Surf Science in the Gulf of Maine: Understanding Perceptions of Risk Related to Water Quality and Decision Making in the Surfing Community

Technical report summarizing research findings

By Sophia Scott and Dr. Shannon Rogers
Plymouth State University
Center for the Environment

Produced as part of the New England Sustainability Consortium's Safe Beaches and Shellfish Research Project

November 2016

ABSTRACT

Surfers represent a culturally and economically important subpopulation of beachgoers who are subject to greater health risks from impaired coastal waters. These increased risks relate to the amount of time surfers spend in the water, their higher incidence of water ingestion, and the propensity for surfers to surf around storm events when water quality is most likely to be poor.

To better understand this important stakeholder group, we surveyed almost 300 surfers and conducted 20 interviews with key informants in the surfing communities of Maine and New Hampshire in 2015. We employed a mixed methods approach, combining the qualitative and quantitative methods of in depth interviews and intercept surveys, to address our research goals of understanding surfers' perceptions of water quality risk and how this impacted their decision to enter the water to surf.

Though we approached our research from the angle of water quality risk and decision-making the major theme that emerged from our interviews is that surfers Maine and New Hampshire hold a wealth of local ecological knowledge (LEK) especially around issues of water quality. This knowledge can help bolster scientific research and serve as a valuable resource to policy makers, beach managers, and those implementing general coastal management processes.

In addition to the finding that Maine and New Hampshire surfers provide valuable insight on issues of water quality, we find that surfers indicate that water quality and pollution can impact an individual's decision to surf and that they overwhelmingly want to know about the quality of the water where they surf. Given this, and paired with the knowledge that surfers are more vulnerable to water pollution, demonstrates that the surfing population should have improved access to water quality information at their local surf spots. There is a unique opportunity for coastal managers to learn and benefit from knowledge held within the surfing community. Likewise, surfers will benefit from improvements in beach water quality management.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

INTRODUCTION

The Gulf of Maine is a region of the North Atlantic that is rich in natural resources and provides innumerable ecosystem services to its human inhabitants. This important coastal system is inherently linked to the economies of both Maine and New Hampshire (NOEP 2015). In 2015 coastal zone counties contributed $45.7 and $22.4 billion respectively in Maine and New Hampshire (NOEP 2015). Coastal recreation is a significant contributor to the costal economy and is responsible for an estimated $120-480 million (Leeworthy and Wiley 2001). One of the most popular coastal recreation activities in this region is beach visits. Most recent estimations of visitors for Maine's southern beaches were 15 million visitors in 2015 (DPA 2015). In NH the most recent estimates are for 2009 when there were an estimated 8.1 million beach visitation days (Pendleton 2009). While there are many threats to our coasts, a significant problem currently impacting ME and NH beaches are the occurrence of advisories and closures, which arise when water quality is below an accepted threshold for human health and safety (Jones 2011). Beach advisories and closures can have significant impacts on socio-economic systems through perception and value of place, health implications due to exposure to contaminated water, and loss of revenue from unwarranted beach closures (Jones 2011, Porter et al. 2010).

While there are many types of beachgoers who are impacted by advisories and closures, those who enter the water to swim or play in the intertidal sands are at the highest risk of exposure to pathogens (Heaney et al. 2012, Stone et al. 2008, Dwight et al. 2004). Of this group of primary water contact beach goers, surfers are a subpopulation that have a higher risk of suffering from the effects diminished water quality (Harding et al. 2014, Stone et al. 2008). This occurs for a number of different reasons. Surfers are in the water for longer periods of time and become fully emerged (versus wading). Surfers participate in the sport year round and thus are subject to seasonal variation in rainfall and changes in wastewater treatment plant outputs. Given the nature of the sport, surfers are more apt to ingest water or get cuts or scrapes through which microbial pathogens can enter. Finally, surfers often surf during or after storm events when the waves are the best but water quality is poor.

