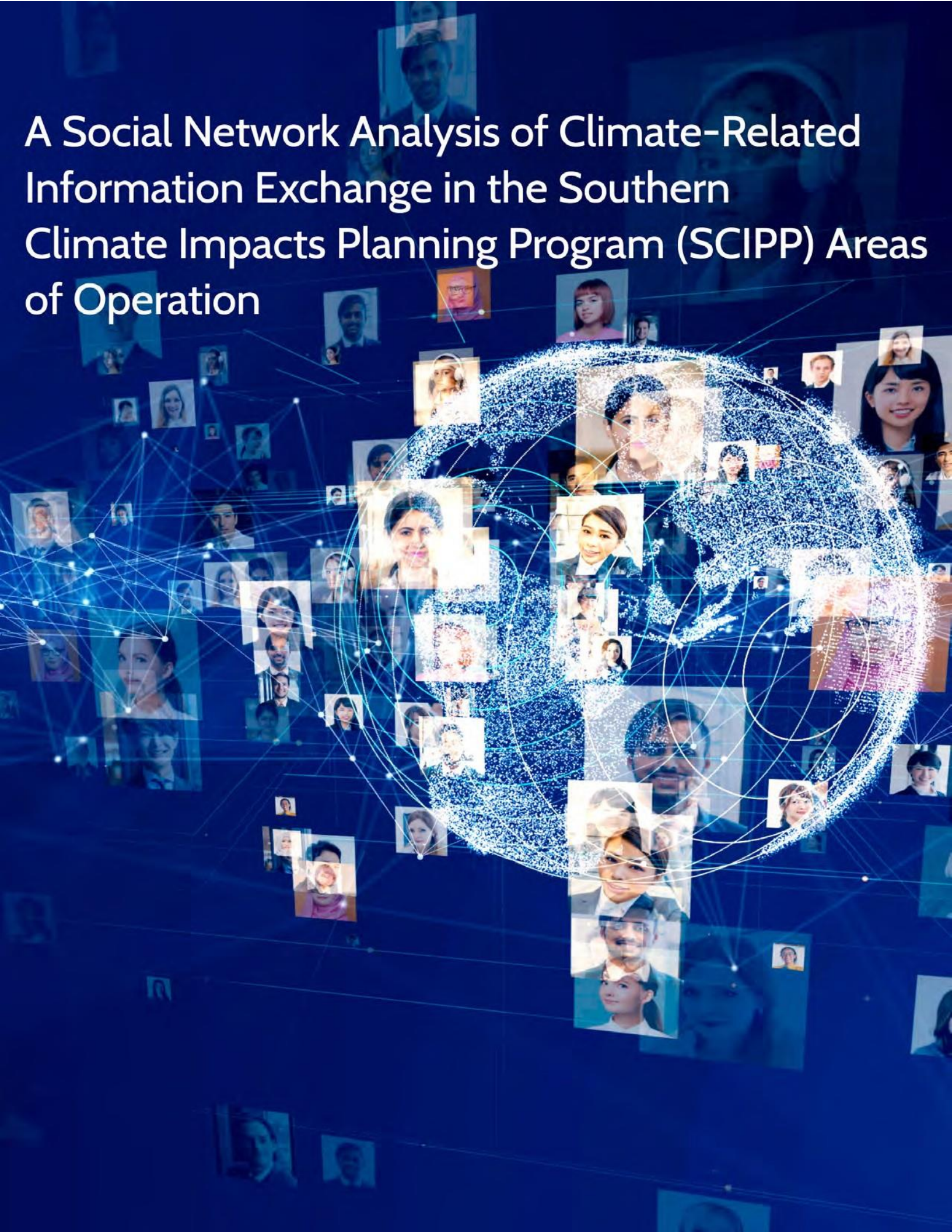


A Social Network Analysis of Climate-Related Information Exchange in the Southern Climate Impacts Planning Program (SCIPP) Areas of Operation



A Social Network Analysis of Climate-Related Information Exchange in the
Southern Climate Impacts Planning Program (SCIPP) Areas of Operation

William Howe, Mark Shafer, and Rachel Riley
Southern Climate Impacts Planning Program
University of Oklahoma

October 2020

Suggested Citation: Howe, W. T., M. Shafer, and R. Riley, 2020: A social network analysis of climate-related information exchange in the Southern Climate Impacts Planning Program (SCIPP) areas of operation. *Southern Climate Impacts Planning Program*, 29 pp. [Available online at <http://www.southernclimate.org/documents/SCIPPSNA2020.pdf>].

Introduction

In the year 2020 information is abundant and accessible. Such a statement is neither a criticism nor a praise but a statement of fact. As information has - and continues to - become more accessible it is important that topic experts find a way to distribute information to those that need it in an efficient manner. Websites, blogs, social media posts, and opinion articles abound that provide information about climate change and events. However, sources differ on both topic knowledge and evidence credibility. Therefore, it is imperative that organizations with experts dedicated to the study and reporting of globally important topics, such as climate information, be able to provide that information to both other organizations and to individual citizens.

This report takes the first step in realizing this goal by taking stock of the current connections and reach of the Southern Climate Impacts Planning Program (SCIPP). By assessing the uses and needs of primary stakeholders, secondary connections, and public consumption, SCIPP can begin to formulate a plan to strategically connect with new organizations that provide access to a more diverse population, and strengthen connections with organizations that have the most secondary connections to organizations with whom SCIPP does not have a relationship. The analysis also helps to identify those residents that may be members of a traditionally underrepresented population that may not have access to climate information. Such an analysis is accomplished in three steps, as depicted below. This study will inform SCIPP's future outreach initiatives.

