



Responding to the Effects of Coastal Climate Change: *Results of a National Sea Grant Survey*

By Neal McIntosh and Joe Cone

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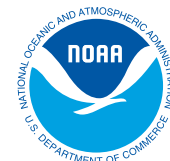
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Executive Summary

This report presents the findings from a national climate-change adaptation survey. This survey was developed to understand the opinions, current phase of planning, and information needs of coastal/resource professionals and elected officials regarding climate change and adaptation to it. The national survey project was led by Oregon Sea Grant; seven other Sea Grant programs cooperated and participated. Individual Sea Grant programs administered the survey to elected officials and coastal/resource professionals within their state. Programs varied in the times they administered the survey; the first program began in January 2012 and the last program concluded in November 2013.

Among 30 questions, survey participants were asked to indicate how informed they felt about climate change in their area and whether they thought that climate is changing in their area. Participants identified their current phase of climate-change adaptation planning and the related hurdles they have encountered and overcome. Participants also identified topics related to climate change that are important to their work and how much information they had about those topics.

Results are presented for the combined opinions of coastal/resource professionals throughout the participant programs as well as state-by-state results. The report analyzes a set of questions viewed as most illustrative of key knowledge, attitudes, and behaviors, rather than every question on the survey. Three-quarters of the 355 coastal/resource professional respondents—and 70 percent of all respondents—think the climate in their area is changing. Most felt they were moderately to very well informed about the effects of climate change in their area. One hurdle respondents commonly encountered was a lack of agreement over the importance of climate-change effects. Shoreline change and flooding concerns were some of the more commonly encountered important topics to the work of survey respondents.

Thus, while the American public may be divided over whether climate is changing, coastal managers and elected officials in nine states say they see the change happening—and believe their communities will need to adapt.

This report represents an initial attempt to understand the opinions and information needs of coastal/resource professionals in coastal regions throughout the United States on the topic of climate-change adaptation planning. Participating programs are using the survey results to assist communities with adaptation. In addition, it is hoped that this survey may stimulate additional survey research by Sea Grant, NOAA, and other coastal interests on this topic of vital importance to coastal America.

Introduction

For some time, coastal communities have been recognized as vulnerable to effects from climate change (Adger et al., 2005), but “increased rates of climate-related environmental changes have made coastal communities vulnerable in ways never before imagined” (Lundgren & McMakin, 2013). In general, however, community response has lagged scientific understanding (Nisbet, 2010). The National Sea Grant College Program, which is active in every coastal state, has been aware of the challenges coastal communities are facing, and began shaping a national response circa 2005. A workshop in 2006 brought leaders together from the Sea Grant network, including those most directly involved in public engagement activities—extension educators, professional science communicators, and other educators. This workshop formulated plans to make a concerted effort to address the climate needs of coastal communities. In the following years these efforts would lead to special initiatives and new funding made available to state Sea Grant programs.

As part of the National Oceanic and Atmospheric Administration (NOAA), the national Sea Grant program developed a

strategic plan for 2009–2013 that called for the state programs to “conduct research to assess hazard-related risks and increase the availability and usefulness of hazard-related information and forecasting for citizens, industries, and decision-makers in coastal communities.” Oregon Sea Grant responded to this call by leading the development of a national climate-adaptation survey, using additional funding from the National Sea Grant Office (NSGO) through one of the Sea Grant network’s strategic “focus teams” (Hazard Resilient Coastal Communities).

The intent was to administer the survey online to coastal professionals to understand some of their opinions, motivations, and hurdles relating to adapting locally to climate change. Initially, 24 of 32 Sea Grant programs expressed interest in potentially being involved with the survey. As survey planning got underway in fall 2010, approximately a dozen Sea Grant states dedicated some staff participation to this network enterprise, with eight programs (and nine states) ultimately participating in the survey as of November 2013: Connecticut, Hawaii, Illinois-Indiana, Louisiana, Maryland, Minnesota, Oregon, and Washington. These states were representative of most NOAA coastal regions, including the Great Lakes, New England, Mid-Atlantic, Gulf of Mexico, Pacific Coast, and Pacific Islands.

Throughout the early years of this century, climate change has been a contentious topic in much of the United States (Leiserowitz, Maibach, Roser-Renouf, & Smith, 2011; Maibach, Roser-Renouf, & Leiserowitz, 2009). In 2010, when this project began, the views of professionals in coastal communities regarding the effects of a changing climate were not well known. Were their views as divided as those of the broad public? Were there distinct differences between appointed professionals and elected coastal officials in various states? Were the views of professionals in different states significantly different? What hurdles did coastal professionals encounter in considering climate change? These were some

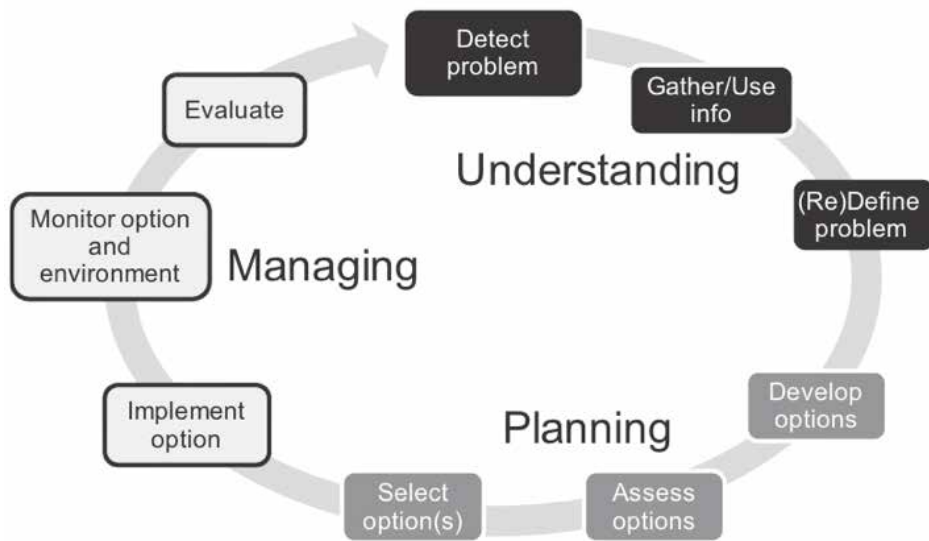


Figure 1. Phases and subprocesses throughout the adaptation process. (S. C. Moser & Ekstrom, 2010)

of the questions that prompted this project and the interests of the Sea Grant partners.

The overall framework and many of the questions in the national survey developed by Oregon Sea Grant and its network partners derived from a similar survey conducted by Sea Grant and partners in California (Hart et al., 2012). Oregon principal investigator Joe Cone, in consultation with the Sea Grant collaborators from participating states,¹ and with permission of the California authors, adopted and in a few instances modified questions from the California survey and added some new ones, as considered appropriate for a national survey.

Many Sea Grant and other outreach practitioners are familiar with conducting “needs assessments,” in which some target audience typically is asked what information they need to have relative to a topic or issue in order to make more informed decisions. While the national survey did indeed ask such questions, we judged a needs assessment alone as too narrow a conceptual framework. The simplifying assumption underlying such assessments is that information is the critical limitation

to constructive action: “If they only knew what we could tell them, then good things would happen.”

However, this “information-deficit model” of science communication has been widely critiqued in recent years and found lacking. The information-deficit model promotes a mainly one-way flow of information from “expert” to “non-experts,” with insufficient attention to what others know (Borchelt & Hudson, 2008); and the application of the model has been generally ineffective in achieving promoted behaviors (Kollmuss & Agyeman, 2002), mainly because information is only one of several factors influencing behavior, “with ideology, social identity and trust often having stronger impacts” (Bubela et al., 2009, p. 514). We were interested in a range of hindrances that those attempting to address climate change might be facing, and we also wanted to know what progress they were making along a decision-making continuum from learning about an issue to taking decisive action. Our questions to elicit that information were derived largely from the California survey and, for the decision-making process, from a benchmark article on climate adaptation (S. C. Moser & Ekstrom, 2010). A diagram of that process is in Figure 1.

¹ *Syma Ebbin and Juliana Barrett (Connecticut); Dolan Eversole and Cindy Knapman (Hawaii); Molly Woloszyn (Illinois-Indiana); Melissa Troscclair Daigle (Louisiana); Vicky Carrasco (Maryland); Hilarie Sorensen and Jesse Schomberg (Minnesota); Bridget Brown and Kirsten Winters (Oregon); and Jamie Mooney (Washington).*

Methods

Through project funding, Oregon Sea Grant established a password-secured online collaboration workplace (www.basecamp.com), which served as a place for group discussion and as a repository of project documents. In addition, the group shared a SurveyMonkey account (www.surveymonkey.com) through which six of the eight participant programs administered the survey.

The questions were drafted as discussed above. Four external scholars and advisors who specialize in survey and climate research reviewed the draft set of questions and made recommendations, and network partners approved a final set of 30 questions (Appendix 1).

Once the national survey questions were created, individual Sea Grant states were encouraged to distribute the survey to coastal professionals and elected officials within their state. States that participated in the survey used the national survey questions and occasionally added state-specific questions that were of interest. The national survey questions were left mostly intact, other than small modifications for clarity or accuracy to individual states (e.g., Louisiana changed the word “county” to “parish”).

Participating states were responsible for obtaining the approval to administer the survey from the human-subjects review board at their affiliated institution. To administer the survey, Sea Grant professionals in the participant states obtained e-mail addresses for relevant stakeholders to survey. Often that population was influenced by the Sea Grant program’s expectation of using the results in subsequent programming, such as informational and planning workshops. Stakeholders that would be unlikely targets for follow-up interaction with the Sea Grant programs were less likely to be solicited to participate in the survey.

