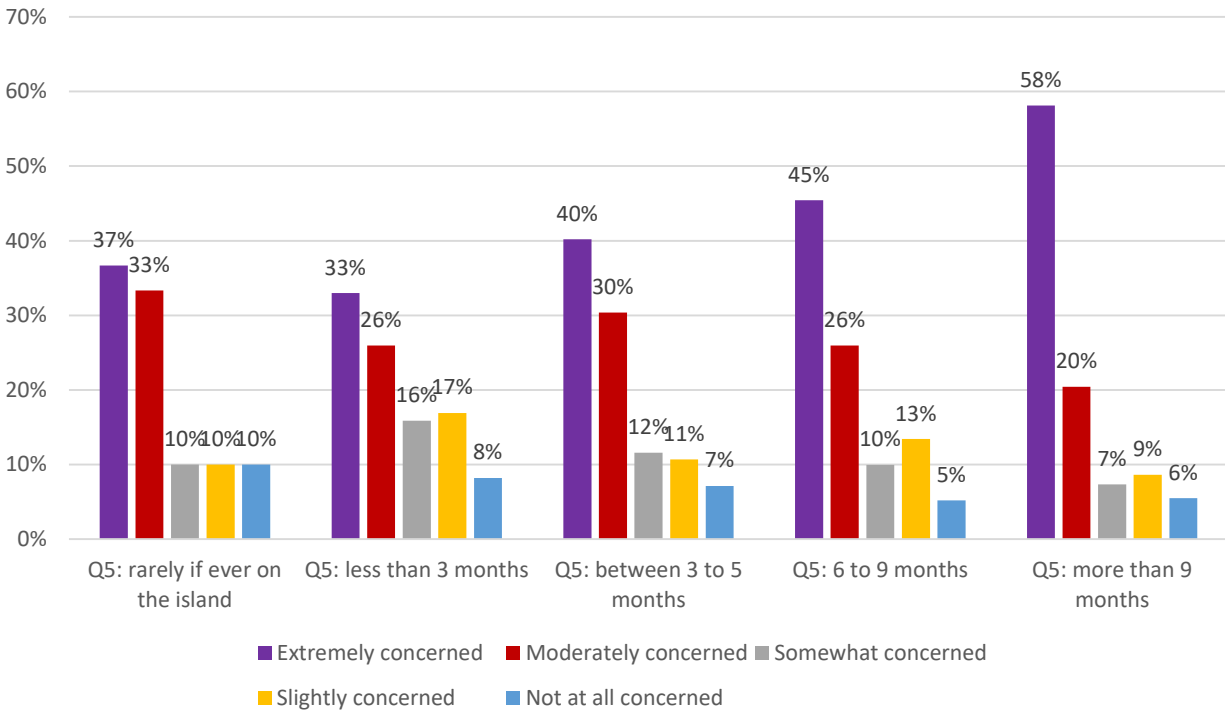
### Impact of Flooding on Utility Services vs. Location of Property



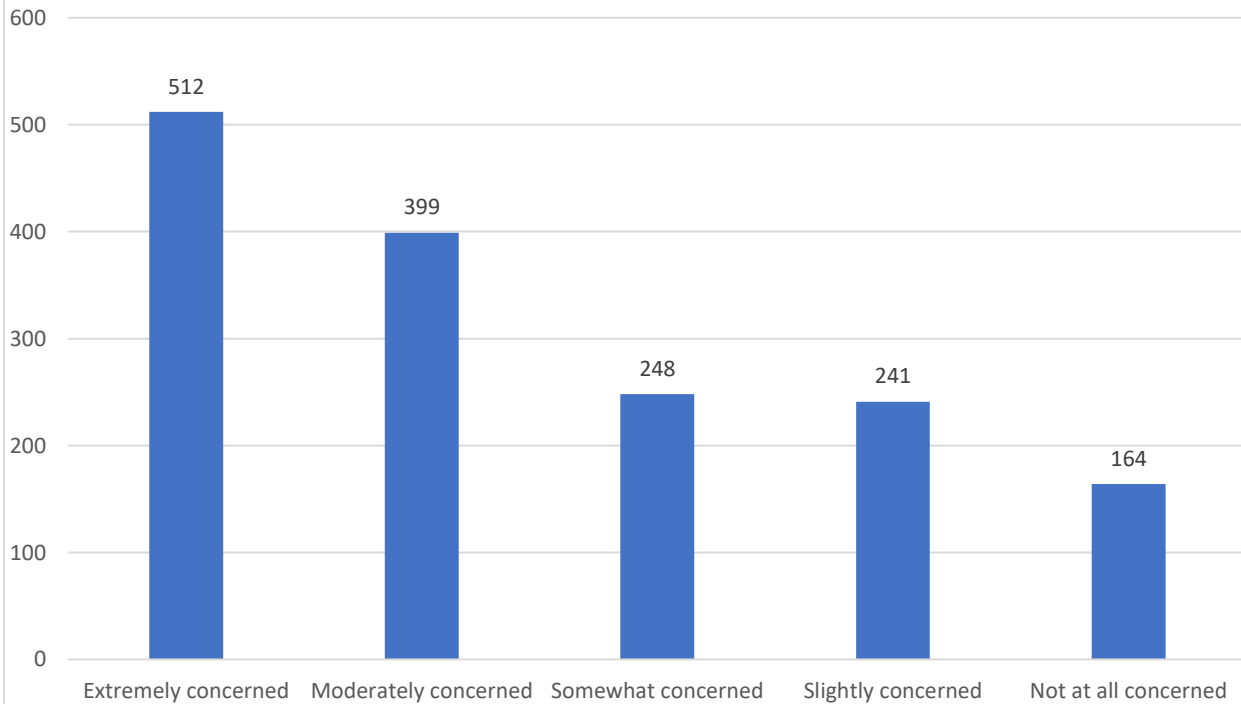
### Impact of Flooding on Utility Services vs. Residency Status



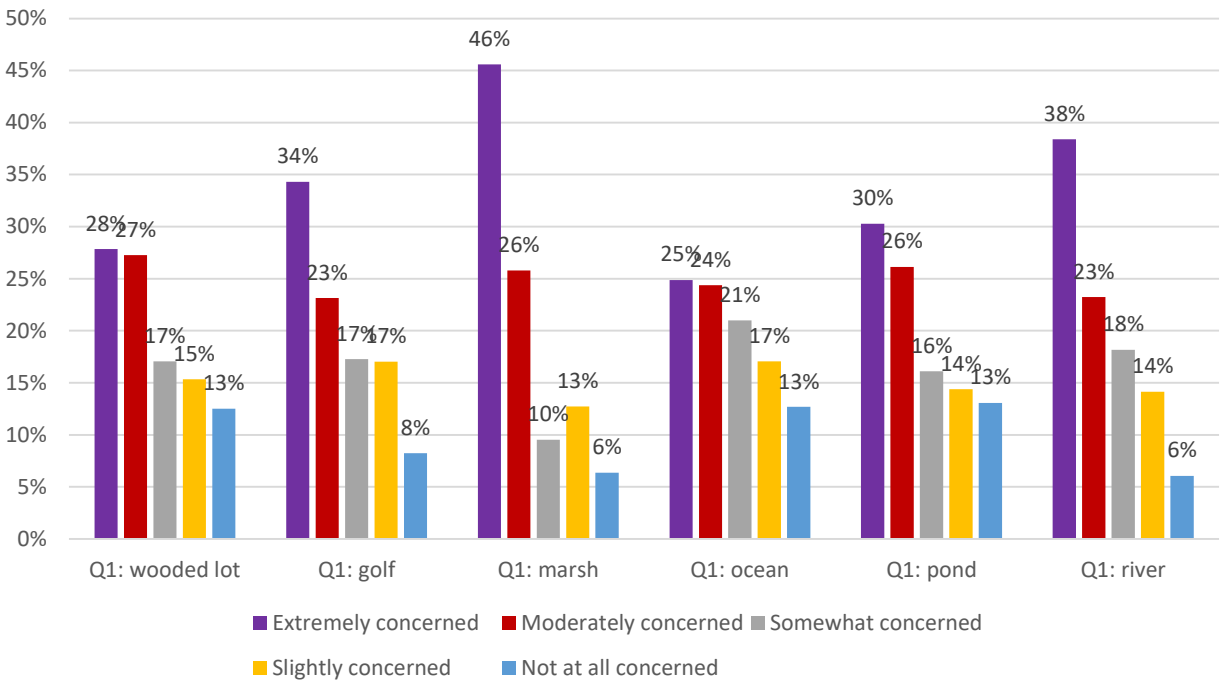
### Impact of Flooding on Utility Services vs. Time Spent on Kiawah



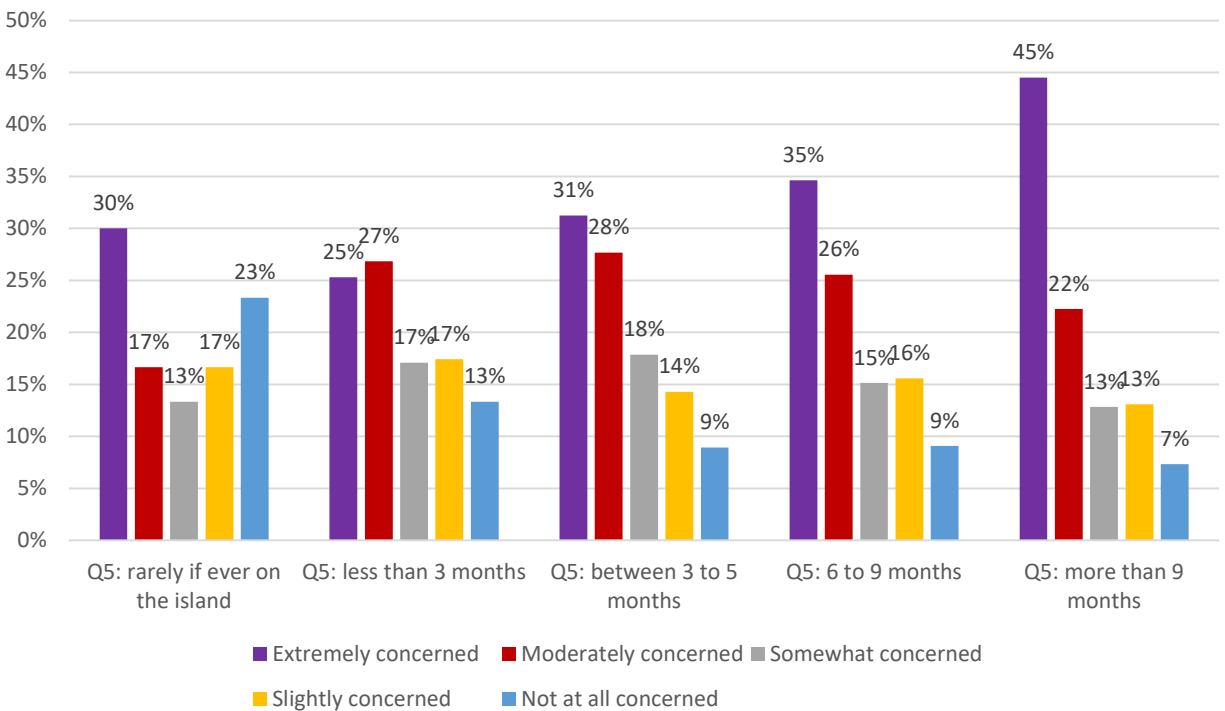
### How concerned are you that flooding could result in damage to your private property such as garages, vehicles, HVAC units, etc.?