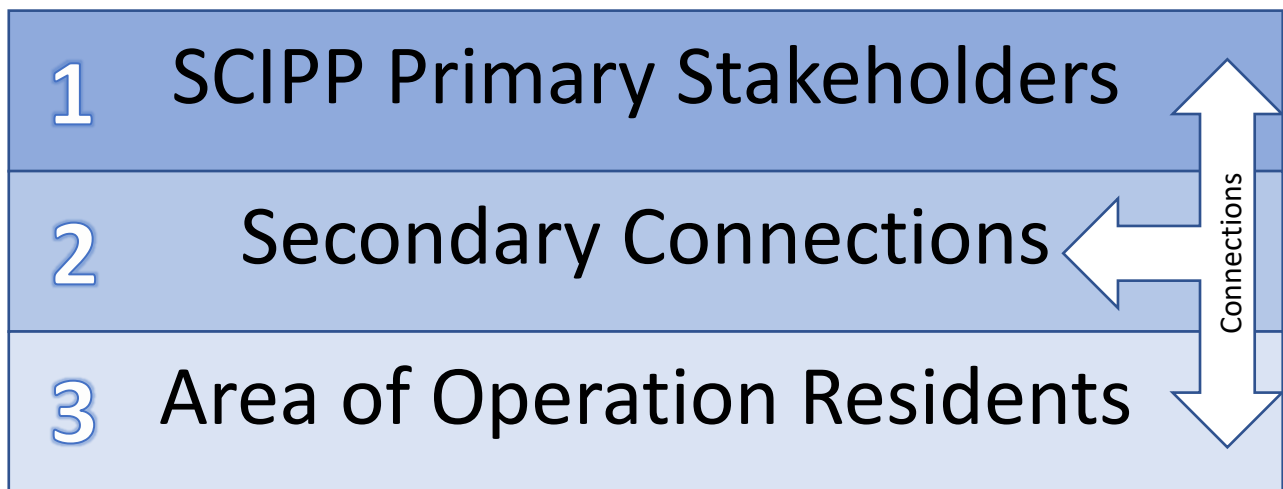


Figure 1: Social network analysis steps to inform SCIPP future sustained assessment outreach.

Step One – SCIPP Primary Stakeholders

To begin the first step of analysis, the SCIPP team compiled a list of all contacts that were known associates. After a general list was compiled the team went through the list, as individuals, and

marked who they thought should be excluded and added any missing contacts. The edited lists were then sent to the lead researcher who compiled the lists into one document for survey distribution and tracking purposes. The final list contained 315 unique individuals from 182 unique organizations. A variety of organizations were listed including but not limited to universities, federal/state/city governmental organizations, tribal entities, non-profit organizations, and military/first responders. All 315 individuals were emailed a survey link to complete. Of these emails 30 were returned as invalid email addresses (9.5%) and 45 completed the survey (14.3%). One detail of methodological importance is that the survey was identified as being administered by the lead researcher and their parent organization, the University of Oklahoma, rather than SCIPP so as not to bias responses. However, that identification could also have limited the number of participants that agreed to take the survey.

Participant Demographics

Most of the participants ($N = 45$) who responded were white ($n = 32$, 71.1%) and 6 participants (13.3%) reported a traditionally underrepresented racial or ethnic identity; the remaining 15.6% of participants did not answer this question. Most participants currently lived in the SCIPP region: Arkansas ($n = 12$, 26.7%), Louisiana ($n = 2$, 4.4%), Oklahoma ($n = 15$, 33.3%), and Texas ($n = 11$, 24.4%), whereas the remaining 5 participants reported living in Kansas, Missouri, Oregon, or Wisconsin. All participants reported higher education such as an Associate's degree ($n = 1$), Bachelor's degree ($n = 10$), Master's degree ($n = 17$), Doctorate or Professional ($n = 3$). The average age of participants was 51.70 ($SD = 8.90$).

Intended Information Use and Scale

Forty-one unique organizations were identified from the total responses. Organizational types were diverse and included non-profit, government, tribal, and educational, among others. Participants reported seeking climate information for the following reasons: to be better informed ($n = 9$), prepare for a presentation or meeting ($n = 8$), develop a plan ($n = 6$), make a decision ($n = 3$) or other ($n = 3$). Participants operated in various geographic domains including city (11.1%), county (4.4%), multi-county (4.4%), state (17.8%), tribal (6.7%), regional (8.9%) and other (11.1%).

Familiarity with Climate Information Sources

The beginning survey questions sought to gauge participants' overall engagement with climate change information by asking how familiar they were with pre-identified sources about climate and hazard risks. Participants were asked to rate their familiarity on a 1 to 5 scale where 1 = Not Familiar at All and 5 = Extremely Familiar. The results are presented in Tables 1 and 2.

Source	<i>M</i>	<i>SD</i>
National Climate Assessment	2.49	1.34
U.S. Climate Resilience Toolkit	2.41	1.21
Intergovernmental Panel on Climate Change (IPCC)	2.41	1.26
NCEI/AMS State of the Climate Report	2.05	1.24
EPA Climate Change Indicators in the United States	1.97	1.02
RAND Risk Assessment Methodology	1.44	0.74

Table 1: Participants' familiarity with pre-identified sources of climate information ordered from most familiar to least familiar.