E-mail addresses were obtained in any of several ways: from lists held by the Sea Grant program, from publicly available sources, and from organization leaders

who acted as “gatekeepers” to lists of their members. An e-mail to participate, along with a link to the online survey, was sent to invitees. A standard protocol (Salant & Dillman, 1994) of leaving the survey open for three or four weeks and sending an invitation and two reminders was recommended, but the individual states had control over when they launched, how often they sent reminders to their survey lists, and when they closed their surveys. Half of the programs used the built-in collectors in SurveyMonkey to administer their program’s survey; the other half e-mailed their potential participants a Web link to the survey (Table 1). This made it impossible to calculate the true response rate for those states and for the survey as a whole. The response rate for the states that used a Web link and for the whole survey is a maximum response rate; the true response rate is likely lower.

As responses on a changeable public issue like climate change may in part reflect when responses were made, Table 1 shows when the participating states closed their own survey.

Survey responses from each of the participant Sea Grant programs were downloaded from SurveyMonkey for

further analyses by the authors of this report. This report analyzes a set of questions viewed as most illustrative of key knowledge, attitudes, and behaviors, rather than every question on the survey. The questions analyzed were questions 1, 2, 3, 11, 15, 19, and 21 in Appendix 1. Appendix 2 shows the phrasing of those questions where participating Sea Grant programs deviated from the original phrasing.² Most of the results presented here are based on the percentages of respondents from each program that responded in a certain way. This was favored over the raw numbers of respondents so that interstate comparisons could be made more easily. However, the questions concerning the most commonly encountered hurdles and the importance of topics to respondents’ work were analyzed using the number of participants that answered, rather than percentages. The reason was that we wanted to determine which topics participants felt were “extremely important.” Comparing the percentages among states is less informative

2 The entire set of questions is not presented for each state, as it is outside the scope of our analysis. Interested readers may contact individual participating state Sea Grant programs for these details. A list of contacts is in the Acknowledgments.

than simply knowing which topics were most important to those states.

Since one of the goals of this project was to determine the opinions of coastal/resource professionals specifically, a filter was created in SurveyMonkey to allow interpretations of the opinions of just coastal/resource professionals. For all programs except for Maryland, this entailed creating a filter in SurveyMonkey to select just the responses from those who indicated they were a “coastal/resource professional.” Maryland’s response options for the occupation question were changed slightly, so for Maryland we included all public-sector employees who were not volunteers. We deemed this appropriate, since most of Maryland’s counties are coastal, bordering either the Atlantic Ocean or Chesapeake Bay. Minnesota was a very late addition to this study, with a relatively small number of participants; we were unable to filter the responses to include only coastal/resource professionals.

State/Program	Date Survey Closed	Number Sent To	Responded	Response Rate
Connecticut	July 2012	250*	86	34%*
Hawaii	March 2012	150*	48	32%*
Illinois-Indiana	February 2012	3453	258	7%
Louisiana	November 2012	276*	44	16%*
Maryland	January 2012	307	105	34%
Minnesota	November 2013	91*	26	29%*
Oregon	July 2012	353	140	40%
Washington	September 2012	339	97	29%

Table 1. Survey closure date and response rates by program.

*In the “Number Sent To” column, * indicates that the survey was sent as a Web link to potential participants, as opposed to using a SurveyMonkey collector. Since participants may have forwarded the survey link to others, and in some programs this was explicitly encouraged, the response rates for those states (also marked with *) are the maximum response rates possible and not the true response rates.*

Results

Overall, the survey was sent to at least 5,219 individuals, and 804 responses were obtained, for a maximum, aggregate, response rate of 15 percent. However, this nominal rate has a number of caveats (see Table 1) and is not as meaningful as the rate for individual states. The states themselves had marked differences in survey distribution, which affected the rates and their precision.

SURVEY PARTICIPANTS

Survey respondents were asked to identify their primary work affiliation within three broad groupings: elected officials; coastal/resource professional: public sector; or other primary work affiliation. Table 2 summarizes the primary work affiliations of survey participants by state. “Elected officials” included mayor, city council member, county commissioner, tribal official, port commissioner, state legislator, and other local elected official. “Coastal/resource professional” included town/city manager; finance manager; planner; permitting officer; floodplain/flood district manager; water resources manager; wetland manager; harbor, parks, or beach manager; town clean energy/sustainability coordinator; community development department; public works/transportation

department; wildlife/natural resource department; emergency services department; other town/city department; council of governments; planning/zoning board member; flood and erosion control board; conservation commission; and other volunteer board. “Other primary work affiliation” included consulting engineer, local nongovernmental organization, national or international nongovernmental organization, university, and other affiliation.

COASTAL/RESOURCE PROFESSIONALS: PUBLIC SECTOR

Of all the coastal/resource professionals in the public sector who participated in this survey from the different participant programs (n=355), 75% think climate change is occurring in their area. Of those who think climate change is occurring in their area (n=266), most are “very” (43.2%) or “extremely” (25.2%) sure that climate change is occurring; 23.1% are “somewhat” sure and 0.6% are “not at all” sure. To a question placed at the start of the survey, most coastal professionals who responded consider themselves to be moderately (56.9%) or very well (21.7%) informed about the effects of a changing climate in their area; 18.0% consider themselves somewhat informed and 2.8% of coastal professionals consider themselves not at all informed about the effects of a changing

climate in their area. This self-assessment is somewhat more favorable than the pattern of response seen later in the survey, where information needs were solicited. There, most respondents indicated they had only “some of the information” they needed relative to even their most important climate topics. In Appendix 2 we show tables of results for each question analyzed, by state.

Results by State/Program

CONNECTICUT

There were 86 participants from the state of Connecticut. Most of the Connecticut participants feel they are very well (28.6%) or moderately (63.1%) informed about the effects of a changing climate in their area (Figure 2). Of the participants from Connecticut, 87.1% think the climate in their area is changing, 7.1% think the climate in their area is not changing, and 5.9% don’t know if the climate in their area is changing; one person skipped this question (Figure 3).

The most common current phase of climate-change adaptation planning and implementation for Connecticut participants is “understanding” (40.8%), followed by “not currently involved” (32.4%), planning (25.4%), and “implementing” (1.4%) (Figure 4). The most commonly encountered

What is your primary work?	CT (n=54)	HI (n=38)	IL-IN (n=163)	LA (n=24)	MD*	MN (n=17)	OR (n=109)	WA (n=70)
Elected official	8	1	63	1	*	3	25	7
Coastal / resource professional: public sector	42	30	95	20	*	14	70	46
Other primary work affiliation	11	8	12	4	*	1	20	22
Skipped question	32	10	95	20	*	9	31	28

Table 2. The number of respondents by state for each of the primary work affiliations. See text for affiliation details.

The n-value (in parentheses under the state abbreviation) refers to the number of people who answered the question. Despite being asked to choose only one category, some respondents chose more than one category, so the sum of the three categories might be higher than the number of people who answered the question. *Maryland asked this question in a different format than the other participant states.

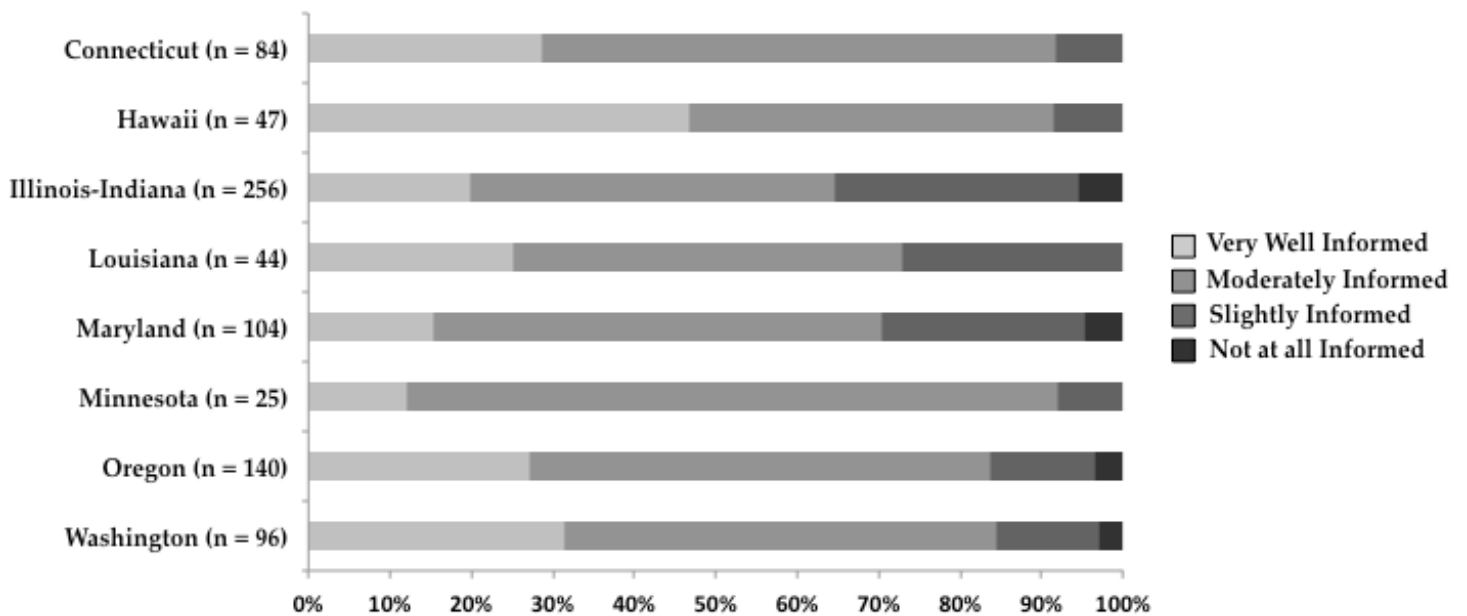


Figure 2. Responses by state to the question: How well informed are you about the effects of a changing climate in your area?

hurdle to climate adaptation planning for Connecticut participants is “lack of agreement over importance of climate change effects,” which was encountered by 37 of 53 respondents (Table 3). The top three most important topics, as determined by the highest proportion of participants who consider it “extremely important” to their work, are flooding or saltwater intrusion, sea-level rise, and shoreline change (Table 3). When asked to indicate the amount of information they had associated with these important topics, the most common answer was “some of what I need” (24 of 52 responses, 27 of 51 responses, and 25 of 52 responses, respectively).