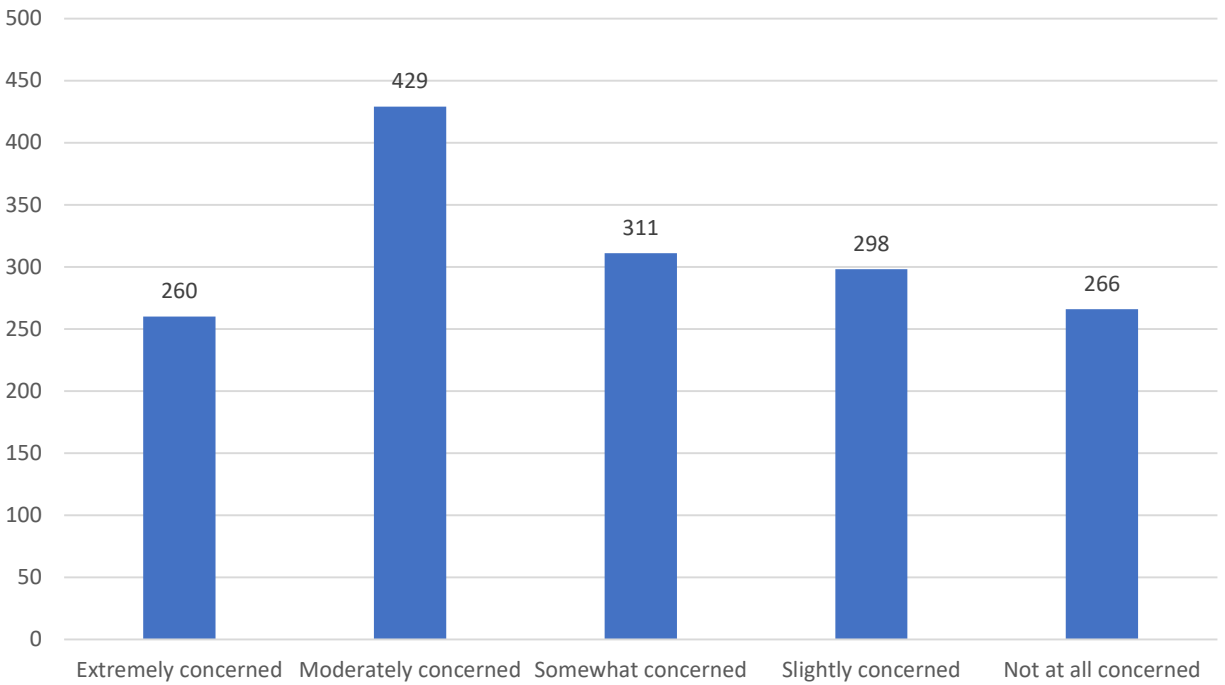
Concern About Flood Damage to Private Property vs. Location of Property



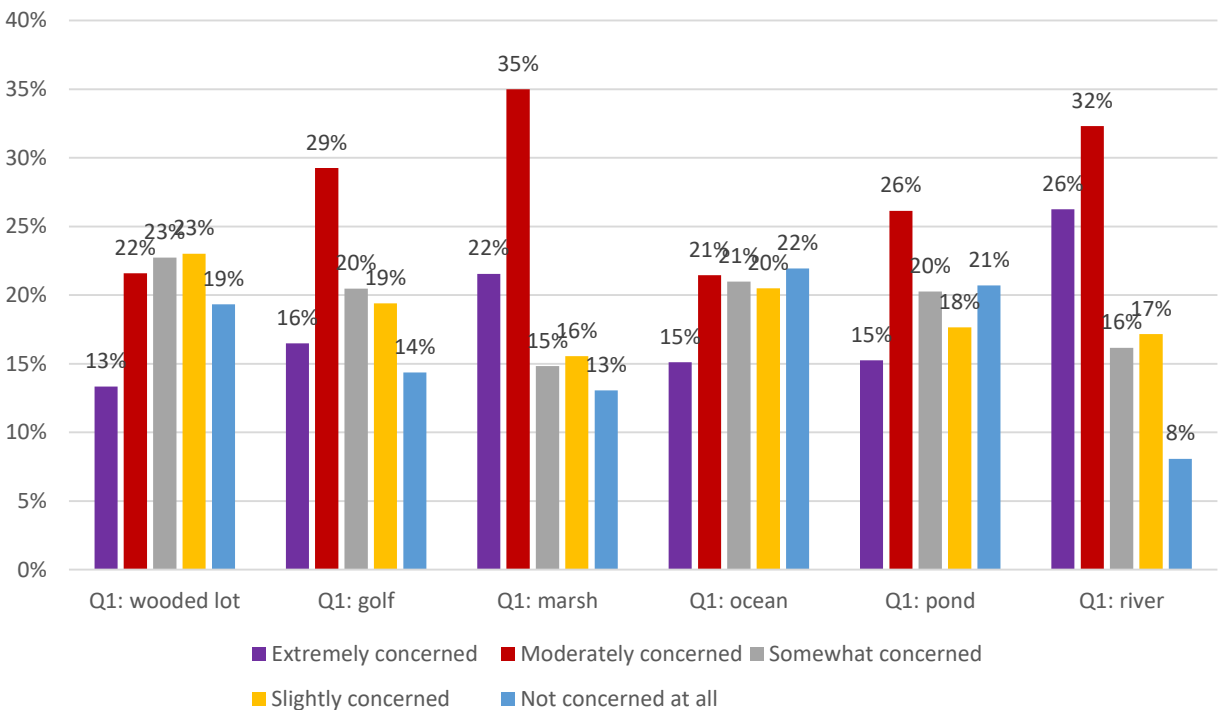
Concern About Flood Damage to Private Property vs. Time Spent on Kiawah