In addition to surfers being a high-risk subpopulation of beachgoers, they are an important beach stakeholder group. Recent studies have shown that they play an active socio-economic role in coastal communities (Wagner et al. 2011, Lazarow et al. 2009, Slotkin et al. 2009, Nelsen et al. 2007, Lazarow 2007). Indeed, there are 16 surf shops along the coast from Portland, ME to Hampton, NH.

There is also evidence that surfers are environmentally minded and excellent candidates for stewards of their coastal environment (Martin and Assenov 2014, ASBPA 2011, Taylor 2007). Though typically not viewed as a group with a large population there are an estimated 2.4-3.3 million surfers in the United States (SGMA 2012, Leeworthy et al. 2005, Leeworthy and Wiley 2001) and while there has been no solid research attempt to quantify surfers Maine and New Hampshire our research suggests that the surfing population in the Gulf of Maine is a significant, coastal stakeholder.

The aggregate surfer population is a group that is at higher risk for water-borne pathogens, economically significant, and ecologically minded. These factors make them an ideal demography to study and stakeholder group to include in management decisions in the Gulf of Maine. Given the level of pathogen exposure and the corresponding health risk (typically GI illness) and coupled with a strong sense of environmental sustainability, Maine and New Hampshire surfers provide valuable insights about coastal waters and coastal management.

New England Sustainability Consortium

The New England Sustainability Consortium (NEST**)** is a collaborative, sustainability science research and education program focused on bridging the gap between science and decision making. The research presented here was conducted as part of NEST's *Safe Beaches and Shellfish Project* that focused on coastal issues in Maine and New Hampshire. This place-based, problem-driven, and solutions-oriented transdiciplinary research project spans states and institutions focused on working collaboratively to solve a regional problem.

RESEARCH GOALS

We wanted to understand the relationships between surfers' perceptions of risk and water quality and decision to enter the water to surf. Specifically, we were interested in learning whether knowledge of water quality or pollution would impact a surfer's decision to enter the water. Given the potential for surfers' increased vulnerability to water pollution, we also sought to understand how surfers thought about risk, how risk impacted their decision to surf, and whether surfers considered water quality to be a risk.

To address these questions, we sought to actively engage with the surfing community and use them as our primary source of knowledge to support our research. Specifically, we relied on the research methods of interviews and surveys. These methods resulted in in-depth and rich qualitative data from 20 key informants and a mixture of quantitative and qualitative data from a wide reaching (n=291) sample that was capable of representing a larger population of surfers.

What follows is a summary of our findings as well as some preliminary recommendations. Our complete data set and several journal articles are available upon request.

STUDY AREA

We focused our research on 12 surf beaches in southern ME and NH. This region of the Gulf of Maine boasts many beaches which are popular with tourists and residents alike. In addition to supporting typical beach recreation, many of the beaches in this region are