Connecticut provides a timely example of how threatening events may change behaviors. Program participants in Connecticut note that the survey was conducted after tropical storm Irene but before Superstorm Sandy. As of December 2013 (post-Sandy), the level of interest and concern within the state’s municipalities relating to climate change, sea-level rise, and coastal storms “has risen dramatically, as have the resources created and under development for municipalities.”³

HAWAII

Hawaii had 48 participants, most of whom feel they are very well (46.8%) or moderately (44.7%) informed about the effects of a changing climate in their area (Figure 2). Of the Hawaiian respondents, 85.4% think the climate in their area is changing, 4.2% think that the climate in their area is not changing, and 10.4% don’t know if the climate in their area is changing (Figure 3).

The current phase of climate-change adaptation planning and implementation most common to Hawaii participants is “planning” (47.7%), followed by “understanding” (34.1%), “not currently involved” (13.6%), and “implementing” (4.5%) (Figure 4). “Lack of agreement over importance of climate change effects” is the most commonly encountered hurdle to climate-adaptation planning for Hawaiian participants, which was encountered by 32 of 39 individuals (Table 3). The most important topics to the work of respondents from Hawaii are the cost of climate adaptation, which was scored as extremely important by 30 of 38 individuals; sea-level rise, scored as extremely important by 29 of 38 individuals; and shoreline change, also scored as extremely important by 29 of 38 individuals (Table 3). The amount of information respondents felt they had associated

with the cost of climate adaptation was “none of what I need” (17 of 38 responses) and “some of what I need” for sea-level rise and shoreline change (24 of 38 responses and 25 of 38 responses, respectively).

ILLINOIS-INDIANA

The combined Sea Grant program for the states of Illinois and Indiana had 258 participants. Most of the participants from Illinois-Indiana feel they are very well (19.9%) or moderately (44.5%) informed about climate change in their area (Figure 2). Sixty-point-nine percent of the Illinois-Indiana participants think the climate in their area is changing, 24.0% do not think the climate in their area is changing, and 15.1% don’t know if the climate is changing in their area (Figure 3).

Most of the participants from Illinois-Indiana indicated that they are “not currently involved” (60.1%) in climate-change adaptation planning and implementation, followed by “understanding” (31.9%), “planning” (6.1%), and “implementing” (1.9%) (Figure 4). The Illinois-Indiana survey leader was surprised that 60% of people who responded believe the climate in their area is changing, and yet the same

percentage are not involved at all in climate adaptation planning.³

The most common hurdle to climate-adaptation planning for Illinois-Indiana participants is “lack of agreement over importance of climate change effects,” which was encountered by 82 of 154 individuals (Table 3). The three most-important topics to the work of respondents from Illinois-Indiana are the frequency and extent of flooding events, which was scored as extremely important by 88 of 158 individuals; water infrastructure, scored as extremely important by 81 of 156 individuals; and land-use planning and zoning, scored as extremely important by 69 of 156 individuals (Table 3). The amount of information respondents felt they had was “some of what I need” for both frequency and extent of flooding events (63 of 152 responses) and water infrastructure and land-use planning and zoning (57 of 151 responses and 44 of 150 responses, respectively). Two of the top three most-important topics to respondents from Illinois-Indiana were options that were unique to their survey. From the list of options that all the states received, the

next two most-important topics are economic vulnerability and spread of invasive species, scored as extremely important by 67 of 157 and 64 of 155 individuals, respectively. Illinois-Indiana respondents feel they have some of the information they need for both of these topics, 60 of 149 responses and 59 of 151 responses, respectively.

LOUISIANA

There were 44 participants from Louisiana. Most consider themselves moderately (47.7%) or very well informed (25.0%) about climate-change effects in their area (Figure 2). Seventy-five percent of the Louisiana participants think the climate in their area is changing, 9.1% think the climate is not changing in their area, and 15.9% don’t know (Figure 3).

Most Louisiana participants are not currently involved (61.8%) in climate change-adaptation planning and implementation; the next most-common current phase for Louisiana participants is “understanding” (29.4%), followed by “planning” (5.9%) and “implementing” (2.9%) (Figure 4). “Lack of agreement over importance of climate change effects,” “insufficient

funding to prepare a plan,” and “insufficient staff or staff resources to prepare a plan” are the most commonly encountered hurdles to climate adaptation planning for Louisiana participants; these hurdles were all encountered by 13 of 25 respondents (Table 3).

Shoreline change, flooding or saltwater intrusion, and sea-level rise are the three most-important topics to the work of Louisiana respondents, scored as extremely important by 16 of 26 individuals, 16 of 26 individuals, and 14 of 26 individuals, respectively (Table 3). The amount of information respondents feel they have associated with shoreline change is “some of what I need” (10 of 26 responses), “most of what I need” for flooding or saltwater intrusion (9 of 26 responses), and “some of what I need” for sea-level rise (11 of 26 responses).

MARYLAND

Maryland had 105 participants, most of whom feel they are very well (15.4%) or moderately (54.8%) informed about the effects of a changing climate in their area (Figure 2). Of the Maryland respondents, 66.7% think the climate in their area is

3 Molly Woloszyn, 12/18/13, personal communication.

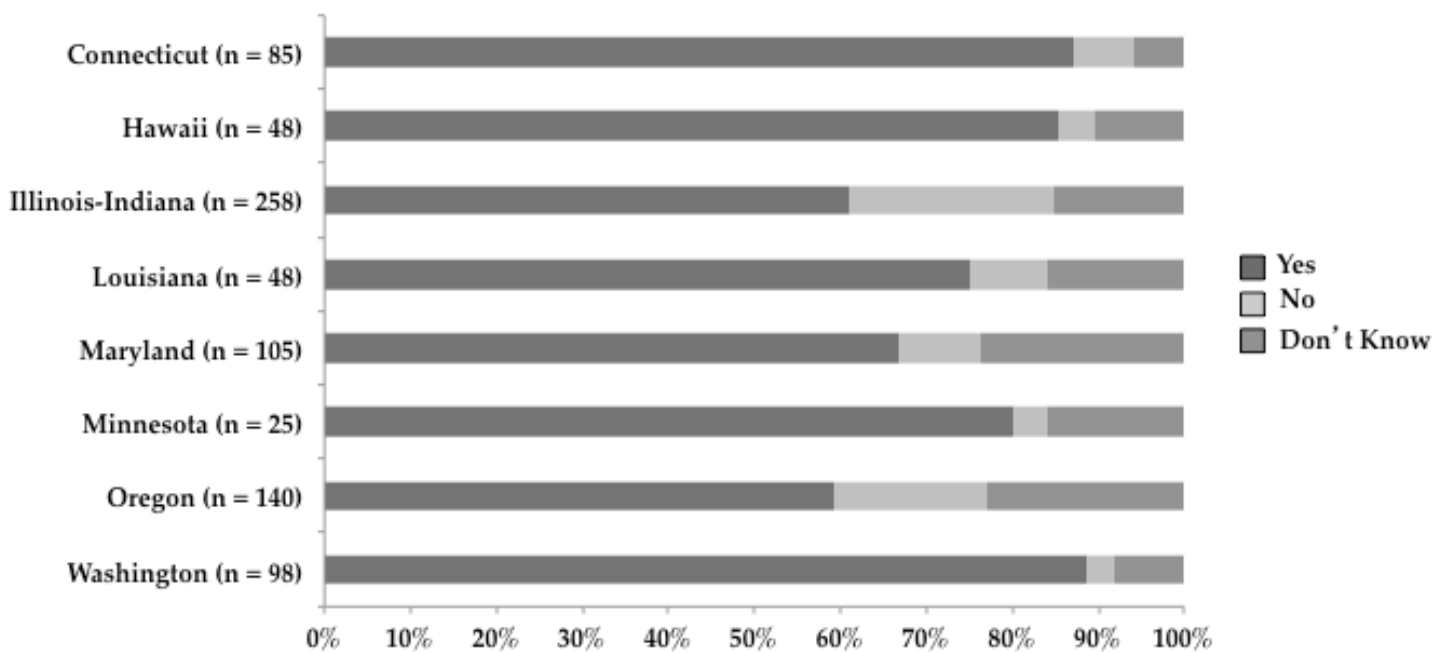


Figure 3. Responses by state to the question: Do you think the climate in your area is changing?