### How concerned are you that flooding could result in damage to your landscaping?

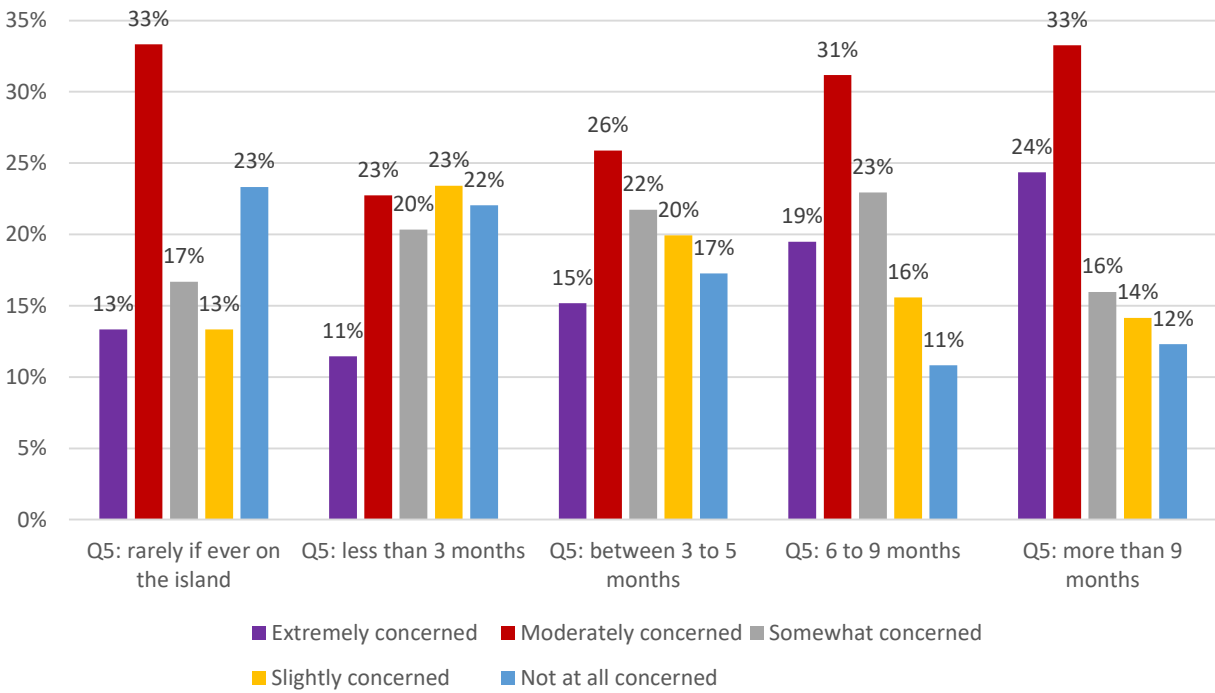


### Concern About Flood Damage to Landscaping vs. Location of Property

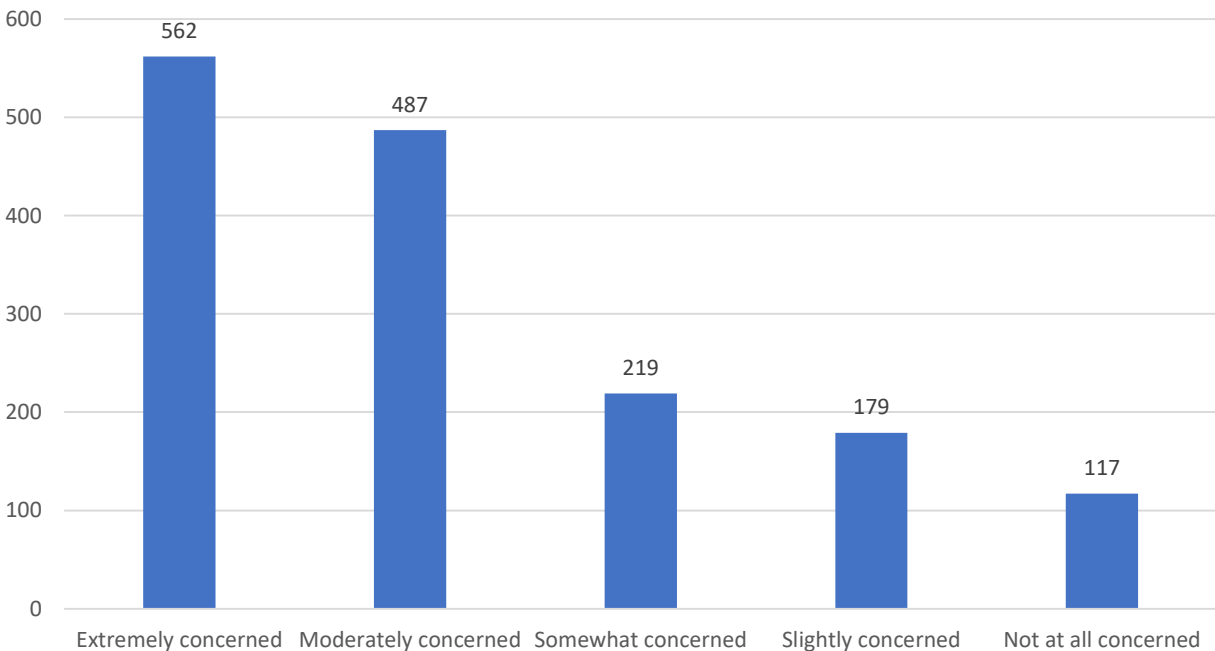




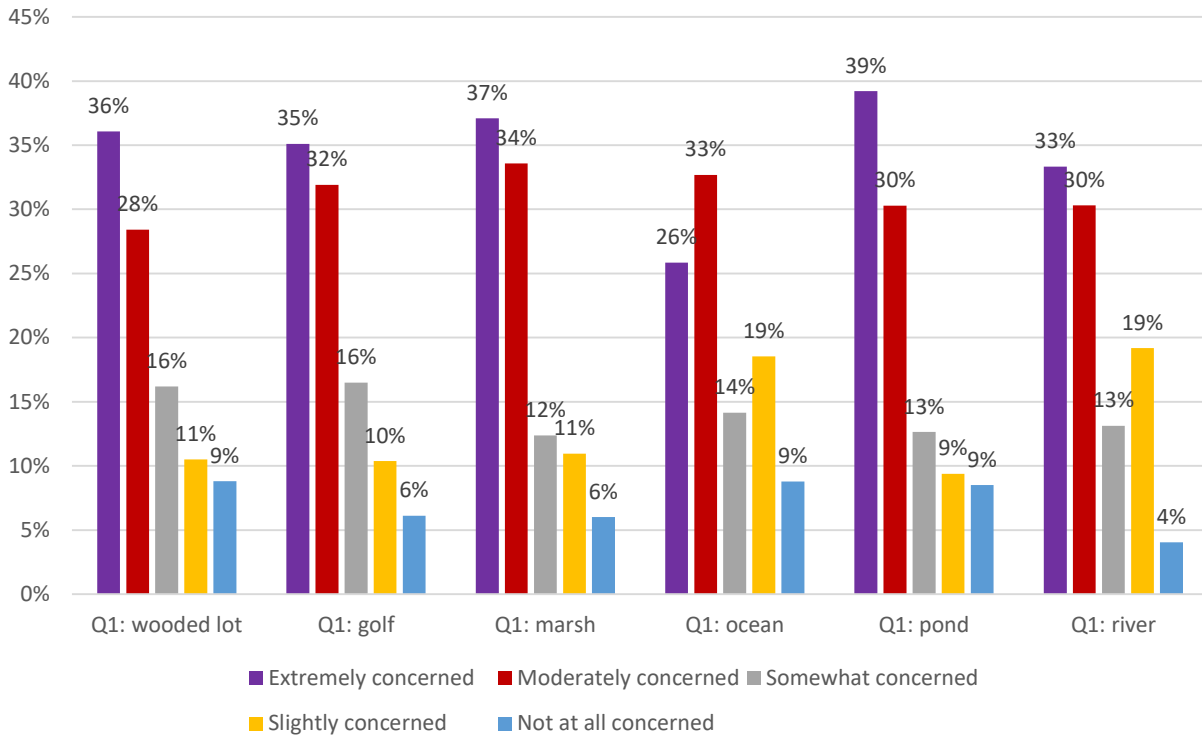
### Concern About Flood Damage to Landscaping vs. Time Spent on Kiawah



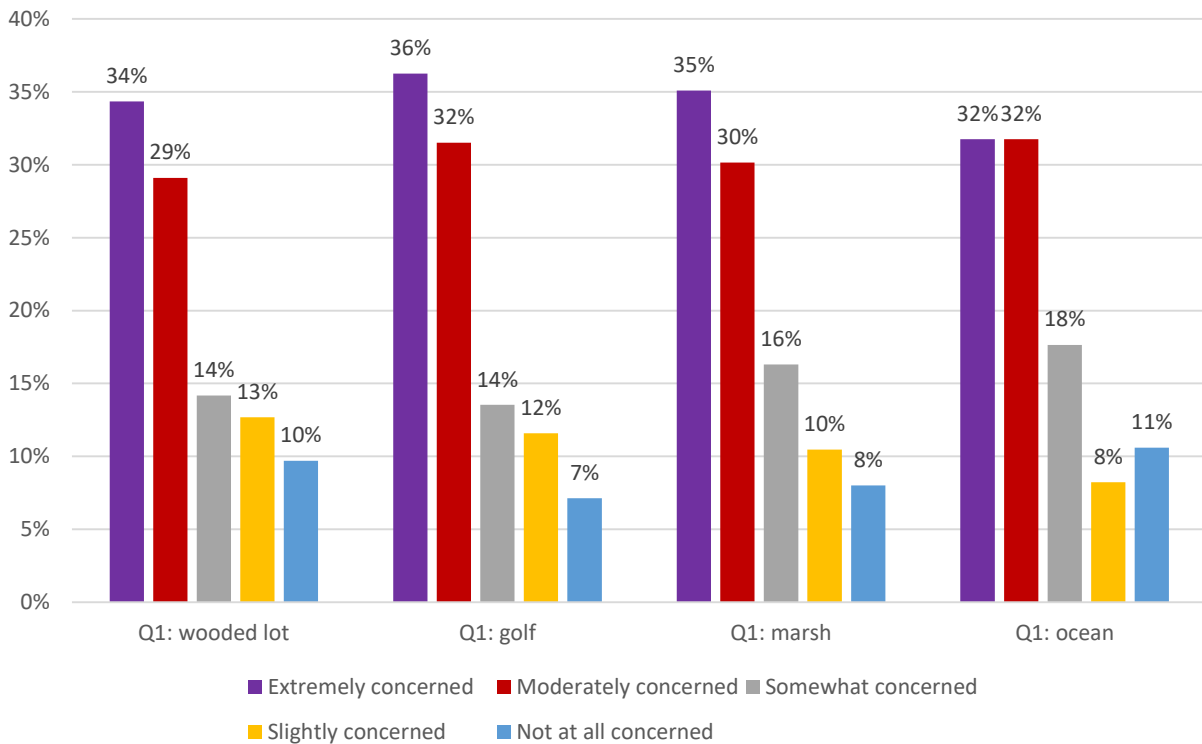
### How concerned are you that flooding could result in an increase in the cost of ownership such as maintenance, repairs, assessments, etc.?



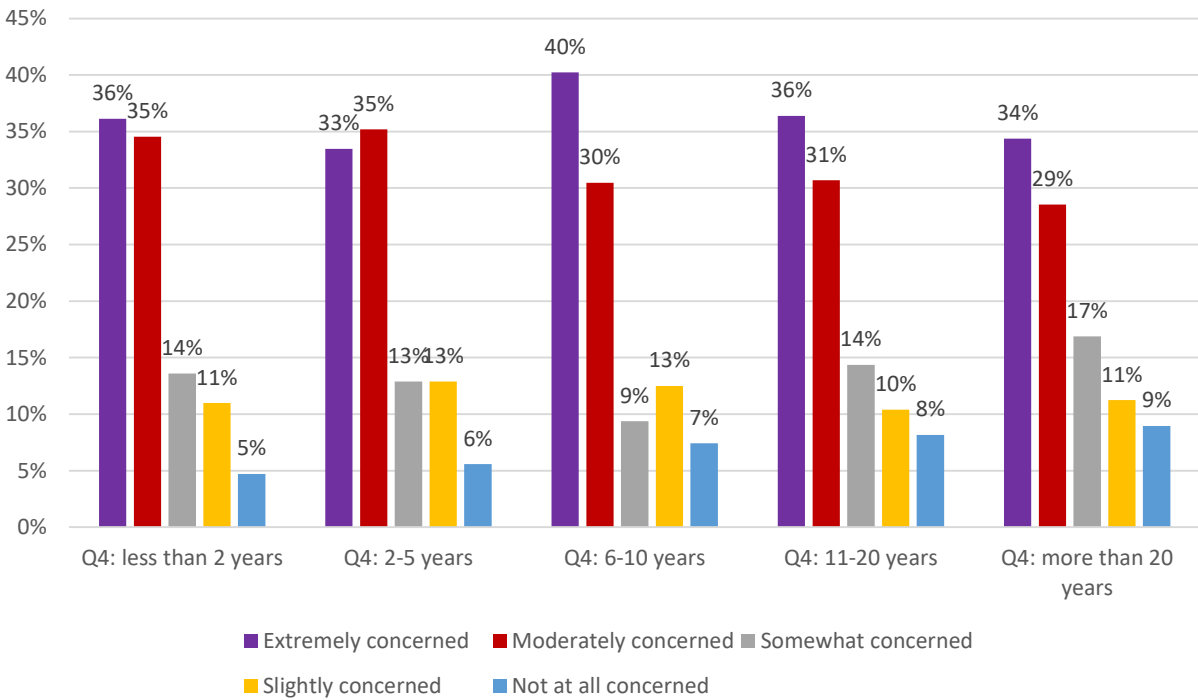
### Concern About Cost of Ownership vs. Location of Property