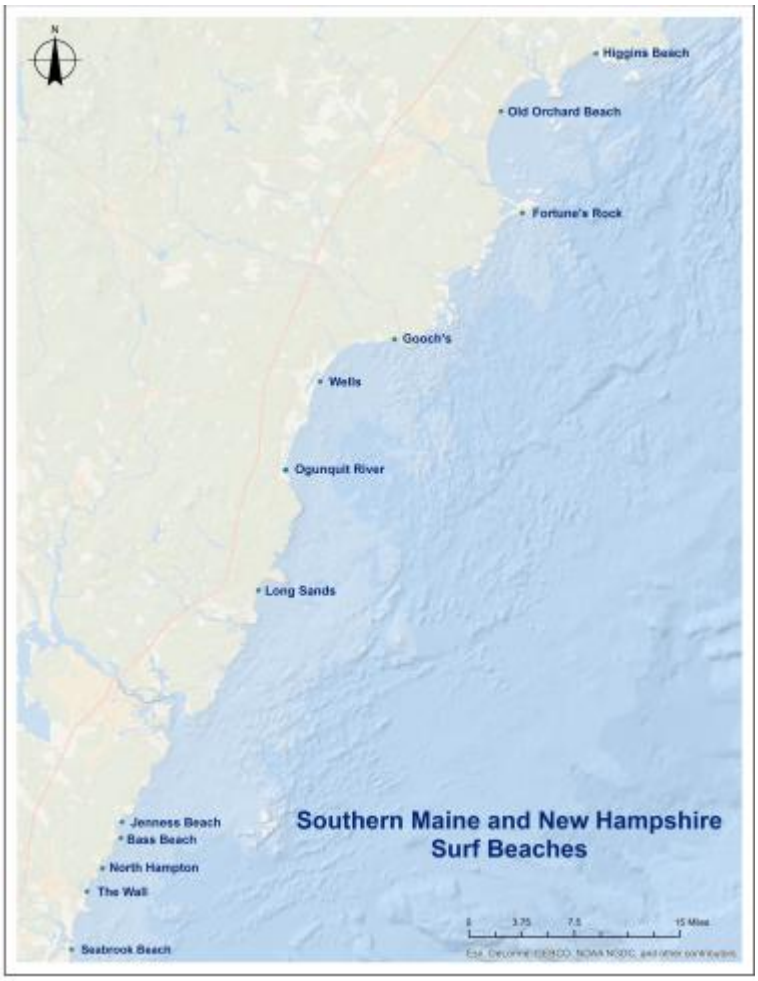

Figure 1. Study area

surfable. We chose to focus our study on 12 surf beaches, 7 of which are located in southern ME and 5 in NH (Figure 1).

While southern ME and NH are geographically close, the two states have significant differences in beach water quality. In their 2013 report, the National Resource Defense Council (NRDC) ranked the 30 states with coastline by beach water quality based on the national Beach Action Value (BAV) (Doffman and Haren 2013). In the report NH ranked 2nd for the cleanest beaches while ME was ranked 27th, three shy from having the least clean beaches in the nation (Doffman and Haren 2013). The beaches included in our study demonstrate this contrast (Table 1). During our data collection period (May-October 2015) there were 47 advisories issued at the study beaches in Maine and 0 issued in New Hampshire (Table 1).

Table 1. National Resource Defense Council Beach Action Value (BAV) exceedances for 2013 and number of issued beach advisories for 2015 (Doffman and Haren 2013, MHB 2015, NHDES 2015).

Beaches	Percent BAV exceedance	Number of advisories
New Hampshire		
Jenness	0%	0
Bass	4%	0
North Hampton	1%	0
The Wall	1%	0
Seabrook	0%	0
Maine		
Higgins	19%	12
Old Orchard	10%	3
Fortune's Rock	0%	0
Gooch's	38%	14
Wells	22%	3
Ogunquit	n/a*	0
Long Sands	22%	15

*NRCD percent BAV exceedance was not available for this beach.

METHODS

To answer our research questions, we took a multimethod approach combining the qualitative and quantitative research methods of literature review, interviews, and surveys (Creswell 2014). The triangulated nature of this approach allowed each methodology strategy to work in concert with the others and ultimately converge together to help develop comprehensive conclusions.

Interview protocol

In an effort to understand surfers' perceptions of risk, water quality, and decision making we conducted semi-structured, open-ended interviews with key informants in the surfing community. We recruited willing surfers to interview using an opportunist sampling strategy by visiting surf shops up and down the coast (Berg 2004). We attempted interviewee recruitment at 9 surf shops in the study area from Portland, ME to Hampton, NH. Further interviewees were identified via snowball sampling strategy (Noy 2007). The interview protocol was semi-structured and questions were designed to understand surfer's perception of risk and water quality and whether this influenced a surfer's decision to surf or not to surf. Questions offered ample opportunity for surfers to display any additional knowledge they had about the Gulf of Maine system. We also asked questions pertaining to surfers' knowledge of surfing spots and

surfing behaviors as well as knowledge of water quality and the role this played in the decision to surf (Figure 2).

We interviewed a total of 20 key informants including surf shop owners, surf shop employees, regular surfers, a surf blogger, a surf coach, and an employee of surf advocacy group over the time period of May 2015-February 2016. Interviews lasted approximately 30 minutes, were digitally recorded, and later transcribed for analysis.