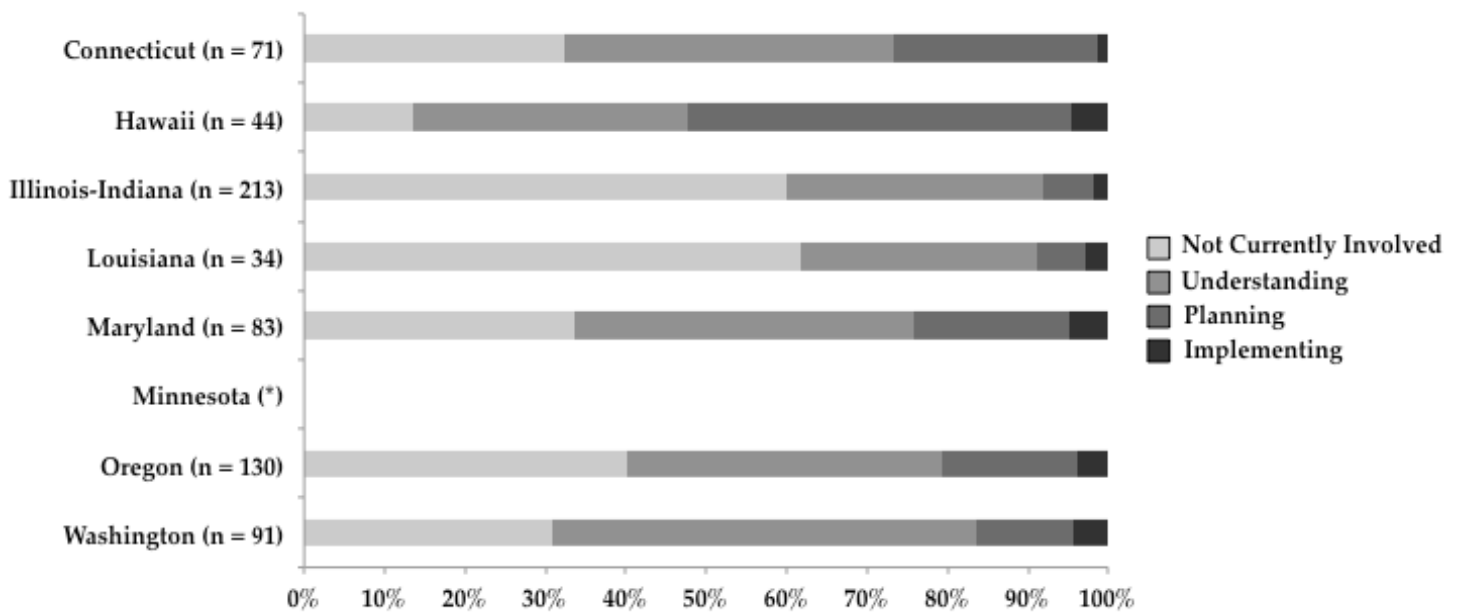


Figure 4. Responses by state to the question: Which of the following best describes your current phase of climate change adaptation planning and implementation? *Minnesota did not ask this question.

changing, 9.5% think that the climate in their area is not changing, and 23.8% don't know if the climate in their area is changing (Figure 3).

The most common current phase of climate-change adaptation planning and implementation for Maryland participants is “understanding” (42.2%), followed by “not currently involved” (33.7%), “planning” (19.3%), and “implementing” (4.8%) (Figure 4). The most commonly encountered hurdle to climate-adaptation planning for Maryland participants is that “currently pressing issues are all-consuming,” which was encountered by 46 of 65 individuals (Table 3). The most important topics to the work of participants from Maryland are shoreline change, scored as extremely important by 32 of 68 individuals, flooding or saltwater intrusion, scored as extremely important by 29 of 69 individuals, and species and habitat vulnerability, scored as extremely important 27 of 67 individuals (Table 3). Maryland participants feel they have some of the information they need about the top three most-important topics (35 of 66 responses, 30 of 66 responses, and 27 of 67 responses, respectively.)

MINNESOTA

Minnesota had 26 people participate in the survey. Most of the participants from Minnesota feel they are very well (12.0%) or moderately (80.0%) informed about climate-change effects in their area (Figure 2). Of the Minnesota respondents, 80.0% think the climate in their area is changing, 4.0% think the climate in their area is not changing, and 16.0% don't know if the climate in their area is changing (Figure 3).

Minnesota did not include the question about the current phase of climate-change adaptation planning and implementation (Q. 11, Appendix 1). Minnesota did include the follow-up questions to the current phase question (Q. 12, Q. 13, Q. 14 Appendix 1). The number of people who chose to answer the follow-up questions gave some indication of the phase that participants would have chosen if that question had been included, but should not be considered conclusive. Of the 26 participants, 19 answered the follow-up question to the “understanding” question, implying that 19 participants from Minnesota feel they are in the “understanding” phase. No one answered the follow-up questions to the “planning” or “implementing” questions, implying that none of the Minnesota

participants feel they are in the “planning” or “implementing” phase. Additionally, though there was no follow-up question for those who indicated they are “not currently involved” in climate-change adaptation planning, 13 participants indicated that they are not involved in climate “adaptation planning” based on their answer to the question asking about what prompted their involvement in climate adaptation planning (Q. 10, Appendix 1).

The hurdle most commonly encountered, by 15 of 17 Minnesota participants, was that there is a “lack of agreement over importance of climate change effects” (Table 3). The topics most important to the work of Minnesota participants are the spread of invasive species, scored as extremely important by 11 of 18 individuals; flooding, which 10 of 18 individuals scored as extremely important; shoreline change, scored as extremely important by 9 of 18 participants; and predictions of ecosystem impacts, also scored as extremely important by half the participants (Table 3). Minnesota participants most frequently felt they had just “some” of the information they need about the most important topics (11 of 18 responses, 11 of 18 responses, 10

of 18 responses, and 11 of 18 responses, respectively).

OREGON

Oregon had 140 individuals participate in the survey. Oregon participants primarily feel they are very well (27.1%) or moderately (56.4%) informed about the effects of climate change in their area (Figure 2). When asked if they thought the climate in their area was changing, 59.3% said yes, 17.9% said no, and 22.9% said they don't know (Figure 3).

The phase of climate-change adaptation planning and implementation that is most common for Oregonians is "not currently involved" (40.0%), followed by "understanding" (39.2%), "planning" (16.9%), and "implementing" (3.8%) (Figure 4). The hurdle most commonly encountered, by 80 of 110 Oregon participants, is "lack of agreement over importance of climate change effects" (Table 3).

The three most-important topics to the work of Oregon respondents are economic vulnerability, scored as extremely important by 49 of 109 respondents; the cost of climate adaptation, scored as extremely important by 47 of 110; and flooding or saltwater intrusion, scored as extremely important by 45 of 108 respondents (Table 3). Oregon respondents feel they have "some of what [they] need" in terms of information for economic vulnerability and flooding or saltwater intrusion (54 of 106 responses and 55 of 108 responses, respectively). Regarding the cost of climate adaptation, nearly half of Oregon participants feel they have "none of [the information they] need" (50 of 106 responses).

WASHINGTON

The state of Washington had 98 participants, most of whom consider themselves moderately (53.1%) or very well informed (31.3%) about the effects of climate change in their area (Figure 2). Of the Washington respondents, 88.8% think the climate in their area is changing, 3.1% think the climate is not changing, and 8.2% don't know (Figure 3).

Washington participants are mostly (52.7%) in the "understanding" phase of climate-change adaptation planning and implementation, followed by "not currently involved" (30.8%), "planning" (12.1%), and "implementing" (4.4%) (Figure 4). A "lack of urgency regarding climate effects" is the most common hurdle for Washington respondents, encountered by 64 of 69 individuals (Table 3). The three most-important topics to the work of Washington respondents are species and habitat vulnerability, scored as extremely important by 41 of 64 individuals; sea-level rise, scored as extremely important by 40 of 64 respondents; and shoreline change, scored as extremely important by 38 of 64 participants (Table 3). Washington participants feel they have "some of what [they] need" for information about the three most-important topics (37 of 61 responses, 38 of 63 responses, and 45 of 63 responses, respectively).

Discussion

Throughout the participant states, most of the respondents think the climate in their area is changing. Regional differences are apparent in the responses to whether climate change is occurring in their area, but without replicates from neighboring states it is not possible to extrapolate these results to a regional trend. Such trends may be difficult to establish, in any event. In the study, two neighboring states had the most extreme differences in the percentage of respondents who think the climate in their area is changing; Oregon had the lowest percentage of participants (59.3%) who think the climate in their area is changing, and Washington had the highest, with 88.8% of participants thinking the climate in their area is changing.

It should be noted that the wording of the question was: Do you believe that the climate in your area is changing? The wording of this question leaves some doubt as to whether the individuals who responded "no" believe the climate is changing at all. Care should be taken in extrapolating these results to larger beliefs

about climate change; it is entirely possible that these individuals do not think the climate in their area is changing but that they are not climate change deniers. Care is also warranted in interpretation, as the surveys were not conducted through random sampling of the populations of interest. Instead, sampling was purposive, and thus generalizations to these populations in the states themselves, much less than in other non-surveyed states, cannot be made with confidence.

The respondents largely feel that they are moderately to very well informed about the effects of climate change in their area. This could be due in part to self-selection to participate in the study by people who are knowledgeable about climate-change topics. Further, some participant programs e-mailed the survey to lists of contacts they already had available; it is possible that these individuals might be more informed about climate change than the average population of coastal professionals.