The National Climate Assessment (NCA) was found to be most familiar to respondents while the RAND Risk Assessment Methodology was least familiar. Among the goals of the project was to determine the relative use of the NCA and other prominent climate change information tools. This is in support of the U.S. Global Change Research Program's network of Sustained Assessment Specialists, which hypothesizes that Sustained Assessment Specialists will promote use of NCA reports. This was indeed found to be the case, as the NCA was the most cited source, although there remains substantial room for further uptake. RAND Risk Assessment Methodology is not known to be widely used within the region but was included to make sure participants were not checking all boxes whether they actually used them or not.

Source	1	2	3	4	5
National Climate Assessment	11	12	7	4	5
U.S. Climate Resilience Toolkit	11	10	13	1	4
Intergovernmental Panel on Climate Change (IPCC)	13	8	9	7	2
NCEI/AMS State of the Climate Report	18	9	7	2	3
EPA Climate Change Indicators in the United States	15	15	5	3	1
RAND Risk Assessment Methodology	27	8	3	1	0

Table 2: Familiarity with sources of climate information. 1=Not Familiar at All and 5=Extremely Familiar.

Familiarity with Climate Information Providers

Similar to the first question, participants were asked about provider familiarity (Table 3).

Source	<i>M</i>	<i>SD</i>
Local National Weather Service Office	4.16	1.00
State Mesonet	3.16	1.62
State Climate Office	3.08	1.32
Southern Climate Impacts Planning Program (SCIPP)	2.92	1.34
Southern Regional Climate Center	2.86	1.28
USDA Southern Plains Climate Hub	2.27	1.18
SouthCentral Climate Adaptation Science Center(SCCASC)	1.91	1.25

Table 3: Participants' familiarity with climate information providers ordered from most familiar to least familiar.

The Local National Weather Service office was found to be the most familiar climate provider followed by the State Mesonet, State Climate Office, and SCIPP.

Source	1	2	3	4	5
Local National Weather Service Office	1	1	7	10	18
State Mesonet	11	2	5	8	11
State Climate Office	8	2	11	11	5
Southern Climate Impacts Planning Program (SCIPP)	9	3	12	8	5
Southern Regional Climate Center	6	11	6	10	4
USDA Southern Plains Climate Hub	14	7	8	8	0
SouthCentralClimateAdaptationScience Center (SC CASC)	20	5	5	3	2

Table 4: Familiarity with climate information providers. 1=Not Familiar at All & 5=Extremely Familiar

Social Network of SCIPP and Primary Stakeholders

Social Network Analysis was performed using Gephi 0.9.2 software. The network had 82 unique organizations, or nodes, and 133 unique connections, or edges. Analysis revealed eight distinct

groups. Further analysis of these groups found that they were similar in either geographic region, topical interest, or both. The figure below presents all nodes and edges color coded according to group.