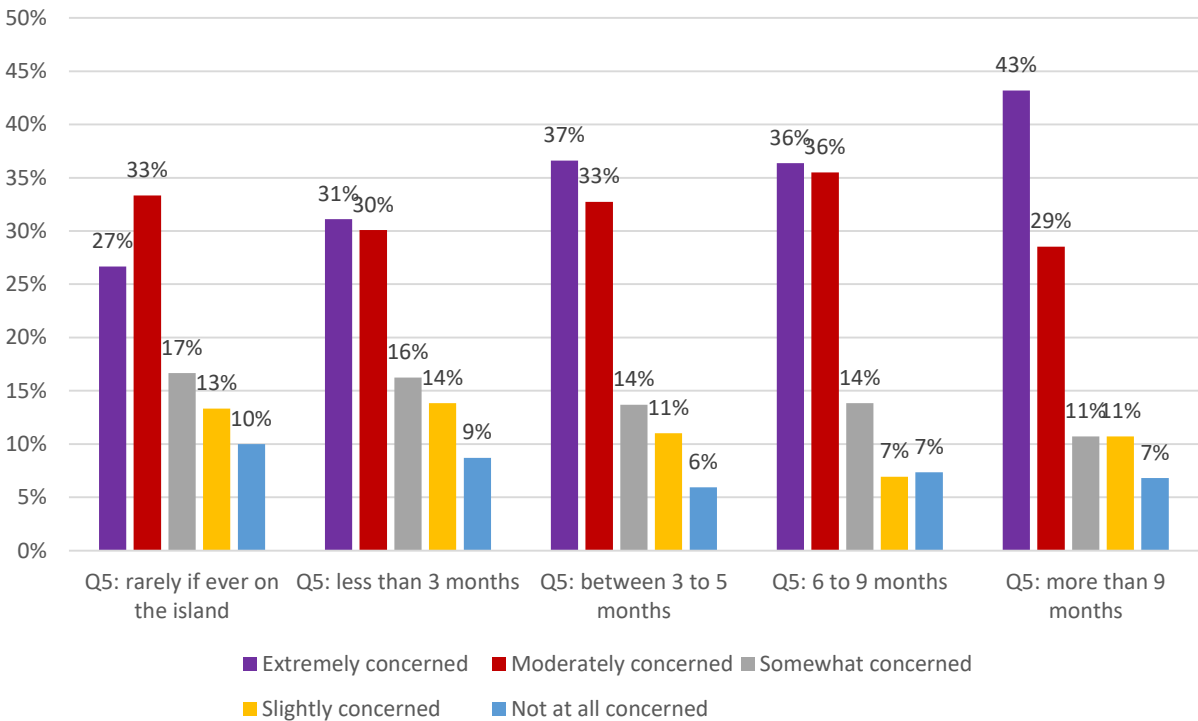
### Concern About Increased Cost of Ownership vs. Type of Property



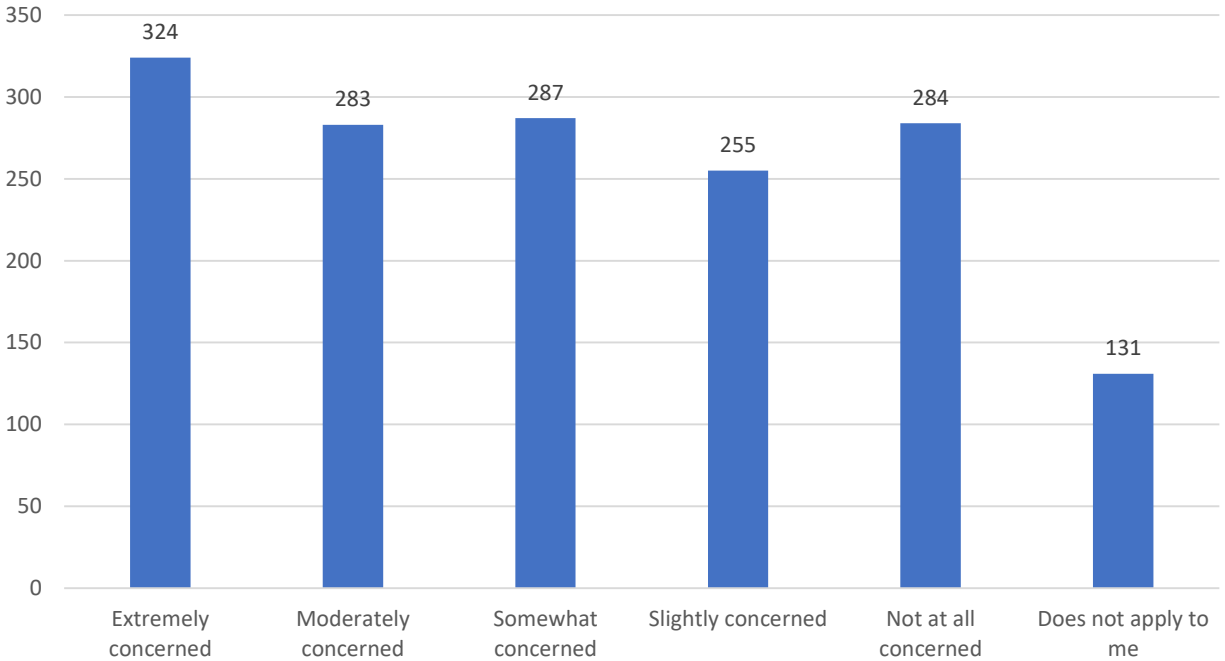
### Concern About Increased Coast of Ownership vs. Years on Kiawah



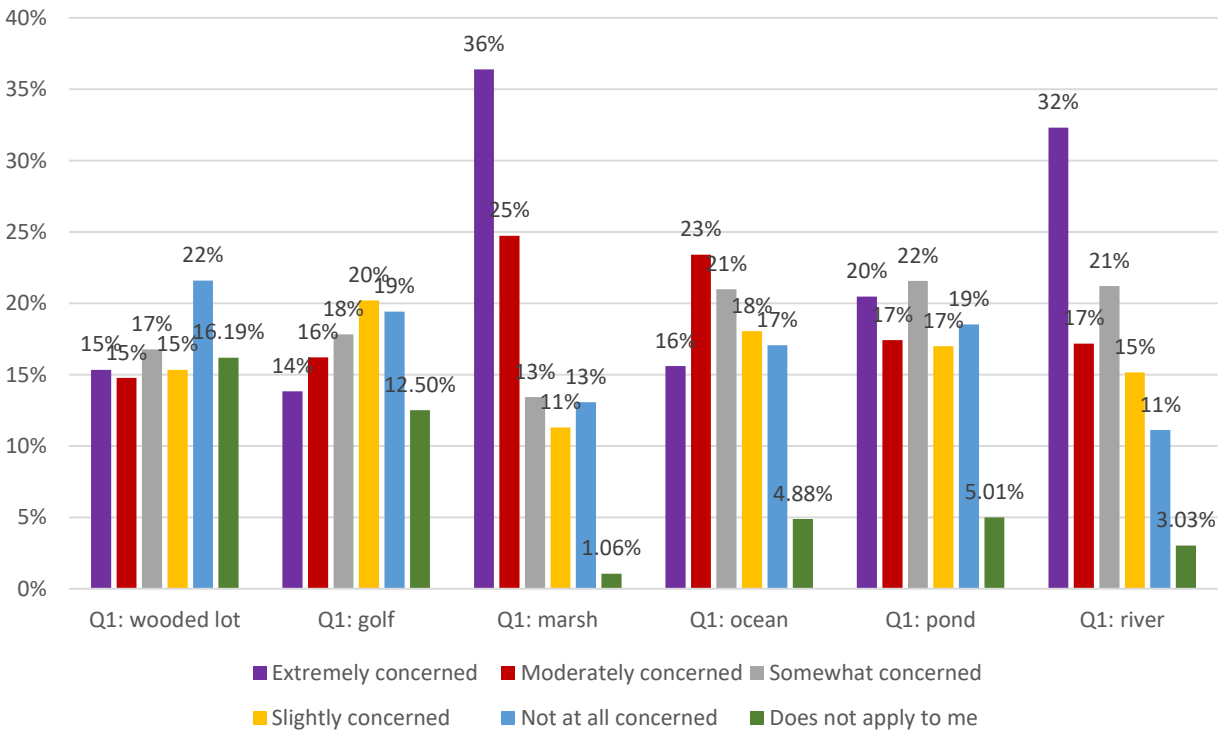
### Concern About Cost of Ownership vs. Time Spent on Kiawah



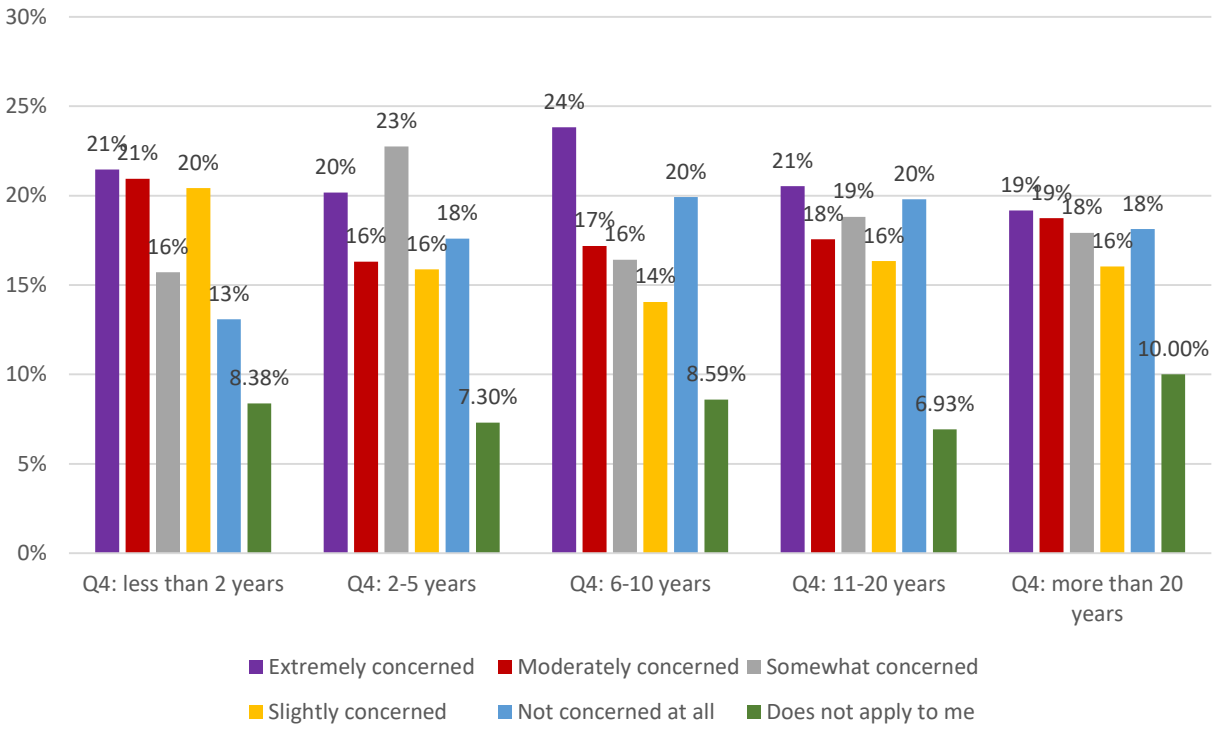
### How concerned are you about the permanent loss of land on your property due to rising water levels in the marsh, ponds, or ocean?