Throughout the participant programs, the largest differences were seen in the phase of climate-change implementation—the states were in. In this regard, Hawaii seems to be farthest along, with most respondents being either in the planning phase or the implementing phase of climate-change adaptation. When compared to the results of the California needs-assessment report (Finzi Hart et al., 2012), Hawaii had a greater percentage of participants in the planning phase, but California had a larger percentage (11%) of people in the implementing phase and a greater percentage of people in those two phases than Hawaii did.

There seems to be a link between how well informed people are as a program and the stage of involvement for the corresponding program. It is not a perfect match, but the trends for these two questions match fairly well for Illinois-Indiana and Louisiana as well as for Oregon and Washington (Figures 2 and 4). For many of the programs, the trend appears to be that the lower the percentage of people who consider themselves very well informed, the higher the percentage of people who are

State/Program	Topics Indicated as “Extremely Important” to Survey Respondents			Most-Encountered Hurdle
	#1	#2	#3	
Connecticut	Flooding or saltwater intrusion (31 of 53)	Sea-level rise (31 of 54)	Shoreline change (30 of 54)	Lack of agreement over importance of climate-change effects (37 of 53)
Hawaii**	Cost of climate adaptation (30 of 38)	Sea-level rise (29 of 38)	Shoreline change (29 of 38)	Lack of agreement over importance of climate-change effects (32 of 39)
Illinois-Indiana	Frequency and extent of flooding events (88 of 158)	Water infrastructure (81 of 156)	Land use planning and zoning (69 of 156)	Lack of agreement over importance of climate-change effects (82 of 154)
Louisiana*+	Shoreline change (16 of 26)	Flooding or saltwater intrusion (16 of 26)	Sea-level rise (14 of 26)	Lack of agreement over the importance of climate-change effects; Insufficient funding to prepare a plan; Insufficient staff or staff resources to prepare a plan (13 of 25)
Maryland	Shoreline change (32 of 68)	Flooding or saltwater intrusion (29 of 69)	Species and habitat vulnerability (27 of 67)	Currently pressing issues are all-consuming (46 of 65)
Minnesota***	Spread of invasive species (11 of 18)	Flooding (10 of 18)	Shoreline change; Predictions of ecosystem impacts (9 of 18)	Lack of agreement over importance of climate-change effects (15 of 17)
Oregon	Economic vulnerability (49 of 109)	Cost of climate adaptation (47 of 110)	Flooding or saltwater intrusion (45 of 108)	Lack of agreement over importance of climate-change effects (80 of 110)
Washington	Species and habitat vulnerability (41 of 64)	Sea-level rise (40 of 64)	Shoreline change (38 of 64)	Lack of urgency regarding climate effects (64 of 69)

Table 3. Topics indicated as “extremely important” to the work of survey respondents, and hurdles most encountered by survey respondents.

*Indicates topics #1 and #2 were tied. **Indicates topics #2 and #3 were tied. ***Indicates topic #3 was a tie. + Indicates three-way tie for most-encountered hurdle.

not currently involved in climate-change adaptation planning.

Flooding was in the top three most important topics to the work of participants in six of the eight participant programs. All of the oceanic states except for Oregon had shoreline change within the top three most-important topics. Coastal/resource professionals largely feel they have “some” of the information they need about the topics that are most important to their work. This suggests that information about shoreline change and flooding would be useful to participants within these Sea Grant programs.

The most commonly encountered hurdle in six of the eight programs is

“lack of agreement over importance of climate change effects.” In Maryland and Washington, where it is not the most commonly encountered hurdle, it is the second-most-commonly encountered hurdle (45 of 65 respondents and 58 of 69 respondents, respectively). This suggests that regardless of whether coastal professionals believe climate-change adaptation planning should occur, opposition—or at least uncertainty—is met at some point in the process. Work could potentially be done to help coastal professionals make progress in the face of uncertainty, as a considerable literature exists about managing under climate uncertainty (see, for example, Morgan, 2008; Susanne C.

Moser, 2009; Norton, Sias, & Brown, 2011; Schoemaker, 2004). If the lack of agreement over climate effects is caused by opposition to addressing climate change, it would be useful to understand whether that opposition is driven by personal values, ideology, inadequacy of the science, or some other factor, as prudent responses would likely differ.

Meanwhile, the state participants have a variety of ways in which they are using or planning to use their survey findings. For example, encouraged by this survey that climate adaptation is of interest to people in Illinois and Indiana, that program’s climate lead has expanded work with communities on adaptation, including developing a cli-

mate adaptation toolkit with the Chicago Metropolitan Agency for Planning.⁴ Fact sheets, Web pages, and short presentations are also planned. In early 2013, Louisiana Sea Grant presented the completed data for the state to both its Marine Extension Program and the state Local Coastal Programs group. The project will be used to help inform climate outreach methods and tools for future projects.⁵

In Connecticut, feedback from coastal municipalities in the state following storms Irene and Sandy reinforced survey findings that coastal flooding and erosion are two of the most critical issues. Connecticut Sea Grant now has a number of projects related to these topics, and is also developing a Climate Adaptation Academy for municipi-

⁴ Molly Woloszyn, 12/18/13, *personal communication*.

⁵ Melissa Trosclair Daigle, 12/20/13, *personal communication*.

pal officials and commission members that will begin with a focus on sea-level rise, shoreline change, and flooding.⁶

Conclusion

Most coastal/resource professionals seem to believe climate change is occurring in their area. This is coming from a well-informed group of professionals in various regions throughout the United States. Flooding and shoreline change are important topics to most of the participant programs. Lack of agreement over climate-change effects is a hurdle encountered by many participants.

This survey represents a large-scale effort by Sea Grant to assess the opinions, phase of adaptation planning, and information needs of coastal professionals on

⁶ Juliana Barrett, 12/20/2013, *personal communication*.

the subject of climate change. The survey results indicate several trends in opinions and information gaps that exist on a national scale. Overall, our results stand in some contrast to repeated surveys of the broad American public (notably the “Six Americas” research). While that public may be divided over whether the climate is changing, coastal managers and elected officials in nine states say they see the change happening—and believe their communities will need to adapt.

For most, if not all, state Sea Grant research partners, conducting an online survey using this software and approach was a new experience, and in some cases, the operational novelty and demands required a greater time investment than initially may have been anticipated.⁷

⁷ - particularly in the IRB process, and in obtaining contacts of individuals to solicit, according to some.

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For inquiries specific to the responses in individual states, the authors refer readers to the project leaders in the Sea Grant programs in those states (as of the date of publication):

Syma Ebbin & Juliana Barrett (Connecticut); Dolan Eversole and Cindy Knapman (Hawaii); Molly Woloszyn (Illinois-Indiana); Melissa Trosclair Daigle (Louisiana); Vicky Carrasco (Maryland); Hilarie Sorensen (Minnesota); and Jamie Mooney (Washington).

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Appendix 1: List of Questions

Numbers listed might vary slightly by program depending on additions/deletions.

Questions denoted with * were analyzed within this report. Any changes or addendums to those questions are listed in Appendix 2. Questions denoted with + were used to infer answers for Minnesota for Question 10 (see text and App. 2).

The answer choices are presented in italics below the question.

*1. How well informed are you about the effects of a changing climate in your area?

- *Very Well Informed*
- *Moderately Informed*
- *Slightly Informed*
- *Not At All Informed*

*2. Do you think the climate in your area is changing?

- *Yes*
- *No*
- *Don't Know*

*3. How sure are you that the climate in your area is changing?

- *Extremely Sure*
- *Very Sure*
- *Somewhat Sure*
- *Not At All Sure*

4. How sure are you that the climate in your area is NOT changing?

- *Extremely Sure*
- *Very Sure*
- *Somewhat Sure*
- *Not At All Sure*

5. In the comment boxes below, please express briefly in your own words as many as five RISKS that you associate with a changing climate on your coast.

[comment box]

6. Which following statement best represents how you think your community OUGHT to respond to changes in COASTAL AREAS that might result from a changing climate?

- *We should consider potential climate-related effects in ALL relevant decisions.*
- *We should prepare for ONLY the most likely scenario based on the best available information.*
- *We should take only actions that will benefit us whether or not climate change occurs.*
- *We should wait to make any changes until we have better information.*
- *We should not change what we do; there is no need.*

7. In your opinion, who should initiate a local response to the likely effects of a changing climate? (Please select one).

- *Federal Government*
- *State Government*
- *Regional Government*
- *County Government*
- *Municipal Government*
- *Tribal Government*
- *Combination of Government Agencies*
- *Private Sector*
- *Local Non-governmental Organization (NGO)*
- *National NGO*
- *University*
- *Combination of Government and other organizations*
- *Grass-roots citizen initiative*
- *No one: No Response Needed*

8. Please rate how important it is in your work to address climate change through “mitigation,” the reduction of greenhouse gas emissions from energy use or land use.

- *Top Priority*
- *Medium Priority*
- *Low Priority*
- *Not on the Agenda*
- *Don't Know*

9. Please rate how important it is in your work to address climate change through “adaptation,” efforts to plan or prepare for, or manage the projected impacts of climate change.

- *Top Priority*
- *Medium Priority*

- *Low Priority*
- *Not on the Agenda*
- *Don't Know*

+10. If you are professionally involved in your community or region in climate “adaptation planning”—that is, planning to adapt to the effects of climate change -- what prompted your involvement? (Please check all that apply).