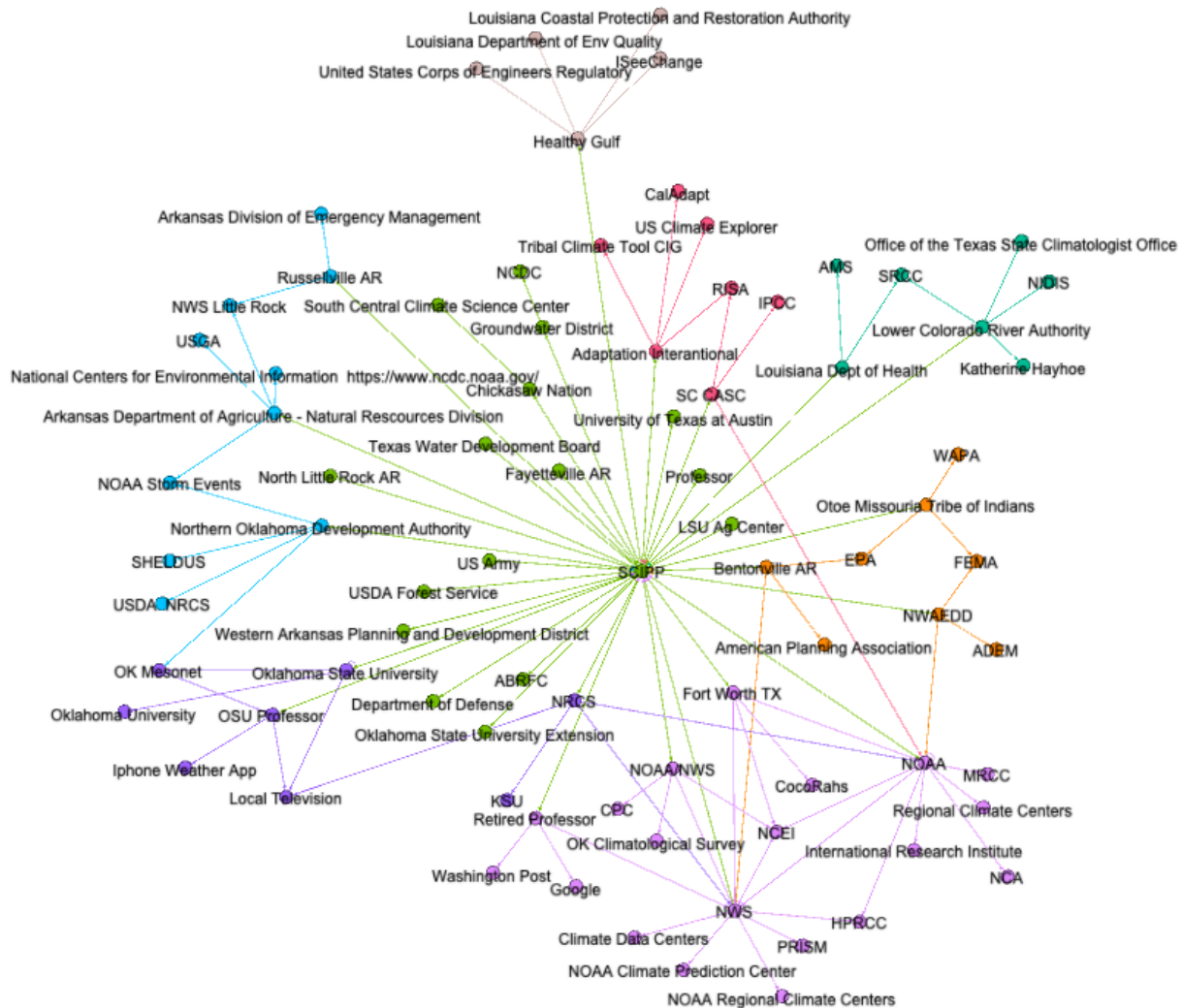


Figure 2: Social network analysis of key SCIPP stakeholder survey respondents.

An important note is that this network analysis does not represent all of the key stakeholders of SCIPP, but rather the key stakeholders that responded. SCIPP is, predictably, at the center of the network, but attention to the details of this analysis reveal some key points of information vital to building the long-term impact of SCIPP. One such observation is that some stakeholders such as Adaptation International and Healthy Gulf provide access to other organizations with whom SCIPP is not directly connected. Another point to consider is that, although there are some tribal

connections present such as the Otoe Missouria Tribe of Indians, there is little connection to traditionally underrepresented populations, an opportunity for SCIPP expansion. One explanation for the limited connections to tribal nations is that although SCIPP worked closely with many of them in its early years (2011-2013), the South Central Climate Adaptation Science Center (SC-CASC) has since established itself in the region and works directly with tribal nations. Therefore, SCIPP's current interaction with tribes is primarily through SC-CASC as an intermediary. There remain, however, opportunities to connect with other underserved populations throughout the region.

Primary Stakeholders Rating of SCIPP and Means of Accessing Information

Social network analysis will return in Step Two, but there was additional information provided by primary stakeholders about SCIPP that can help inform future directions and supply data about what SCIPP is doing well. Participants were asked to rate the information provided by SCIPP and the three other climate information sources that they named on a 0-100 scale, where 0 was below average, 50 was average and 100 was above average. The question not only asked participants to rate SCIPP's information overall, but also in reference to four subdimensions: obtainable, or this information is easy to access; amount, or the quantity of information; accurate, or how correct the data are; and reliable, or the trustworthiness of the information. SCIPP's averaged scores are presented in Table 5 below along with average scores of three other organizations to which participants reported going for information.

Scale Label	SCIPP	Other Org 1	Other Org 2	Other Org 3
Info Overall	70.28	74.02	72.08	71.43
Info Obtainable	64.60	68.71	69.78	68.20
Info Amount	58.97	68.68	65.71	62.92
Info Accuracy	78.32	78.68	74.72	75.48
Info Reliability	79.23	79.99	78.11	79.10

Table 5: Participant's averaged scores for SCIPP and the three other climate information source organizations on a scale from 0 to 100.

Although SCIPP scored lower overall than other organizations, an analysis of the sub scores reveals that the amount of information produced by SCIPP was the largest factor in driving this score down and that the other three categories of obtainable, accurate, and reliable were largely

on par with other organizations (and in some cases greater than the others). Further analysis is needed to determine if the lower score on the amount of information relates to the need for real-time weather information, such as provided by National Weather Service forecast offices, versus information needed for long-term planning, which is SCIPP's primary focus. SCIPP appears to be meeting at least some long-term planning needs as demonstrated by the high scores for accurate and reliable. It is possible that increasing the amount of information that SCIPP shares could meet a need, but SCIPP should also be careful about contributing to information overload, which is a known stakeholder challenge. Further investigation into whether more information is needed by core stakeholders, including more frequent website updates, may be needed.

Primary Stakeholders Report How They Obtain Information

Participants were asked how they received information from SCIPP, as well as from the other three organizations that they listed. Participants were also asked how they provided information to others as well to seek a more well-rounded view of this topic.

Source	SCIPP	Other Org 1	Other Org 2	Other Org 3	Stakeholder
Website	63.6%	77.3%	95.5%	94.4%	41.4%
Email	18.2%	9.1%	0.0%	0.0%	17.2%
Newsletter	9.1%	4.5%	0.0%	0.0%	3.4%
Formal Report	0.0%	0.0%	4.5%	0.0%	6.9%
Social Media	0.0%	0.0%	0.0%	0.0%	6.9%
Phone	0.0%	0.0%	0.0%	5.6%	0.0%
Other	9.1%	9.1%	0.0%	0.0%	24.1%

Table 6: Sources and modes of climate-related information retrieval.

This table clearly reveals that stakeholders are seeking information online and especially when they are seeking information from their non-primary source. However, it is interesting that most of them did not report distributing information in this manner. Nevertheless, SCIPP could take steps to have an improved web presence to increase both the availability and amount of information that can be provided.