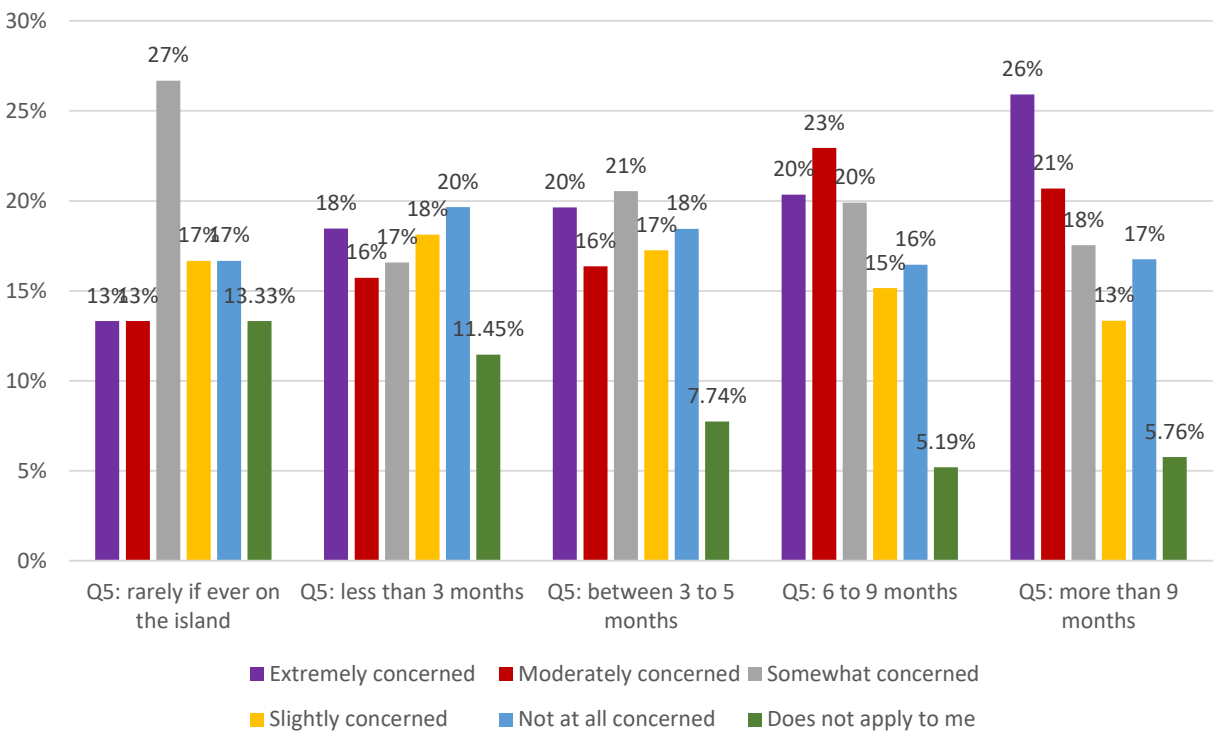
### Concern About Loss of Property vs. Location of Property



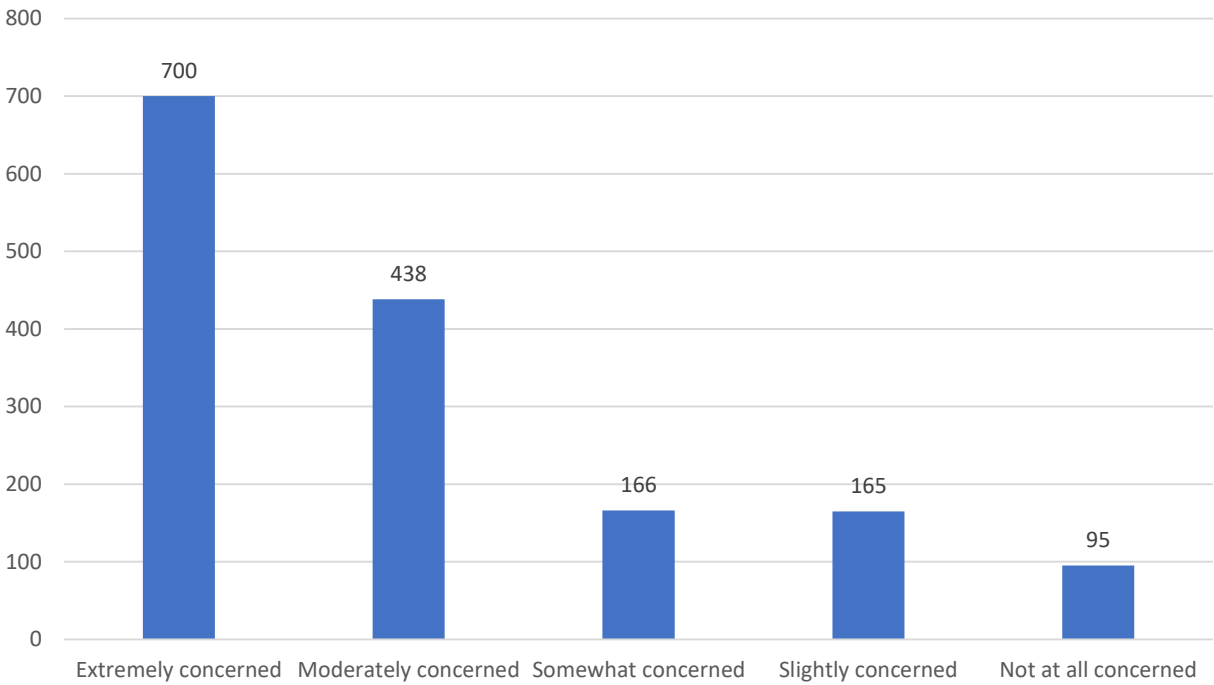
### Concern About Loss of Property vs. Years on Kiawah



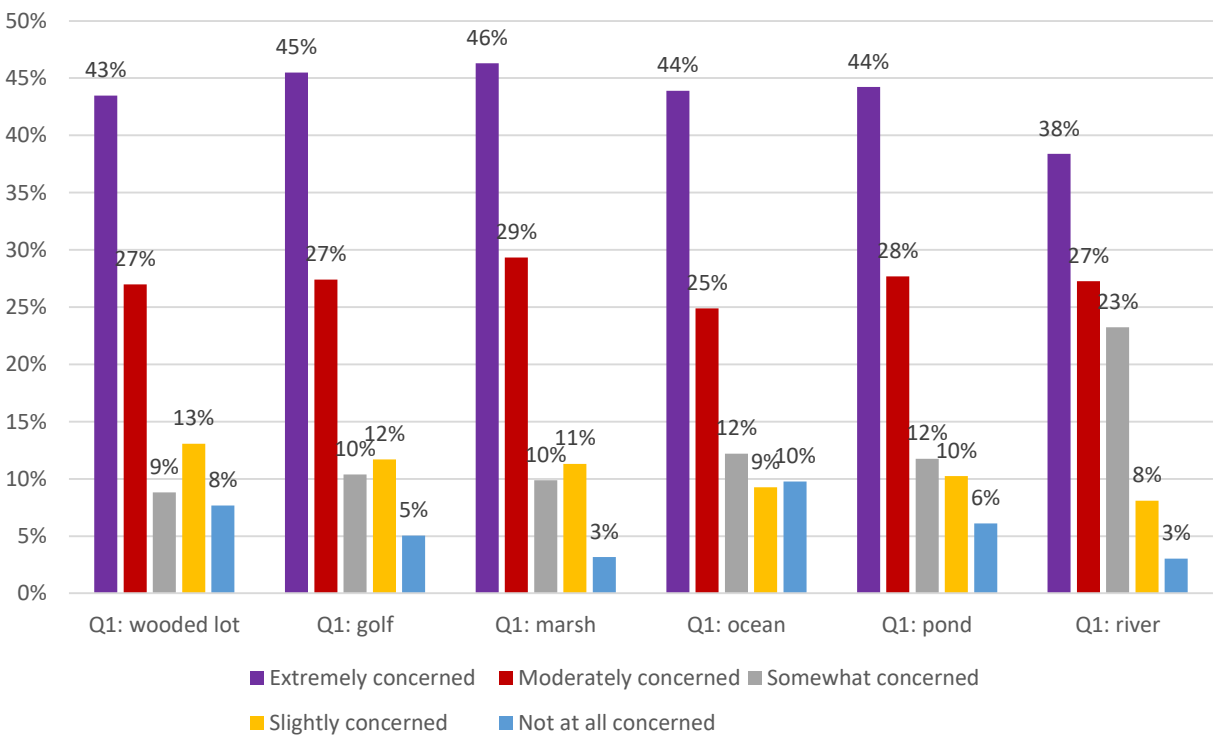
### Concern About Loss of Property vs. Time Spent on Kiawah



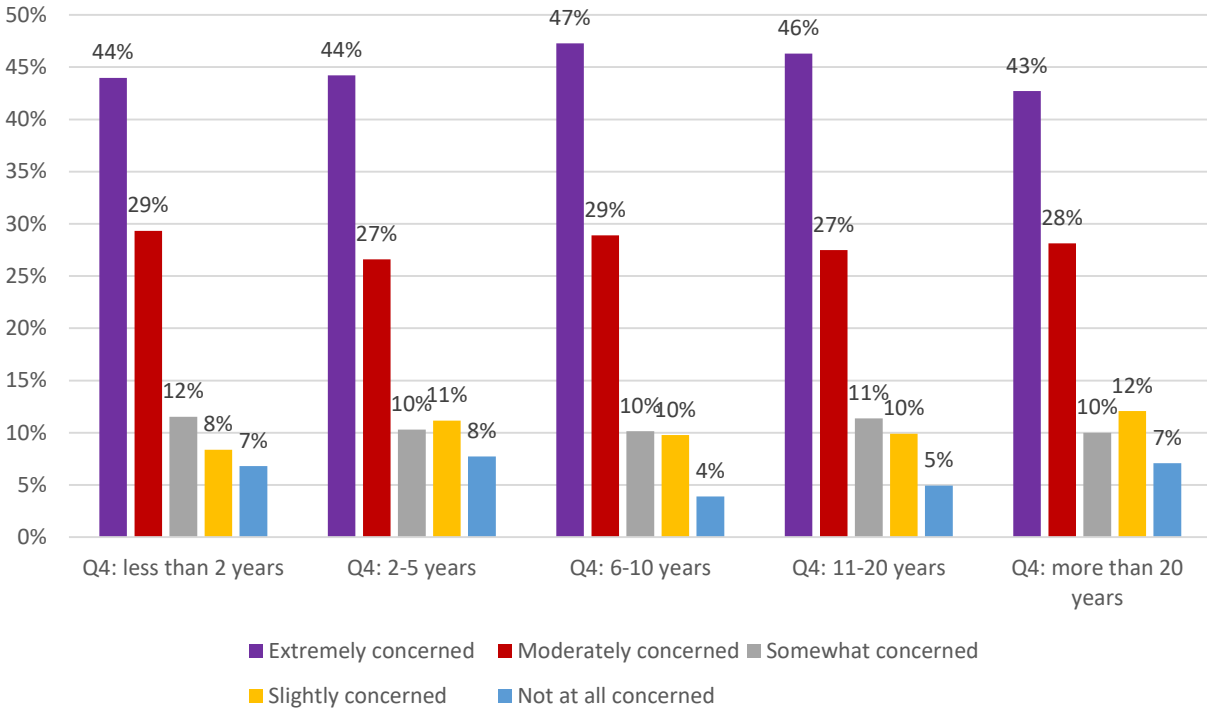
## How concerned are you about erosion to the beach and damage to our dune system?