- Where do you go surfing? Why? Where do you get your information about surfing conditions?
- What are the most popular surf spots? What makes these spots popular?
- Have you ever noticed anything in or about the water that would make you question its quality? Has this impacted your decision to surf?
- Have you heard about water quality/pollution/contamination issues? If so, where did this information come from? Does it make you concerned? Why or why not?
- Do you surf in storms, high rainfall events, or during a posted beach advisory?
- Have you attributed getting sick to surfing? Does this knowledge impact any of your decisions about where or when to surf?
- Are there any questions that we should be asking surfers that we haven't addressed?
- Is there anything else that you'd like to add to this conversation that we haven't addressed?

Figure 2. Examples of interview questions

Survey protocol

Initial interviews (methodology described above) conducted in the spring of 2015 informed the design of our survey instrument. From May-October of 2015 we conducted a 10-question intercept survey on the 12 surf beaches of our study area. The target participant was a surfer above the age of 18 who was present at a beach within our study area. We focused solely on the surfing population and excluded other wave riders such as boogie boarders, body surfers, stand up paddle boarders, and wind surfers. We approached surfers exiting the water and after consent was given, verbally administered the survey. Survey participants were thanked with a gift of surf wax. The survey was designed to elicit a surfers' knowledge of water quality and whether this impacted the decision to surf (Figure 3). Surveys typically took about 5 minutes to complete.

- Have you surfed…
  - During storms?
  - During a posted beach water quality advisory?
- Have you ever noticed anything in the water that would make you question its quality?
- Do water pollution concerns impact your decision to surf?
  - Is this a risk?
- Have you ever attributed getting sick to surfing?
- Would you be interested in knowing about water quality conditions at your local surf spot?
- How would you like this knowledge shared with the surfing community?

Figure 3. Examples of survey questions

We recorded demographic information as well as involvement in an environmental or surf group and surf experience (in number of years surfing). Our survey also contained open-ended questions about water quality. During our data collection period we visited the beaches in our study area a total of 64 times. Of those survey recruitment days, surfers were present to survey 39 out of the 64 efforts, representing a sampling success rate of 61% (Table 2). A successful beach visitation (survey attempt) occurred when there were surfers present to survey. Over the course of the field season n=291 surfers were surveyed with a 90.6% response rate, (total surfers surveyed/total surfers approached)*100 or (291/321)*100.

Table 2. Intercept survey sampling schedule

Beach	Total survey sampling attempts	Failed survey sampling attempts	No. surfers surveyed	No. surfers declined survey	Total no. surfers approached
Jenness	9	1	68	5	73
Bass	2	1	1	0	1
North Hampton	2	2	0	0	0
The Wall	9	3	37	6	43
Seabrook	4	4	0	0	0
Higgins	7	1	78	8	86
Old Orchard Beach	5	5	0	0	0
Fortune's Rock	4	0	16	0	16
Wells	6	4	4	1	5
Long Sands	4	1	33	4	37
Gooch's	7	2	42	3	45
Total	64	25	291	30	321

ANALYSIS

Two types of data resulted from our study: qualitative data derived from interviews and a combination of quantitative and qualitative data from surveys. A different data analysis approach was used for each dataset. Interview transcriptions employed the qualitative research method of latent content analysis and grounded theory while survey data was analyzed using quantitative methods of descriptive statistics, cross tabulations, chi squared test of independence, and logistic regression.

Interview data

Once transcribed from audio recordings we analyzed the interview data by employing both grounded theory methodology and the data analysis method of qualitative latent content analysis. Grounded theory casts a broader net than latent content analysis in that it results in formation of a theory whereas latent content analysis reveals codes and themes to answer research questions (Cho and Lee 2014). Coding, used in both grounded theory and latent content analysis, is a way in which a researcher can categorize key concepts or ideas within the data. We used the computer program NVivo to aid us in our coding and analysis process (Bazeley 2007, Welsh 2002).

Survey data

We recorded survey responses into the Microsoft program Excel. Answers that could be easily coded into binary or other numerical data were transformed to allow for easier statistical analysis. Open-ended questions were left unaltered and were coded using a process similar to our analysis of interview data.