Primary Stakeholders Report How Often They Seek Information

Stakeholders were asked to report how often they seek information both from SCIPP and from the three other organizations they listed. The results of this question are reported below.

Frequency	SCIPP	Other Org1	Other Org 2	Other Org3
Hourly	0.0%	4.5%	0.0%	0.0%
Daily	0.0%	18.2%	31.8%	33.3%
Weekly	4.5%	40.9%	18.2%	33.3%
Monthly	54.5%	31.8%	36.4%	22.2%
Yearly	27.3%	4.5%	13.6%	11.1%
LessthanYearly	13.6%	0.0%	0.0%	0.0%

Table 7: Frequency of information seeking.

As expected, most of SCIPP's access is monthly or annual. This is primarily due to SCIPP's focus on long-range planning, where information does not need to be accessed as frequently, as compared to short-term weather information that has immediate importance and changes frequently. However, these findings provide even more evidence as to how important it is that the website be kept up to date. Findings would suggest that the website should be updated, at a minimum, once a month in order to retain stakeholder interest. Increasing updates may attract more views although there may be a point of diminishing return.

Step Two – SCIPP Secondary Connections

In addition to reporting from what organizations stakeholders sought information, stakeholders were asked to what organizations they provided information. Although some stakeholders do not provide information to other organizations, this was a key point of convergence to explore what organizations might not be included in the current SCIPP network that perhaps should be. This second social network analysis followed the same procedure as before. Additionally, known SCIPP stakeholders that did not respond to the survey were included in the new analysis so that an overlay map could be provided should stakeholders mention they distribute information to other stakeholders of SCIPP. The new network had 322 nodes and 377 edges and is shown in Figure 3.

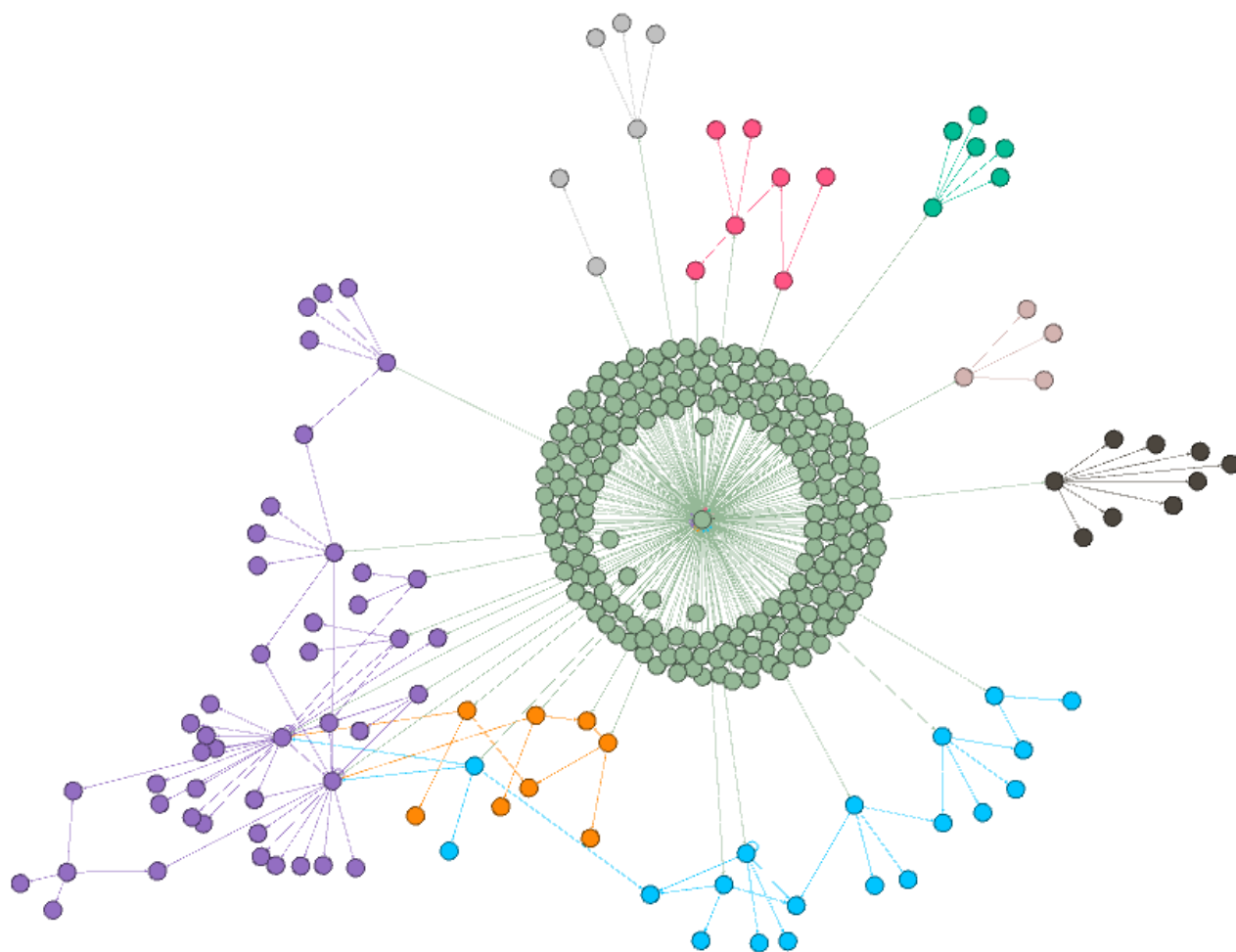


Figure 3: Social network analysis of all key SCIPP stakeholders and secondary contacts. Nodes of the same color indicate relationship clusters, or groups, according to SNA statistics. Green dots are the network shown in Figure 2; other colors indicate networks held by some SCIPP stakeholders that are not directly connected with SCIPP.