- *Supervisor's directive*
- *Direction or mandate from city or county*
- *State-level climate adaptation strategy*
- *Regionally or locally specific information showing potential impacts*
- *Legislative mandate (state or federal)*
- *A recent event (e.g., extreme storm event, flooding, cliff or levee failure)*
- *Update of general plan, local coastal plan, or emergency management plan*
- *Development or update of a local Climate Action Plan*
- *Other local governments providing models for adaptation planning*
- *Community support or encouragement (from NGOs, civic groups, local individuals)*
- *Personal motivation to address the issue*
- *Funding became available*
- *I am NOT involved*

*11. Which of the following best describes your current phase of climate change adaptation planning and implementation?

- *NOT CURRENTLY INVOLVED at all in planning to adapt to the effects of climate change.*
- *UNDERSTANDING: We're in a relatively early stage, trying to understand what the potential impacts of climate change and our vulnerabilities are.*
- *PLANNING: We're in a more advanced stage, trying to assess what our options are to prepare for and reduce the risks from climate change.*
- *IMPLEMENTING: We're in a fairly advanced stage, starting to implement some identified adaptation options and monitoring how they're performing.*

+12. You indicated you are currently in the “understanding” phase of climate change adaptation. Please check the statement below that best describes where you are in this phase.

- *We are just beginning to be aware of the problem.*
- *We have started to gather some information to better understand the problem.*
- *We have completed an assessment of the problem.*

+13. You indicated you are currently in the “planning” phase of climate change adaptation. Please check the statement below that best describes where you are in this phase.

- *We are brainstorming a range of options to prepare for and manage climate risks.*
- *We have completed an assessment of potential response options.*
- *We have selected a subset of response options to move forward with.*

+14. You indicated you are currently in the “implementing” phase of climate change adaptation. Please check the statement below that best describes where you are in this phase.

- *We have begun implementing the selected response options.*
- *We are monitoring how well the implemented responses are working out.*
- *We are evaluating and reassessing how well the implemented options are faring.*

*15. As you’ve considered, or become involved in, climate adaptation planning, you may have encountered the following hurdles—defined as obstacles that can be overcome. For the items below, which may arise as hurdles, please consider the three listed possibilities (encountered this hurdle, overcame this hurdle, have not encountered) and select the best one for each item.

- *Unclear that climate change effects present a local problem*
- *Lack of agreement over importance of climate change effects*
- *Lack of access to scientific information to define problem*
- *Lack of know-how to analyze relevant information that is available*

- *Lack of trust in available science*
- *Climate change effects don’t appear to require our response*
- *No legal mandate to take climate change impacts into account*
- *Unclear how climate change relates to my job*
- *Currently pressing issues are all-consuming*
- *Insufficient funding to prepare a plan*
- *Insufficient staff or staff resources to prepare a plan*
- *Lack of leadership to develop planning options once problem was identified*
- *Lack of data/information to assess solution options*
- *Lack of agreement in selecting solution options*
- *Opposition of elected officials to adaptation planning*
- *Lack of public support to plan for climate effects*
- *Explicit opposition from coastal development interests*
- *Explicit opposition from other coastal stakeholders*
- *Other (please specify hurdle and status)*

16. What is your personal level of concern about the effects of a changing climate in your area? (Scale: extremely concerned, moderately concerned, slightly concerned, not at all concerned)

- *Local effects of climate change*
- *Tsunamis/earthquakes*
- *Extreme weather*
- *Population growth*
- *Inappropriate development*
- *Weak economy*
- *Limited capacity of local government*
- *Other stressor (please specify)*

17. Please provide your views on the following (Scale: strongly agree, agree, neither agree nor disagree, disagree, strongly disagree):

- *I feel a professional responsibility to plan for the local effects of climate change.*
- *It’s important for governments to prepare for the local effects of climate change.*

- *It’s important for individuals to prepare for the local effects of climate change.*
- *My professional actions to plan for the local effects of climate change could benefit the community.*
- *A failure to plan for the local effects of climate change would have negative consequences for the community.*

18. As individuals we’re also members of society and represented by government. And whether—or how—to prepare for a changing climate potentially involves government decisions. We’d like to know your views (strongly agree, moderately agree, slightly agree, slightly disagree, moderately disagree, strongly disagree) on the proper role of government in your local context.

In this context, how strongly do you agree or disagree with each of the following statements? (Please select one per row).

Note: The statements are strongly worded to clearly represent different views.

- *The government interferes far too much in our everyday lives.*
- *Sometimes government needs to make laws that keep people from hurting themselves.*
- *It’s not the government’s business to try to protect people from themselves.*
- *The government should stop telling people how to live their lives.*
- *The government should do more to advance society’s goals, even if that means limiting the freedom and choices of individuals.*
- *Government should put limits on the choices individuals can make so they don’t get in the way of what’s good for society.*

*19. We’d like to know about your work—elected, professional or volunteer—as it relates to the coast, the environment and your community. Please select the category and item that BEST matches your primary relevant profession or position. (Please only select a single item from one column, leaving the remaining two columns blank.)

- *Elected Officials: mayor, city council member, county commissioner, tribal of-*

official, port commissioner, state legislator, other local elected official

- Coastal Professional: town/city manager; finance manager; planner; permitting officer; floodplain/flood district manager; water resources manager; wetland manager; harbor, parks, or beach manager; town clean energy/sustainability coordinator; community development department; public works/transportation department; wildlife/natural resource department; emergency services department; other town/city department; council of governments; planning/zoning board member; flood and erosion control board; conservation commission; other volunteer board
- Other Primary Work Affiliation: consulting engineer, local non-governmental organization, national or international non-governmental organization, university, other affiliation.

20. How do you think climate change may affect the local conditions and features of the natural environment in your area? Even if you have not previously considered the potential effects of climate change on your community or region, please offer your best estimate. (Please select one per row). (Scale: Likely increase, Stay the same, Likely decrease, Don't know, Not applicable)

- Air temperatures
- Seawater (or lake) temperatures
- Stream temperatures
- Precipitation (rain)
- Precipitation (snow)
- Summer water supplies
- Winter water supplies
- Amount of runoff
- Flooding
- Rate of sea-level rise (lake levels)
- Storm frequency
- Storm intensity
- Shifts in geographic ranges of land species
- Shifts in geographic ranges of aquatic species
- Occurrence of algae blooms
- Coastal water quality
- Other (please specify with likelihood)

*21. Please review the following examples of information as they relate to a locally changing climate. First, rate the importance of that type of information to your work (Please select one per row). (Scale: Extremely important, moderately important, slightly important, not at all important).

- Local climate predictions: seasonal to annual
- Local climate projections: decadal to century
- Sea-level rise
- Shoreline change
- Flooding or saltwater intrusion
- Predictions of ecosystem impacts
- Ocean acidification
- Spread of invasive species
- Species and habitat vulnerability
- Social vulnerability
- Economic vulnerability
- Cost of climate adaptation
- Information about communicating climate risks, specifically
- Information about communicating climate change, generally
- Other type of information and importance (please specify)

*22. Again, review these same items of information as they relate to a locally changing climate. Now, indicate the amount of information you have on each item. (Please select one per row.) (Scale: All of what I need, most of what I need, some of what I need, none of what I need, don't need this information.)

- Local climate predictions: seasonal to annual
- Local climate projections: decadal to century
- Sea-level rise
- Shoreline change
- Flooding or saltwater intrusion
- Predictions of ecosystem impacts
- Ocean acidification
- Spread of invasive species
- Species and habitat vulnerability
- Social vulnerability
- Economic vulnerability

- Cost of climate adaptation
- Information about communicating climate risks, specifically
- Information about communicating climate change, generally
- Other type of information and importance (please specify)

23. How many years have you served in your current organizational capacity?

24. In an average week, approximately what percentage of your work deals with coastal management issues?

- Under 20% (less than 1 day)
- 21-40% (1-2 days)
- 41-60% (2-3 days)
- 61-80% (3-4 days)
- Over 80% (more than 4 days)
- Don't know

25. Your age.

26. Your gender.

- Male
- Female

27. What is the highest level of education you have completed?

- Less than 12th grade (no diploma)
- High school graduate or equivalent
- Some college, no degree
- Associate's degree
- Bachelor's degree
- Graduate or professional degree

28. In which U.S. state does the majority of your relevant work and/or volunteer responsibilities take place? Please type the FULL STATE NAME below (e.g., Minnesota).

29. Which county?

30. If you would like to receive a report of the survey results when ready, please enter your email address below. You will be contacted only for this reason, and your address will be kept separately from the survey responses.

Appendix 2: Changes, Addendums, and Additional Results to be Analyzed

QUESTIONS

*1. How well informed are you about the effects of a changing climate in your area?

No changes were made to this question or its answers.

State/Program	Answered Question	Very Well Informed	Moderately Informed	Slightly Informed	Not at all Informed	Skipped Question
Connecticut	84	28.6%	63.1%	8.3%	0.0%	2
Hawaii	47	46.8%	44.7%	8.5%	0.0%	1
Illinois-Indiana	256	19.9%	44.5%	30.1%	5.5%	2
Louisiana	44	25.0%	47.7%	27.3%	0.0%	0
Maryland	104	15.4%	54.8%	25.0%	4.8%	1
Minnesota	25	12.0%	80.0%	8.0%	0.0%	1
Oregon	140	27.1%	56.4%	12.9%	3.6%	0
Washington	96	31.3%	53.1%	12.5%	3.1%	2
Coastal Professionals Only	353	21.8%	57.2%	18.1%	2.8%	2

*2. Do you think the climate in your area is changing?

No changes were made to this question or its answers.