We used statistical analysis to test for association with our dependent variables. We employed cross-tabulations and chi-squared test of independence for our statistical analysis. We also used logistic regression analysis to test for significant association between dependent variables and continuous independent variables. Once a significant correlation was found between our depending variables and independent variables we utilized a logistic regression analysis that included all significant variables. Using this method we created a model that was capable of predicting membership in our dependent variable.

FINDINGS

Interview respondent characteristics

A total of 20 key informants in the southern ME and NH surfing community were recruited for participation in our in-depth interviews. The interviewees were primarily male and with a mean age of 36. About half the surfers had a Bachelor's degree or higher. The group was evenly split in membership to a surf or environmental group, while some participants did not actively hold membership but still participated in the organizations. Demographic information is outlined in Table 3.

Table 3. Overall interview sample characteristics (n=20)

Characteristic	Frequency	Percentage (%)
Gender		
Male	18	90
Female	2	10
Residence		
ME	13	65
NH	6	30
MA	1	5
Education		
High school	2	10
Some college	6	30
Associates	1	5
Bachelors	10	50
Masters	1	5
Membership in environmental or surf group		
Yes member	8	40
Not a member	8	40
Not a member but participate	4	20
Continuous variables	Mean, (median), [min-max]	
Age	35.9, (31.5), [18-64]	

Survey respondent characteristics

Our intercept survey recruited a total of 291 participants with a response rate of 90.6% (Table 2). Respondents were primarily male (80%), which is characteristic of the broader surfing population, and had a bachelor's degree or higher (67%). The age of the surfer ranged from 18-79 with a mean age of 33.6 years. Surfing experience ranged from first time surfers to surfers with over a half century of experience (52 years surfing). The mean number of years surfing was 11.4 years. The majority of surfers surveyed were from either ME or NH (60.2%). Of the surfers surveyed in ME, a majority of them were from ME (60.9%) while the opposite was true of surfers surveyed in NH, with only 39.3% NH resident surfers. Demographic information about the counties where we conducted the surveys and for each state can be found in Table 4. A summary of the demographic information is presented in Table 5.

Table 4. Demographic information for counties and states where surveys were administered

2014 Estimates	York County, ME	Cumberland County, ME	Maine	Rockingham County, NH	New Hampshire
Population	200,710	287,797	1,330,089	300,621	1,326,813
Bachelor's degree or higher	28.8%	41%	27.9%	37.2%	33.7%
Median Income	57,348	57,461	48,453	77,348	64,916
Median housing cost	227,800	241,800	174,500	282,100	239,900
Median age	43	41	42.7	37.2	41.1

Table 5. Overall survey sample characteristics (n=291)

Characteristics	n	Frequency	Percentage (%)
Gender	291		
Male		232	79.9
Female		59	20.3
Residence	291		
MA		63	21.6
ME		116	39.9
NH		59	20.3
QC		29	10
Other		24	8.2
Education	291		
HS		28	9.6
Some college		56	19.2
Associates/technical		12	4.1
Bachelors		130	44.7
Graduate		65	22.3
Membership in an environmental or surf group	291		
Not a member		215	73.9
Yes, a member		76	26.1
Surfing during storms	291		
No, I have not surfed during/after storms		64	22
Yes, I have surfed during/after storms		227	78
Surfing during posted water quality advisory			
No, I have not surfed during an advisory		185	63.6
Yes I have surfed during an advisory		106	36.4
Noticing something questionable about the water quality	291		
No, I have not noticed questionable water quality		147	50.5
Yes, I have noticed something questionable		123	42.3
Not here		21	7.2
Attributing surfing to sickness	291		
No, I have never attributed surfing to sickness		206	70.8
Yes, I have attributed surfing to sickness		85	29.2
Interest in knowing about local surf spot water quality	291		
Yes, I am interested in local water quality		281	96.6
No, I am not interested in local water quality		6	2.1
Other		2	0.6
Continuous Variables	Mean, (median), [min-max]		
Age	33.6, (31), [18-69]		
Number years surfing (surfing experience)	11.4, (9), [0-52]		

*In-state meaning that surveyed surfer was a resident to the state in which the surfer was surveyed. For instance, if a surfer was surveyed at Higgins Beach in Scarborough, ME and indicated that they were a resident of Maine, this classified them as 'In-state.'