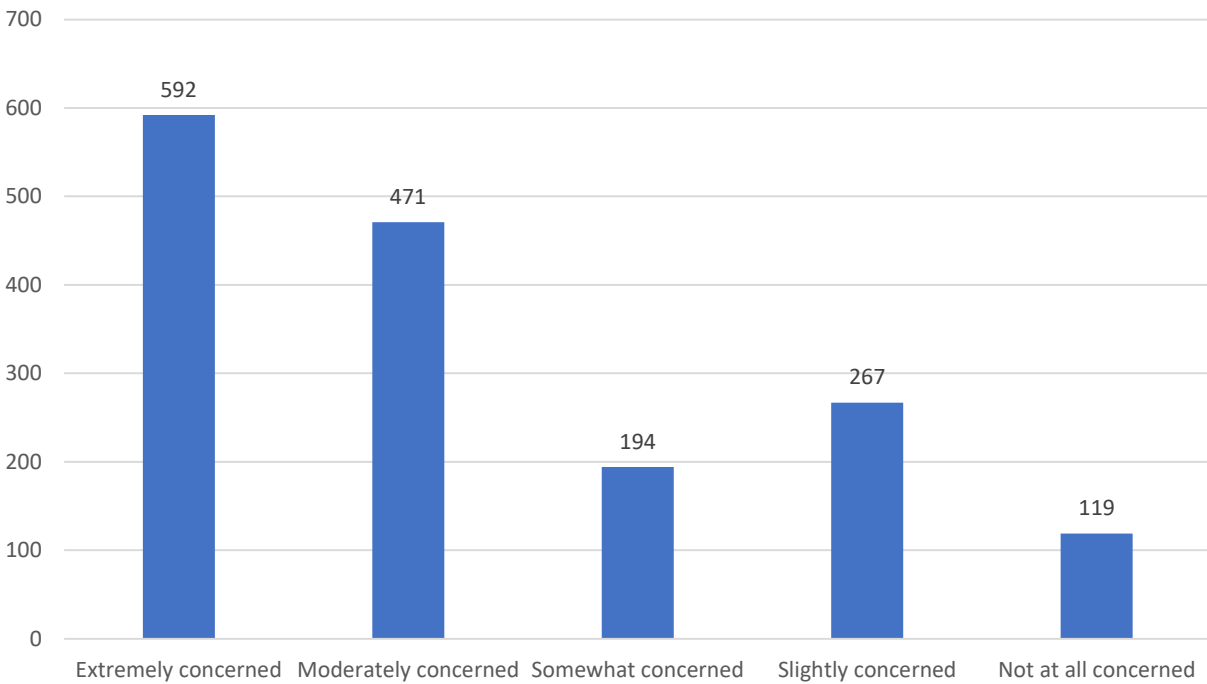
## Concern About Beach Erosion vs. Location of Property



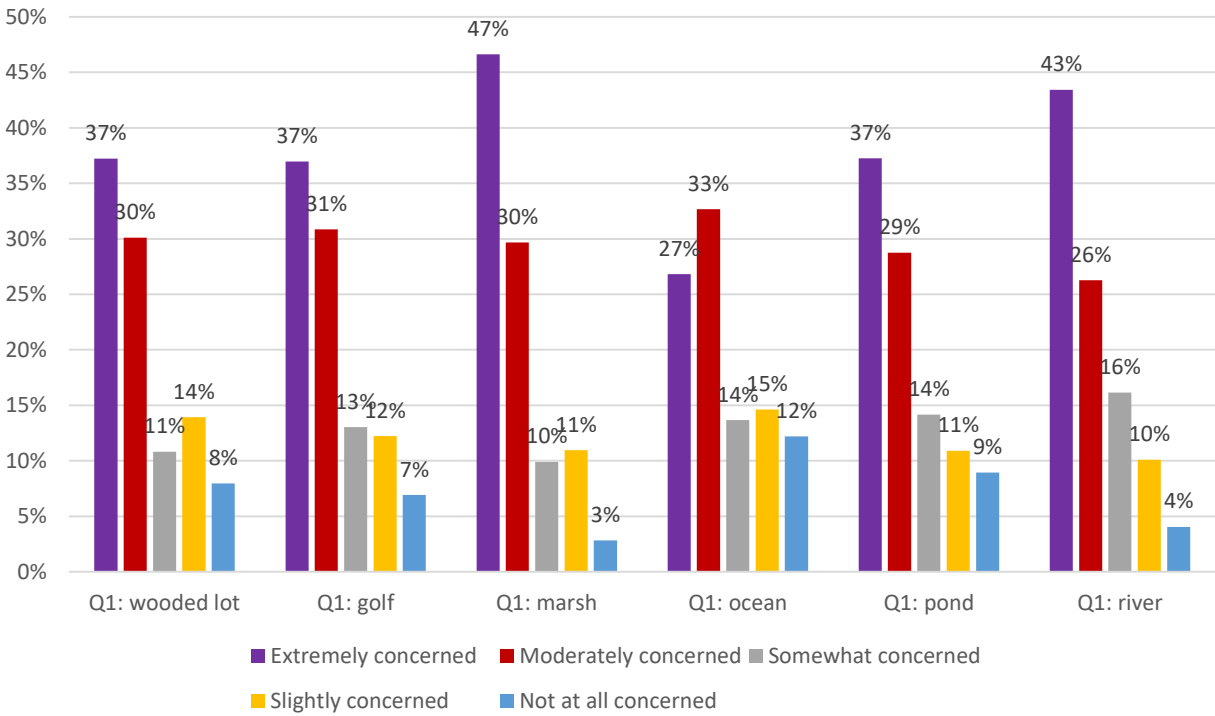
### Concern About Beach Erosion vs. Years on Kiawah



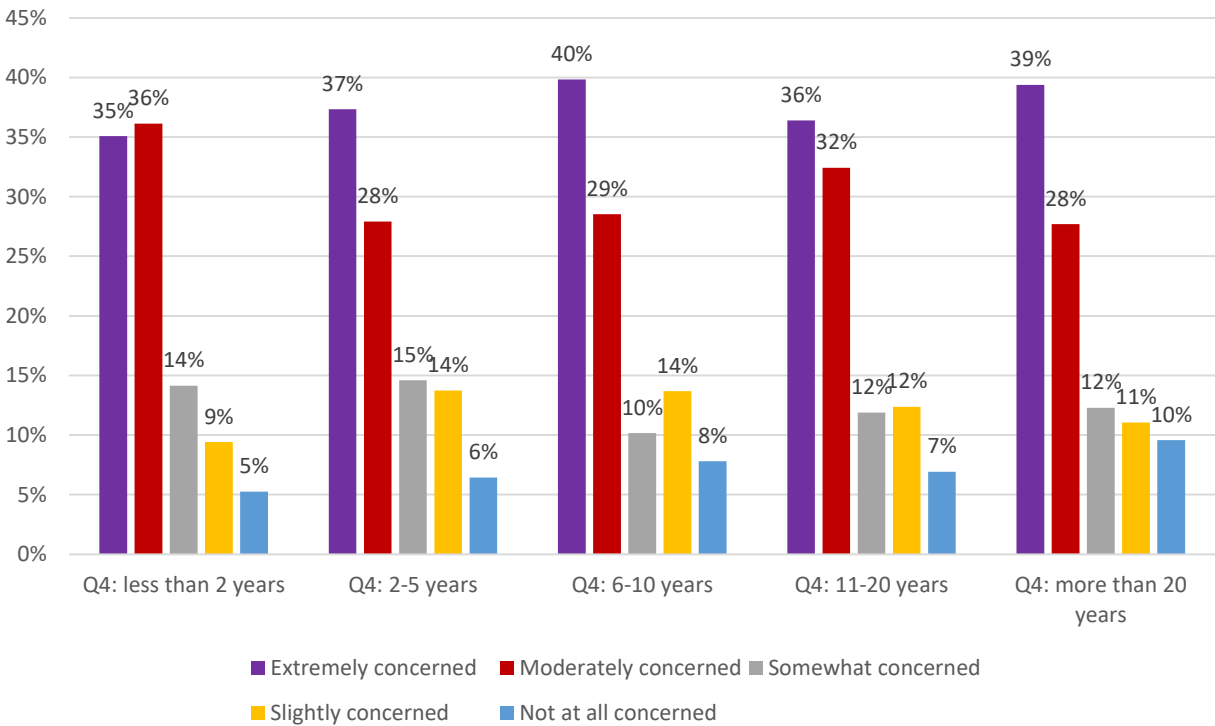
### How concerned are you about damage to the health of our salt marshes?