State/Program	Answered Question	Yes	No	Don't Know	Skipped Question
Connecticut	85	87.1%	7.1%	5.9%	1
Hawaii	48	85.4%	4.2%	10.4%	0
Illinois-Indiana	258	60.9%	24.0%	15.1%	0
Louisiana	48	75.0%	9.1%	15.9%	0
Maryland	105	66.7%	9.5%	23.8%	0
Minnesota	25	80.0%	4.0%	16.0%	1
Oregon	140	59.3%	17.9%	22.9%	0
Washington	98	88.8%	3.1%	8.2%	0
Coastal Professionals Only	355	74.9%	9.9%	15.2%	0

3. How sure are you that the climate in your area is changing?

No changes were made to this question or its answers.

State/Program	Answered question	Extremely sure	Very sure	Somewhat sure	Not at all sure	Skipped Question
Connecticut	74	29.7%	47.3%	20.3%	2.7%	12
Hawaii	41	48.8%	39.0%	12.2%	0.0%	7
Illinois-Indiana	157	17.8%	30.6%	48.4%	3.2%	101
Louisiana	32	15.6%	43.8%	40.6%	0.0%	12
Maryland	70	20.0%	42.9%	37.1%	0.0%	35
Minnesota	19	21.1%	52.6%	26.3%	0.0%	7
Oregon	83	22.9%	50.6%	26.5%	0.0%	57
Washington	85	31.8%	47.1%	21.2%	0.0%	13
Coastal Professionals Only	266	25.2%	43.2%	30.8%	0.8%	89

*11. Which of the following best describes your current phase of climate change adaptation planning and implementation?

- *NOT CURRENTLY INVOLVED* at all in planning to adapt to the effects of climate change.
- *UNDERSTANDING*: We're in a relatively early stage, trying to understand what the potential impacts of climate change and our vulnerabilities are.
- *PLANNING*: We're in a more advanced stage, trying to assess what our options are to prepare for and reduce the risks from climate change.

- *IMPLEMENTING*: We're in a fairly advanced stage, starting to implement some identified adaptation options and monitoring how they're performing.

Minnesota did not include this question, but they did include the three follow-up questions (Q. 12, Q. 13, Q. and 14, App. 1) and the question before (Q. 10, App. 1) which included an option to indicate that they were not involved in climate adaptation planning. No other changes were made to this question or its answers.

State/Program	Answered Question	Not Currently Involved	Understanding	Planning	Implementing	Skipped Question
Connecticut	71	32.4%	40.8%	25.4%	1.4%	15
Hawaii	44	13.6%	34.1%	47.7%	4.5%	4
Illinois-Indiana	213	60.1%	31.9%	6.1%	1.9%	45
Louisiana	34	61.8%	29.4%	5.9%	2.9%	10
Maryland	83	33.7%	42.2%	19.3%	4.8%	22
Minnesota	N/A	N/A	N/A	N/A	N/A	N/A
Oregon	130	40.0%	39.2%	16.9%	3.8%	10
Washington	91	30.8%	52.7%	12.1%	4.4%	7
Coastal Professionals Only	355	40.3%	39.2%	16.6%	3.9%	0

*15. As you've considered, or become involved in, climate adaptation planning, you may have encountered the following hurdles defined as obstacles that can be overcome. For the items below, which may arise as hurdles, please consider the three listed possibilities (encountered this hurdle, overcame this hurdle, have not encountered) and select the best one for each item.

- *Unclear that climate change effects present a local problem*
- *Lack of agreement over importance of climate change effects*
- *Lack of access to scientific information to define problem*
- *Lack of know-how to analyze relevant information that is available*
- *Lack of trust in available science*
- *Climate change effects don't appear to require our response*
- *No legal mandate to take climate change impacts into account*
- *Unclear how climate change relates to my job*
- *Currently pressing issues are all-consuming*
Illinois-Indiana used the word "current" instead of "currently."
- *Insufficient funding to prepare a plan*

- *Insufficient staff or staff resources to prepare a plan*
- *Lack of leadership to develop planning options once problem was identified*
- *Lack of data/information to assess solution options*
- *Lack of agreement in selecting solution options*
- *Opposition of elected officials to adaptation planning*
Oregon replaced the word "adaptation" with "climate."
- *Lack of public support to plan for climate effects*
- *Explicit opposition from coastal development interests*
- *Explicit opposition from other coastal stakeholders*
Maryland omitted the word "coastal."
- *Other (please specify hurdle and status)*

Oregon and Washington added "Lack of urgency regarding climate effects" as a potential hurdle after "Lack of trust in available science." Changes to potential hurdle options are listed in italics beneath the hurdle. No other changes were made to this question or its answers.

Hurdle	Status of Hurdle	State/Program								
		CA	OR	WA	AK	VT	ME	NH	MA	CT
Unclear that climate change effects present a local problem	Encountered this hurdle	35	20	69	12	43	12	65	48	
	Overcame this hurdle	2	9	11	3	4	1	11	8	
	Have not encountered	17	9	75	10	16	5	33	12	
	Response Count	54	38	155	25	63	18	109	68	
Lack of agreement over importance of climate change effects	Encountered this hurdle	37	32	82	13	45	15	80	58	
	Overcame this hurdle	4	6	5	2	2	0	5	6	
	Have not encountered	12	1	67	10	18	2	25	5	
	Response Count	53	39	154	25	65	17	110	69	
Lack of access to scientific information to define problem	Encountered this hurdle	23	18	69	12	28	11	58	34	
	Overcame this hurdle	13	12	9	1	7	2	18	11	
	Have not encountered	18	8	74	12	29	5	30	22	
	Response Count	54	38	152	25	64	18	106	67	
Lack of know-how to analyze relevant information that is available	Encountered this hurdle	22	13	70	12	35	13	53	38	
	Overcame this hurdle	10	15	10	0	6	0	14	14	
	Have not encountered	21	10	69	13	22	5	39	15	
	Response Count	53	38	149	25	63	18	106	67	
Lack of trust in available science	Encountered this hurdle	29	18	70	10	30	14	60	56	
	Overcame this hurdle	5	8	8	0	4	0	14	3	
	Have not encountered	18	12	72	15	30	4	32	10	
	Response Count	52	38	150	25	64	18	106	69	
Lack of urgency regarding climate effects	Encountered this hurdle	---	---	---	---	---	---	77	64	
	Overcame this hurdle	---	---	---	---	---	---	6	1	
	Have not encountered	---	---	---	---	---	---	23	4	
	Response Count	---	---	---	---	---	---	106	69	

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Hurdle	Status of Hurdle	State/Program							
		22	13	60	7	22	10	43	37
Climate change effects don't appear to require our response	Encountered this hurdle	22	13	60	7	22	10	43	37
	Overcame this hurdle	3	8	7	1	5	1	13	2
	Have not encountered	28	17	80	17	37	7	46	28
	Response Count	53	38	147	25	64	18	102	67
No legal mandate to take climate change impacts into account	Encountered this hurdle	32	19	63	7	28	14	49	51
	Overcame this hurdle	1	10	4	0	5	1	8	3
	Have not encountered	19	9	83	18	30	3	48	13
	Response Count	52	38	150	25	63	18	105	67
Unclear how climate change relates to my job	Encountered this hurdle	20	8	35	8	16	8	27	23
	Overcame this hurdle	2	13	12	4	5	4	21	11
	Have not encountered	30	17	100	13	41	6	58	32
	Response Count	52	38	147	25	62	18	106	66
Currently pressing issues are all-consuming	Encountered this hurdle	31	28	65	12	46	11	65	44
	Overcame this hurdle	5	0	7	0	1	0	10	3
	Have not encountered	14	10	74	13	18	6	30	20
	Response Count	50	38	146	25	65	17	105	67
Insufficient funding to prepare a plan	Encountered this hurdle	35	29	76	13	41	13	67	53
	Overcame this hurdle	5	5	6	1	4	0	11	2
	Have not encountered	12	4	66	11	19	4	29	13
	Response Count	52	38	148	25	64	17	107	68
Insufficient staff or staff resources to prepare a plan	Encountered this hurdle	32	29	78	13	39	13	67	56
	Overcame this hurdle	6	5	7	1	2	0	11	3
	Have not encountered	13	4	65	11	24	4	27	9
	Response Count	51	38	150	25	65	17	105	68
Lack of leadership to develop planning options once problem was identified	Encountered this hurdle	26	22	57	7	22	12	45	46
	Overcame this hurdle	5	8	4	2	6	0	15	4
	Have not encountered	20	8	87	16	35	5	45	18
	Response Count	51	38	148	25	63	17	105	68
Lack of data/information to assess solution options	Encountered this hurdle	26	25	68	7	30	12	60	45
	Overcame this hurdle	7	9	6	1	7	0	12	5
	Have not encountered	19	3	74	17	25	6	34	18
	Response Count	52	37	148	25	62	18	106	68
Lack of agreement in selecting solution options	Encountered this hurdle	31	21	62	10	29	12	54	49
	Overcame this hurdle	2	3	3	0	3	0	8	4
	Have not encountered	17	13	82	14	31	5	42	14
	Response Count	50	37	147	24	63	17	104	67
Opposition of elected officials to adaptation planning	Encountered this hurdle	18	19	50	8	21	8	39	42
	Overcame this hurdle	5	3	5	2	1	0	10	0
	Have not encountered	27	15	92	15	40	9	53	25
	Response Count	50	37	147	25	62	17	102	67

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Hurdle	Status of Hurdle	State/Program							
		27	21	50	10	27	10	57	54
Lack of public support to plan for climate effects	Encountered this hurdle	27	21	50	10	27	10	57	54
	Overcame this hurdle	3	0	6	1	3	0	6	2
	Have not encountered	21	15	90	14	32	7	42	12
	Response Count	51	36	146	25	62	17	105	68
Explicit opposition from coastal development interests	Encountered this hurdle	27	18	15	8	12	3	21	26
	Overcame this hurdle	3	0	5	1	3	0	4	1
	Have not encountered	21	19	124	16	46	14	77	38
	Response Count	51	37	144	25	61	17	102	65
Explicit opposition from other coastal stakeholders	Encountered this hurdle	16	17	14	8	15	4	27	28
	Overcame this hurdle	6	0	4	0	2	0	4	0
	Have not encountered	26	20	119	17	45	13	70	36
	Response Count	48	37	137	25	62	17	101	64

*19. We'd like to know about your work—elected, professional or volunteer—as it relates to the coast, the environment and your community. Please select the category and item that BEST matches your primary relevant profession or position. (Please only select a single item from one column, leaving the remaining two columns blank.)