As seen in Figure 3, many SCIPP connections within the sample are recorded as only having a direct relationship with SCIPP rather than also having an indirect relationship. This means that SCIPP stakeholders may not be connected to each other. There are several reasons which could explain this result and why most SCIPP stakeholders do not share the climate information they receive. Those reasons may include climate information does not fit into their position's or organization's core function, they may not feel qualified to share the information, and/or they work in a hierarchical environment and are unable to share such information. However, it is important to note that many of these stakeholders were government officials and emergency managers that inform their state, region, or city. For this reason, the information that SCIPP and other climate information organizations provide is invaluable to the formation of public policy and planning. It does not appear that government officials are sharing this information with each other but are looking to organizations such as SCIPP instead.

Step Three – Residents within the Region

The final step of this analysis was to survey residents within the region to determine the sources from which they were seeking weather and climate information. Texas was selected as the study domain since it constitutes the largest state in the SCIPP region by both area and population and includes hazards common throughout the region. Alternatively, the entire SCIPP region was not used for this part of the study because it would have made the network analysis data unwieldy. Therefore, the team reasoned that Texas residents would provide an adequate response to how information was sought in the region. Participants were recruited via MTurk (Amazon Mechanical Turk, a crowdsourcing marketplace) and paid \$2.00 to complete the survey. They were asked to list up to five organizations they used when they had climate-related questions. Participants were likely those that needed weather and climate information within their personal context rather than a typical SCIPP stakeholder who incorporates weather and climate information into their professional context. An overview of their responses is pictured below (Figure 4).



Figure 4: Textual analysis of Texas resident responses.

After this initial view of the results it was determined that classifying the organizations by type may be more useful for determining where residents were looking for information and those results are shown below (Figure 5). The responses from Texas residents were also cleaned and formatted so that they were standardized. For example, NOAA and NWS were listed and where the organizational name was written the acronym was substituted. There were 1,063 unique nodes found with 1,135 unique connections. Figure 6 shows the complete network studied, with Texas residents listed as one node for improved readability.

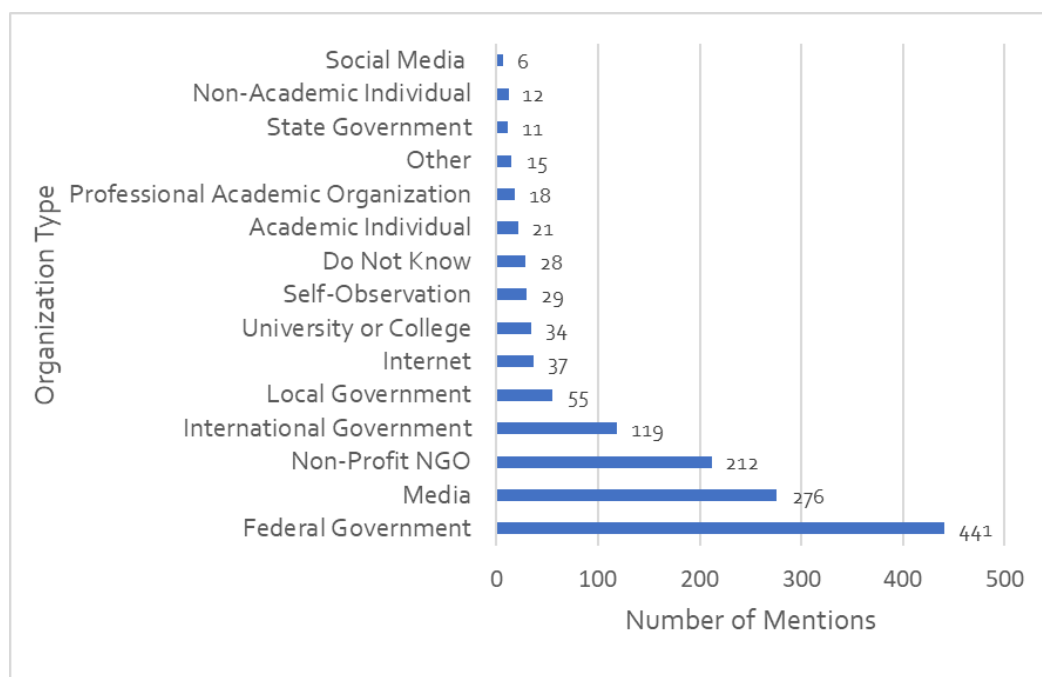


Figure 5: Organization type as sources of climate information mentioned by Texas resident respondents.