### Concern About Health of Salt Marshes vs. Location of Property

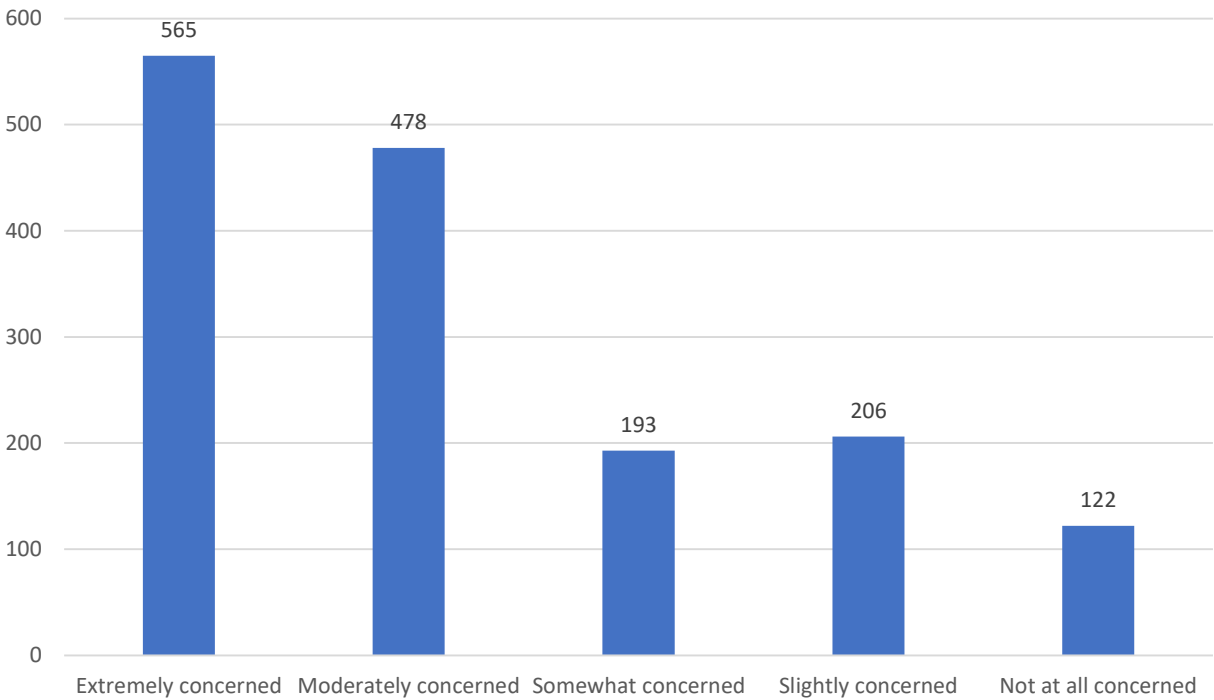


### Concern About Health of Salt Marshes vs. Years on Kiawah

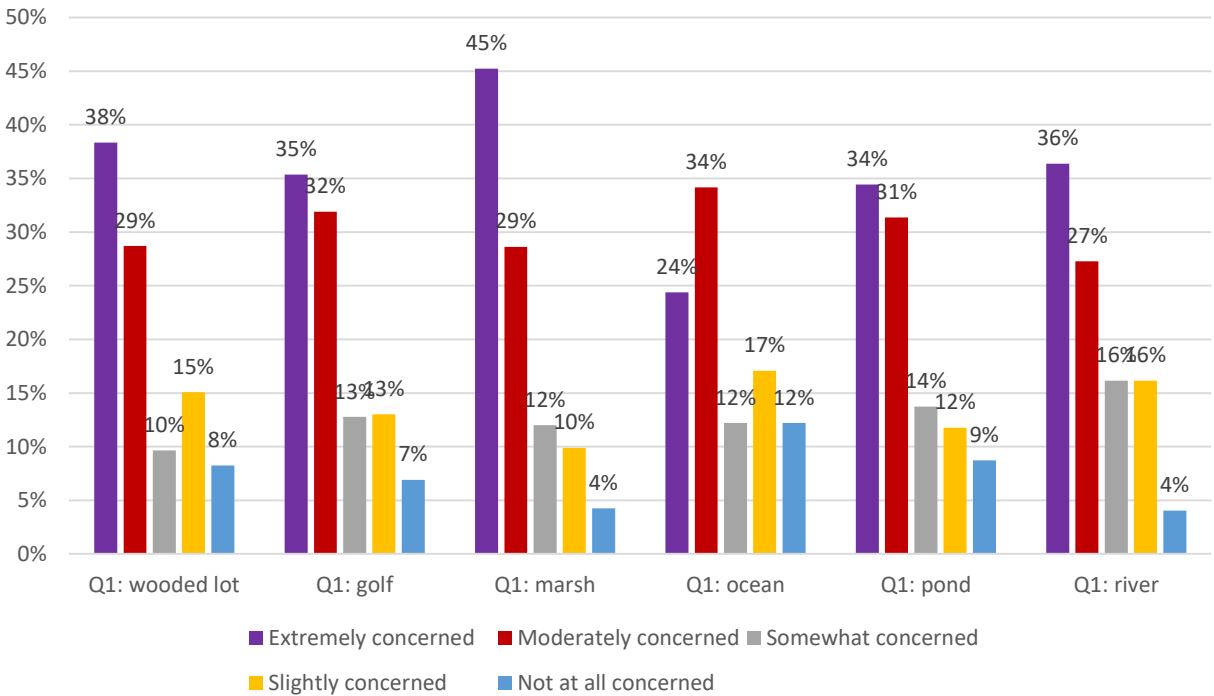




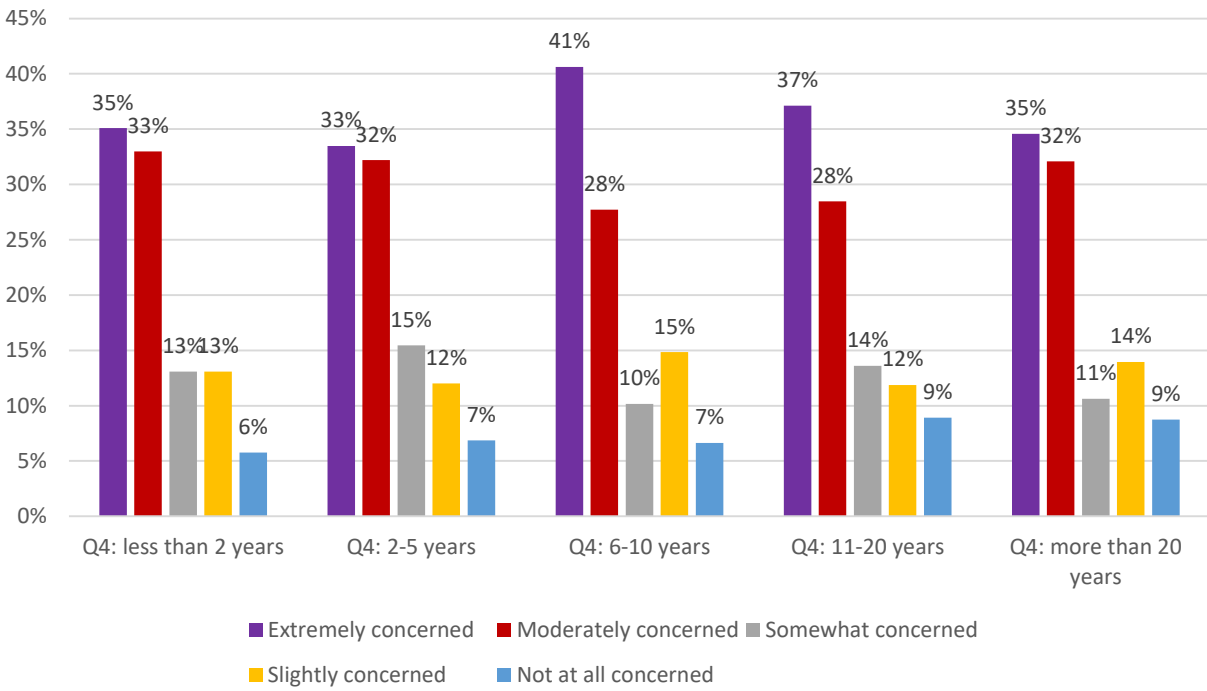
### How concerned are you about damage to our maritime forest from saltwater intrusion and loss of freshwater resources?



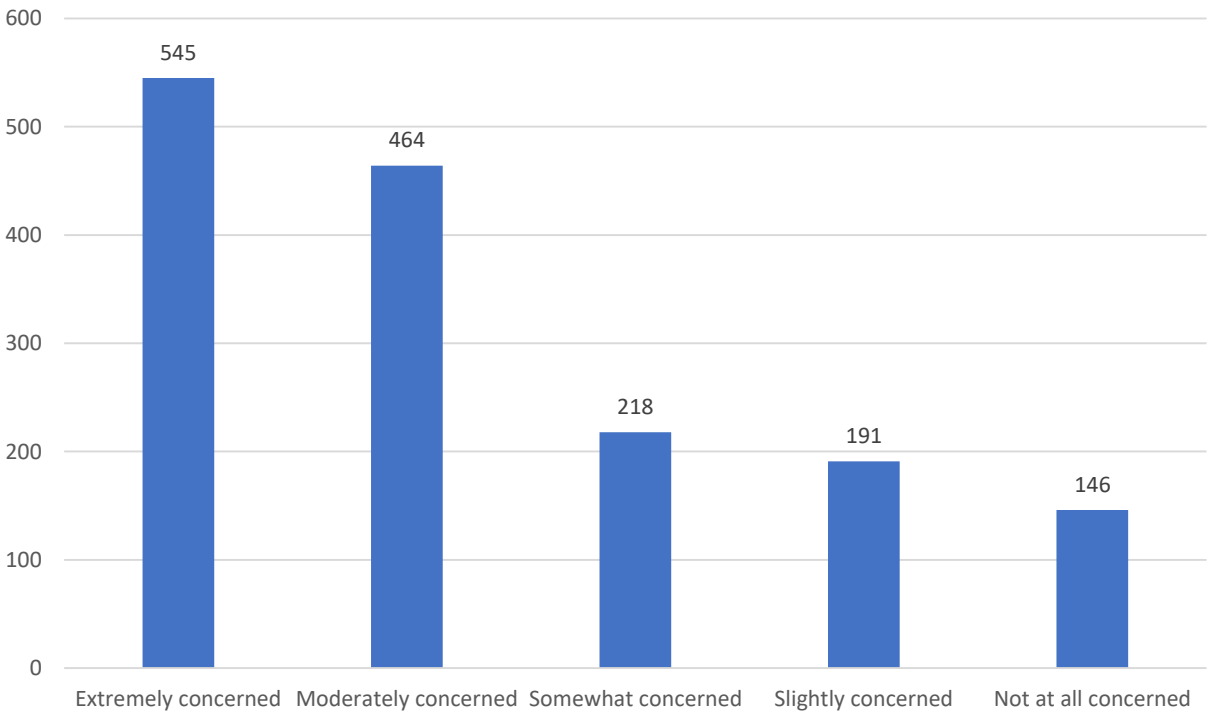
### Concern About Damage to Maritime Forest and Saltwater Intrusion vs. Location of Property



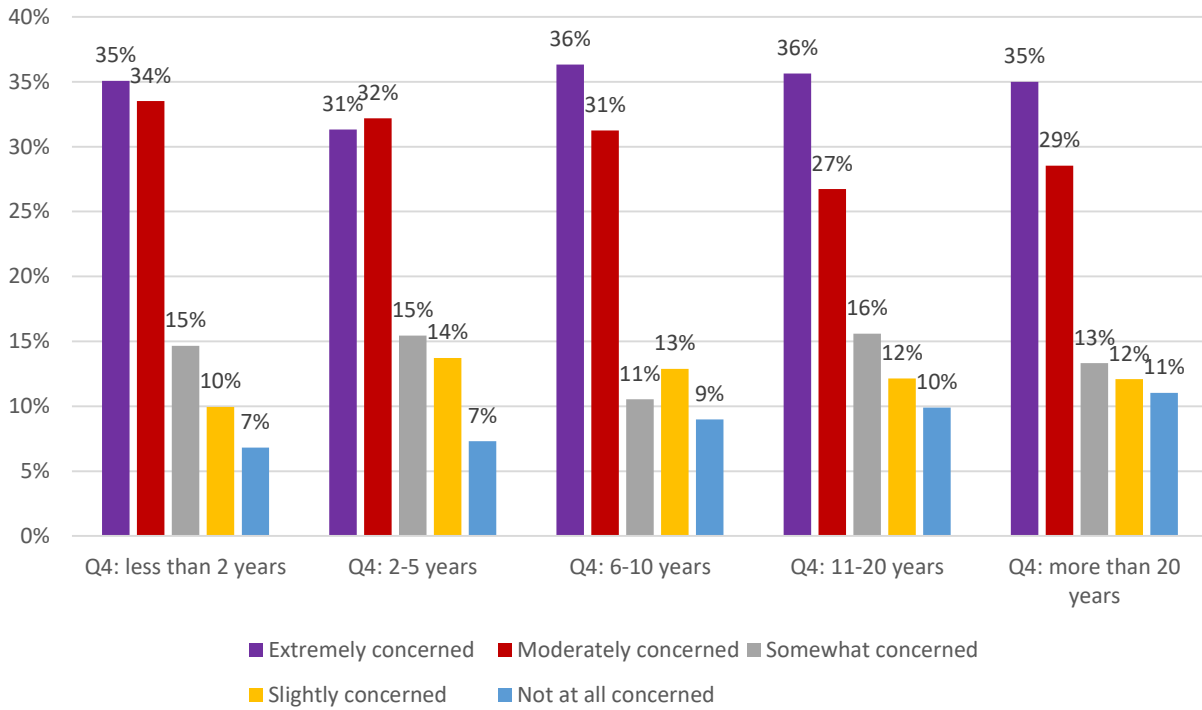
### Concern About Damage to Maritime Forest and Saltwater Intrusion vs. Years on Kiawah