- *Elected Officials: mayor, city council member, county commissioner, tribal official, port commissioner, state legislator, other local elected official*
Minnesota called this category “Elected or Appointed Officials.” Louisiana replaced the word “county” with “parish.” Maryland did not include an “Elected Officials” option.
- *Coastal Professional: town/city manager; finance manager; planner; permitting officer; floodplain/flood district manager; water resources manager; wetland manager; harbor, parks, or beach manager; town clean energy/sustainability coordinator; community development department; public works/transportation department; wildlife/natural resource department; emergency services department; other town/city department; council of governments; planning/zoning board member; flood and erosion control board; conservation commission; other volunteer board*

Minnesota called this category “Natural Resource Professional.” Illinois-Indiana called this option “Resource Professional.”

Other Primary Work Affiliation: consulting engineer, local non-governmental organization, national or international non-governmental organization, university, other affiliation.

Illinois-Indiana added “utility company manager” and “industrial manager” after “consulting engineer.”

Louisiana replaced the word “relates” with “related.” Changes to profession options are listed in italics beneath the profession category. No other changes were made to this question or its answers. See Table 2 in the text for the results for this question.

*21. Please review the following examples of information as they relate to a locally changing climate. First, rate the importance of that type of information to your work (extremely important, moderately important, slightly important, not at all important). (Please select one per row.)

- *Local climate predictions: seasonal to annual*
- *Local climate projections: decadal to century*
- *Sea-level rise*
Illinois-Indiana changed this to “lake levels.” Minnesota changed this to “lake level change.”
- *Shoreline change*
- *Flooding or saltwater intrusion*
Illinois-Indiana changed this to “Frequency and extent of flooding events.” Louisiana used the word “of” instead of “or.” Minnesota omitted the words “or saltwater intrusion.”
- *Predictions of ecosystem impacts*
- *Ocean acidification*
Illinois-Indiana and Minnesota omitted this option.
- *Spread of invasive species*
- *Species and habitat vulnerability*
- *Social vulnerability*
- *Economic vulnerability*
- *Cost of climate adaptation*
- *Information about communicating climate risks, specifically*
- *Information about communicating climate change, generally*
- *Other type of information and importance (please specify)*

Illinois-Indiana added the following as options between “Economic vulnerability” and “Cost of climate adaptation”: “Water infrastructure,” “Transportation infrastructure,” “Shipping,” “Energy infrastructure,” “Agriculture,” “Nonpoint source pollution,” and “Land use planning and zoning.” Changes to important topic options are listed in italics beneath the hurdle. No other changes were made to this question or its answers.

Topic and Level of Importance	State/Program								
		CT	HI	IL-IN	LA	MD	MN	OR	WA
Local climate predictions: seasonal to annual	EI	12	15	41	8	12	8	33	21
	MI	18	15	60	9	24	4	38	30
	SI	12	6	26	8	19	3	29	10
	NI	9	2	28	1	12	3	9	2
	#	51	38	155	26	67	18	109	63
Local climate projections: decadal to century	EI	13	19	19	7	12	7	35	27
	MI	18	14	54	7	20	5	32	26
	SI	13	4	43	10	23	2	31	9
	NI	8	1	40	2	11	4	10	1
	#	52	38	156	26	66	18	108	63
Sea-level rise	EI	31	29	42	14	23	7	41	40
	MI	12	7	48	4	26	5	33	19
	SI	7	2	36	6	15	3	22	3
	NI	4	0	31	2	4	3	12	2
	#	54	38	157	26	68	18	108	64
Shoreline change	EI	30	29	23	16	32	9	43	38
	MI	14	8	50	5	25	3	38	24
	SI	5	1	32	4	8	3	16	0
	NI	5	0	53	1	3	3	12	2
	#	54	38	158	26	68	18	109	64
Flooding or salt-water intrusion	EI	31	26	88	16	29	10	45	37
	MI	12	8	46	4	25	4	35	18
	SI	8	3	15	4	11	3	16	7
	NI	2	1	9	2	4	1	12	2
	#	53	38	158	26	69	18	108	64
Predictions of ecosystem impacts	EI	21	21	45	12	16	9	37	35
	MI	20	12	54	4	32	4	39	25
	SI	8	4	36	6	14	2	21	4
	NI	4	1	21	4	6	3	12	0
	#	53	38	156	26	68	18	109	64
Ocean acidification	EI	12	20	----	7	9	----	42	32
	MI	14	9	----	7	15	----	30	21
	SI	18	7	----	5	21	----	23	7
	NI	9	2	----	6	22	----	13	4
	#	53	38	----	25	67	----	108	64
Spread of invasive species	EI	28	20	64	10	22	11	44	33
	MI	14	9	48	5	25	2	39	21
	SI	8	7	25	5	14	2	18	7
	NI	4	2	18	5	7	3	8	3
	#	54	38	155	25	68	18	109	64

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Topic and Level of Importance	State/Program								
	CT	HI	IL-IN	LA	MD	MN	OR	WA	
Species and habitat vulnerability	EI	27	19	54	11	27	8	42	41
	MI	15	9	49	4	23	5	36	16
	SI	7	8	29	6	11	3	18	6
	NI	4	2	25	4	6	2	12	1
	#	53	38	157	25	67	18	108	64
Social vulnerability	EI	14	22	34	10	19	4	28	22
	MI	21	10	53	4	24	8	42	23
	SI	11	6	40	9	16	2	26	14
	NI	7	0	27	3	9	4	13	5
	#	53	38	154	26	68	18	109	64
Economic vulnerability	EI	20	26	67	13	23	5	49	25
	MI	21	9	57	6	29	9	39	30
	SI	6	3	20	5	10	2	14	5
	NI	5	0	13	1	6	2	7	3
	#	52	38	157	25	68	18	109	63
Cost of climate adaptation	EI	24	30	49	9	27	6	47	29
	MI	19	4	56	8	28	8	39	24
	SI	6	3	25	6	9	3	17	9
	NI	4	1	24	2	4	1	7	1
	#	53	38	154	25	68	18	110	63
Information about communicating climate risks, specifically	EI	24	25	34	8	24	7	35	31
	MI	16	9	61	9	28	5	45	20
	SI	8	4	28	5	13	4	21	11
	NI	4	0	31	4	4	2	9	2
	#	52	38	154	26	69	18	110	64
Information about communicating climate change, generally	EI	23	23	32	10	23	5	27	27
	MI	14	10	59	6	28	8	49	28
	SI	12	5	32	6	13	3	22	7
	NI	4	0	27	4	4	2	9	2
	#	53	38	150	26	69	18	107	64
Water infrastructure	EI	----	---	81	----	----	----	----	----
	MI	----	---	44	----	----	----	----	----
	SI	----	---	19	----	----	----	----	----
	NI	----	---	12	----	----	----	----	----
	#	----	---	156	----	----	----	----	----
Transportation infrastructure	EI	----	---	62	----	----	----	----	----
	MI	----	---	57	----	----	----	----	----
	SI	----	---	21	----	----	----	----	----
	NI	----	---	16	----	----	----	----	----
	#	----	---	156	----	----	----	----	----

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Topic and Level of Importance	State/Program								
		CT	HI	IL-IN	LA	MD	MN	OR	WA
Shipping	EI	----	---	25	----	----	----	----	----
	MI	----	---	45	----	----	----	----	----
	SI	----	---	36	----	----	----	----	----
	NI	----	---	48	----	----	----	----	----
	#	----	---	154	----	----	----	----	----
Energy infrastructure	EI	----	---	58	----	----	----	----	----
	MI	----	---	50	----	----	----	----	----
	SI	----	---	27	----	----	----	----	----
	NI	----	---	21	----	----	----	----	----
	#	----	---	156	----	----	----	----	----
Agriculture	EI	----	---	53	----	----	----	----	----
	MI	----	---	39	----	----	----	----	----
	SI	----	---	34	----	----	----	----	----
	NI	----	---	31	----	----	----	----	----
	#	----	---	157	----	----	----	----	----
Nonpoint source pollution	EI	----	---	47	----	----	----	----	----
	MI	----	---	57	----	----	----	----	----
	SI	----	---	27	----	----	----	----	----
	NI	----	---	25	----	----	----	----	----
	#	----	---	156	----	----	----	----	----
Land use planning and zoning	EI	----	---	69	----	----	----	----	----
	MI	----	---	53	----	----	----	----	----
	SI	----	---	15	----	----	----	----	----
	NI	----	---	19	----	----	----	----	----
	#	----	---	156	----	----	----	----	----