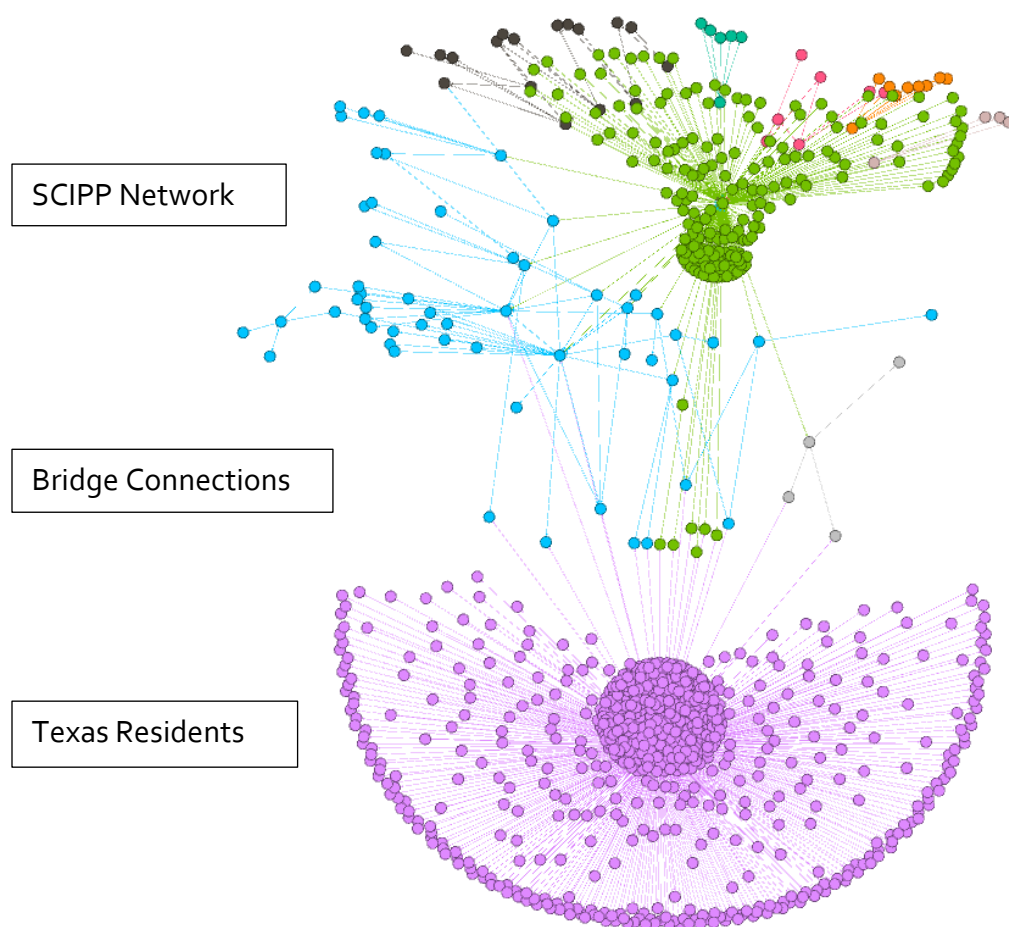


Figure 6: Full social network analysis with SCIPP stakeholders, secondary connections, and Texas resident responses.

The results of this analysis show that certain organizations serve as bridging connections between the scientific community and the public. The first type of bridge is governmental organizations, and primarily federal government organizations. Some examples are: NOAA, NWS, NASA, and EPA. The second type of bridge that was noticed was universities. Specifically, the University of Texas, Texas Tech, Texas A&M and University of Oklahoma were noted as throughputs for information from lead scientists to lay individuals. However, more work could be done to establish more bridges between scientists, stakeholders, and lay audiences.

Conclusion

The results of this study may raise more questions than it answers, however, they are important questions that must be resolved to provide high quality information to other organizations and

the public at large. There are five strategies that SCIPP and other climate services organizations can take to use this information for the benefit of the region. Organizational budgets and capacities must be considered when applying the strategies below, however.

1. SCIPP must increase the appearance, content, and timeliness of updates to its website to provide relevant information.
2. The information provided by SCIPP is respected as accurate and credible, however, more of it needs to be delivered in formats that are more appropriate for stakeholder consumption (e.g. 2- to 4-page briefs).
3. Stronger relationships with universities should be cultivated, not only for research collaborations but also for information distribution to students who will help shape this nation.
4. Traditionally underrepresented populations are noticeably missing from this analysis and represent a structural hole.
5. Sustained assessment specialists are crucial to the mission of SCIPP not only to maintain the relationships that already exist, but to seek out and cultivate new relationships.

SCIPP is already taking steps to address some of the above points. For example, in recent years the team has made some progress in connecting with nodes, but complicating factors have stalled some of those connections. Website updates are also being prioritized along with some increase in social media content, along with offering both in-depth research reports and shorter research briefs.

Appendix A – Survey Questions

How familiar are you with the following sources of information about climate and hazard risks?

	Extremely familiar	Very familiar	Moderately familiar	Slightly familiar	Not familiar at all
National Climate Assessment (NCA)	☐	☐	☐	☐	☐
Intergovernmental Panel on Climate Change (IPCC)	☐	☐	☐	☐	☐
EPA Climate Change Indicators in the United States	☐	☐	☐	☐	☐
U.S. Climate Resilience Toolkit	☐	☐	☐	☐	☐
NCEI/AMS State of the Climate Report	☐	☐	☐	☐	☐
RAND Risk Assessment Methodology	☐	☐	☐	☐	☐

Page Break



How familiar are you with the following climate service providers?

	Extremely familiar	Very familiar	Moderately familiar	Slightly familiar	Not familiar at all
Southern Climate Impacts Planning Program (SCIPP)	☐	☐	☐	☐	☐
South Central Climate Adaptation Science Center (SC CASC)	☐	☐	☐	☐	☐
USDA Southern Plains Climate Hub	☐	☐	☐	☐	☐
Southern Regional Climate Center	☐	☐	☐	☐	☐
State Climate Office	☐	☐	☐	☐	☐
State Mesonet	☐	☐	☐	☐	☐
Local National Weather Service Office	☐	☐	☐	☐	☐

Start of Block: News Seeking Sources

What organization do you work for?