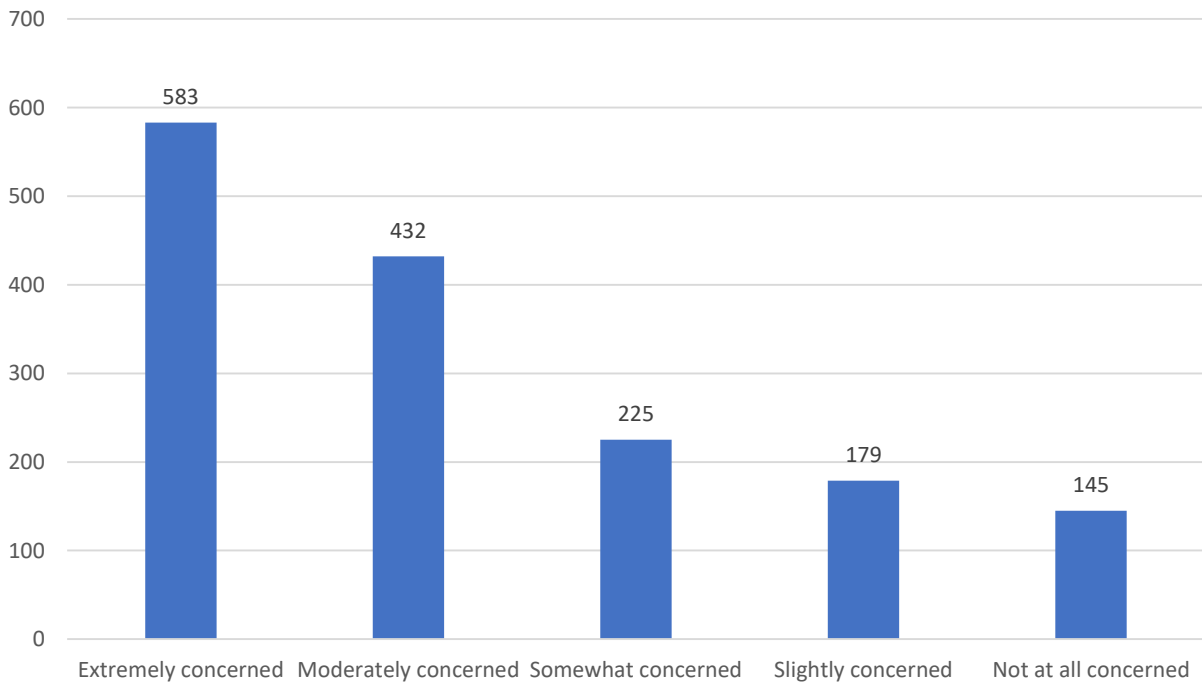
### How concerned are you that rising water levels will cause damage to wildlife habitat?



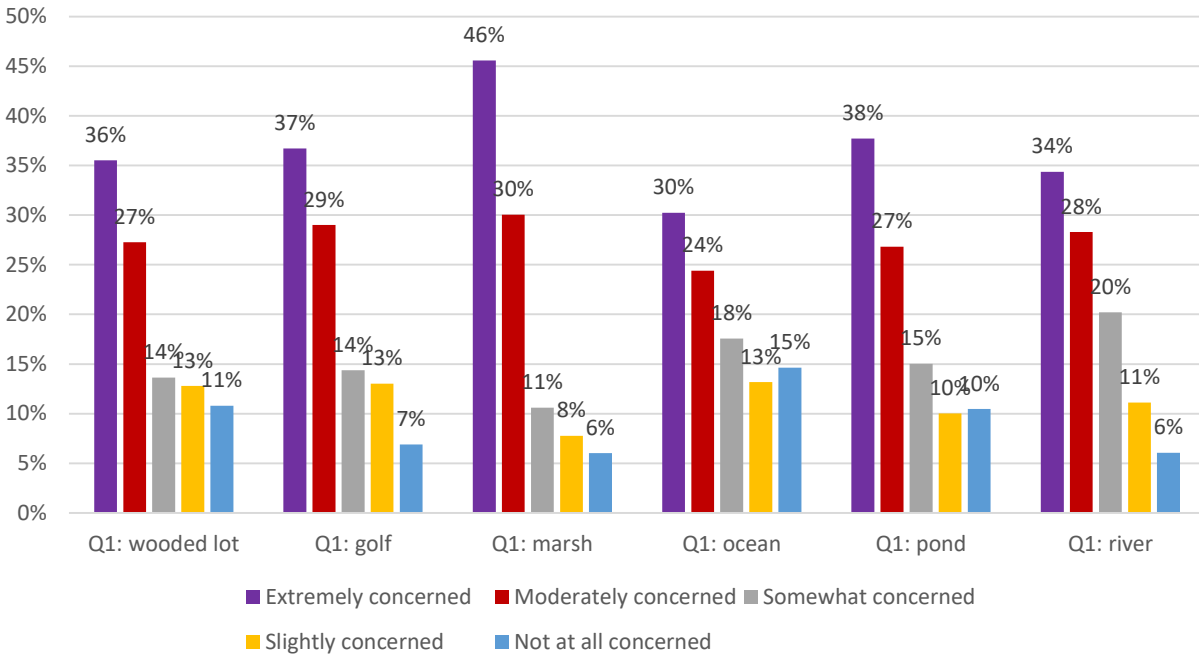
### Concern About Damage to Wildlife Habitat vs. Years on Kiawah



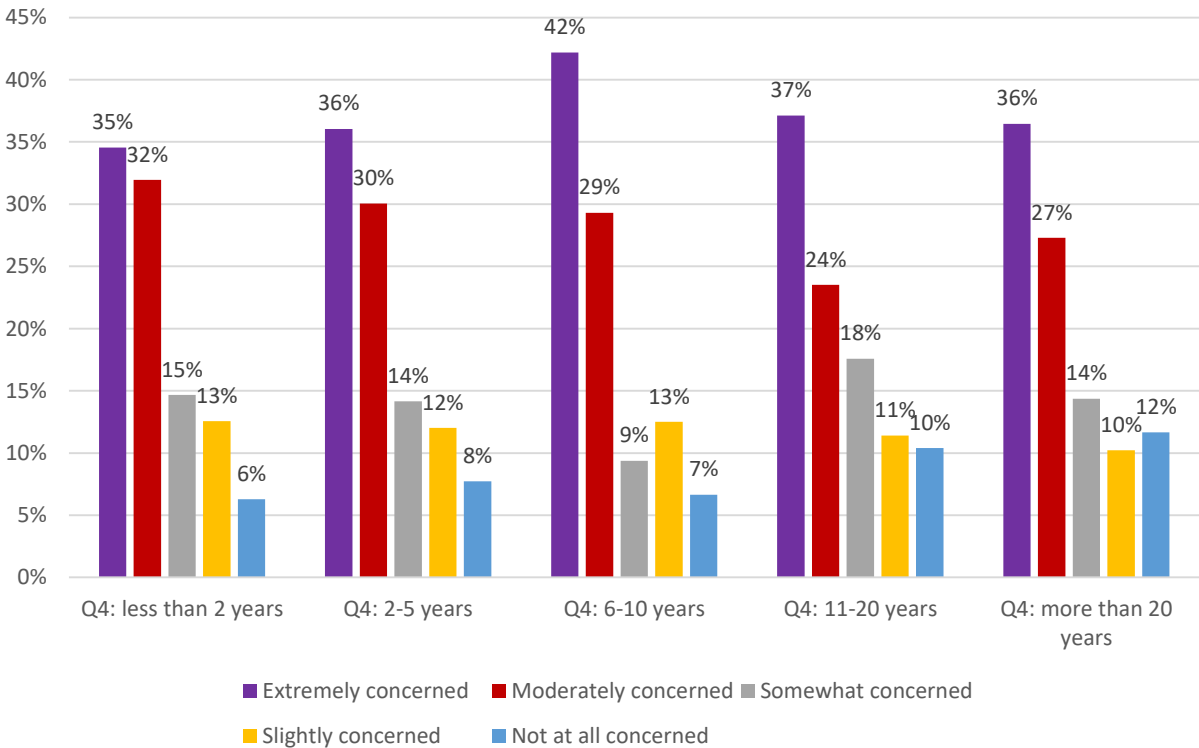
### How concerned are you about the long-term impacts on your quality of life on Kiawah due to future predicted levels of flooding, sea level rise, and climate change?



### Concern About Long-term Impacts to Quality of Life vs. Location of Property



### Concern About Long-term Impacts to Quality of Life vs. Years on Kiawah



## **Community Survey Narrative Comments**

To the open-ended question — Are there any other concerns not covered in this survey about flooding, sea-level rise, and climate change that you would like to share? — there were a total of 277 individual responses. This is about 18% of respondents to the survey. A summary for each of the top categories is listed below.

### 48% of the 277 responses were related to sea level rise, climate change and flooding

- Two areas contained a preponderance of comments: short term versus long term impacts of sea level rise, climate change and flooding, and maintaining the appeal of the island attributes (wildlife, natural environment).
- Comments stating a disbelief in climate change also included the perspective that the cycle of flooding and similar issues were part of the natural environment and not scientifically proven to be related to climate change.
- There were a number of specific issues with streets, drainage and leisure trails, as well as suggestions for mitigation.
- Access to and around the island, including issues with having only one way in and out of the island, was a major concern.

### 21% of the 277 responses were about development issues

- The impact of development was described as a contributor to flooding.
- Nearly all of the comments in this section were related to controlling and standardizing development, mostly on Kiawah, but also on Johns Island and Charleston.
- KICA's willingness and capacity to do what is needed, as well as the ability of the various Kiawah entities to coordinate their efforts, were listed.

### 20% of the 277 responses were about financial issues

In this area the vast majority of comments were in two areas — concerns about housing values and potential assessments rising to maintain the island.

## **ACKNOWLEDGEMENTS**

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Craig Weaver, Mark Permar, and Roger Warren, interviewees who shared their thoughts and input.

Commercial entities who completed the survey about their experiences with clients.

The Kiawah Conservancy Executive Board who provided responses to a short survey