What is your zip code?

Page Break

From what organizations do you **seek** information about climate trends, climate impacts, or climate change?

Please list at least three but up to five.

Please be specific by writing the name of the organization AND that organization's web URL from which you obtain information, if available.

- ☐ Organization 1 _____
 - ☐ Organization 2 _____
 - ☐ Organization 3 _____
 - ☐ Organization 4 _____
 - ☐ Organization 5 _____
-

Page Break

To what organizations do you **provide** information about climate trends, climate impacts, or climate change?

Please list at least three but up to five.

Please be specific by writing the name of the organization AND that organization's web URL from which you obtain information, if available.

- ☐ Organization 1 _____
- ☐ Organization 2 _____
- ☐ Organization 3 _____
- ☐ Organization 4 _____
- ☐ Organization 5 _____

End of Block: News Seeking Sources

Start of Block: SCIPP Relationship Characteristics

Think about the Southern Climate Impacts Planning Program (SCIPP) and answer the following questions with SCIPP in mind.



Compared to other sources, how would you rate the information provided by SCIPP?



What is the primary way you obtain information from SCIPP.

▼ Website ... Other

On average, how often do you obtain information from SCIPP?

▼ Hourly ... Less than once a year

End of Block: SCIPP Relationship Characteristics

Start of Block: Org 1 Relationship Characteristics

Think about `${NSS/ChoiceTextEntryValue/1}` and answer the following questions with `${NSS/ChoiceTextEntryValue/1}` in mind.



Compared to other sources, how would you rate the information provided
by $\text{\$}\{\text{NSS}/\text{ChoiceTextEntryValue}/1\}$?



What is the primary way you obtain information from $\text{\$}\{\text{NSS}/\text{ChoiceTextEntryValue}/1\}$.

▼ Website ... Other

How often do you obtain information from $\text{\$}\{\text{NSS}/\text{ChoiceTextEntryValue}/1\}$?

▼ Hourly ... Less than once a year

End of Block: Org 1 Relationship Characteristics

Start of Block: Org 2 Relationship Characteristics

Think about $\text{\$}\{\text{NSS}/\text{ChoiceTextEntryValue}/2\}$ and answer the following questions with $\text{\$}\{\text{NSS}/\text{ChoiceTextEntryValue}/2\}$ in mind.



Compared to other sources, how would you rate the information provided
by $\$ \{NSS/ChoiceTextEntryValue/2\}$?



What is the primary way you obtain information from $\text{\$}\{\text{NSS}/\text{ChoiceTextEntryValue}/2\}$.

▼ Website ... Other

How often do you obtain information from $\text{\$}\{\text{NSS}/\text{ChoiceTextEntryValue}/2\}$?

▼ Hourly ... Less than once a year

End of Block: Org 2 Relationship Characteristics

Start of Block: Org 3 Relationship Characteristics

Think about $\text{\$}\{\text{NSS}/\text{ChoiceTextEntryValue}/3\}$ and answer the following questions with $\text{\$}\{\text{NSS}/\text{ChoiceTextEntryValue}/3\}$ in mind.



Compared to other sources, how would you rate the information provided
by $\{NSS/ChoiceTextEntryValue/3\}$?



What is the primary way you obtain information from $\text{\$}\{\text{NSS}/\text{ChoiceTextEntryValue}/3\}$.

▼ Website ... Other

How often do you obtain information from $\text{\$}\{\text{NSS}/\text{ChoiceTextEntryValue}/3\}$?

▼ Hourly ... Less than once a year

End of Block: Org 3 Relationship Characteristics

Start of Block: Job Demographics

What is your job title?

Which statement best characterizes how you seek and use information about climate-related topics?

- ☐ To become better informed about an issue
- ☐ To gather information for a plan
- ☐ To gather information for a presentation or meeting
- ☐ To inform a new decision
- ☐ To gather information for an elected official
- ☐ To justify a decision that was already made
- ☐ Other (please describe) _____

At which level do you primarily work?

- ☐ City/Community level
- ☐ County level
- ☐ Multi-County level
- ☐ Tribal level
- ☐ State level
- ☐ Regional level
- ☐ Other level (please specify): _____

What is the primary way **your** organization provides information to stakeholders?

▼ Website ... Other

End of Block: Job Demographics

Start of Block: Demographics Base/Universal



What is your age?

What is the highest level of school you have completed or the highest degree you have received?

- ☐ Less than high school degree
 - ☐ High school graduate (high school diploma or equivalent including GED)
 - ☐ Some college but no degree
 - ☐ Associate degree in college (2-year)
 - ☐ Bachelor's degree in college (4-year)
 - ☐ Master's degree
 - ☐ Doctoral degree
 - ☐ Professional degree (JD, MD)
-

Are you Spanish, Hispanic, or Latinx or none of these?

- ☐ Yes
 - ☐ None of these
-

Choose one or more races that you consider yourself to be:

- ☐ White
 - ☐ Black or African American
 - ☐ American Indian or Alaska Native
 - ☐ Asian
 - ☐ Native Hawaiian or Pacific Islander
 - ☐ Other _____
-

What sex were you assigned at birth, meaning on your original birth certificate?

- ☐ Male
- ☐ Female
- ☐ Undetermined

End of Block: Demographics Base/Universal