Survey respondent characteristics

Our intercept survey recruited a total of 291 participants with a response rate of 90.4% (Table 2). Respondents were primarily male (80%), which is characteristic of the broader surfing population, and had a bachelor's degree or higher (67%). The age of the surfer ranged from 18-79 with a mean age of 33.6 years. Surfing experience ranged from first time surfers to surfers with over a half century of experience (52 years surfing). The mean number of years surfing was 11.4 years. The majority of surfers surveyed were from either ME or NH (60.2%). Of the surfers surveyed in ME, a majority of them were from ME (60.9%) while the opposite was true of surfers surveyed in NH, with only 39.3% NH resident surfers. Demographic information about the counties where we conducted the surveys and for each state can be found in Table 4. A summary of the demographic information is presented in Table 5.

Results

With regards to risk perception, the data showed that almost half of the surfers surveyed that surfing is a risky sport (45.7%) while others said that risk was dependent on conditions (26.8%)

or that surfing is not risky (27.5%). When asked to rank the top three risks associated with surfing the risk identified as the number one top risk was drowning (27.8%) followed by injury (14.8%), and others in the water (13.4%) (Table 6). Water quality is not viewed as a top risk for surfers in our study area. Indeed, when asked to list the top three risks associated with surfing, water quality was identified only twice over the entire 291 sample, once as the number one top risk and once as the third risk. However, when asked directly if water pollution was risk, a large majority of surfers (70.8%) stated that yes, water pollution is a risk. As to whether or not this risk translated to decision making around the choice to surf in polluted water, the reaction is more split, with 47.1% indicating that water pollution would impact their decision to surf, 9.3% of surfers stating that it wouldn't impact their decision to surf here ('Not here' category) and 43.6% noting that water pollution would not deter them from surfing.

Table 6. Top three risks identified by survey participant

Rank	Stated risks
No. 1 risk	Drowning (27.8%)
	Injury (14.8%)
	Others in the water (13.4%)
No. 2 risk	Injury (16.8%)
	Others in the water (14.4%)
	Rocks, reefs, shallow bottom (14.1%)
No. 3 risk	No other risks (17.2)
	Others in the water (16.2%)
	Injury (14.4%)

Despite this, almost all surfers (96.6%) indicated that they were interested in knowing about water quality at their local surf spot and specified the best way that this information could be shared with the surfing community with the most popular method recorded as the online resources of surf forecasting websites such as magicseaweed.com, swellinfo.com, or surfline.com (Table 7).

In terms of risky surf behaviors, 78% of surfers reported surfing during or after storms and 37% of surfers surfed during a posted beach water quality advisory (Table 5). We were interested in understanding why surfers would choose to participate in these risky surf behaviors of surfing during a storm or water quality advisory. Additionally, we were curious to see if any of the variables we tested for would have a significant association with these behaviors. Surprisingly, neither behavior had a significant correlation with general surf risk. Nor was there any significant association between risky surf behaviors and water pollution impacting the decision to surf or the consideration that water quality is a risk.

We were also interested in understanding which variables had a significant relationship in a surfers' belief that water quality is or is not a risk. Specifically, we looked at whether certain surfer characteristics, such as age, surf experience, or education, would result in a surfer being more or less likely to believe that water pollution is a risk. Results from our statistical analysis

Table 7. Preferred method of water quality communication

Knowledge sharing method	Percentage (%)
Online	55.0
Posted at beach	18.4
Social media, text, app	11.8
Surf shop	8.6
News outlet or local government	3.5
Surfrider Foundation	2.0
Other	0.7

show that the variables of general surf risk ($x^2(1, n=182)=5.829$, $p=0.016$) and water pollution impacting the decision to surf ($x^2(1, n=234)=6.003$, $p=0.014$) have a significant correlation with surfers' perception of water quality risk..

Additionally, we wanted to know if there were any significant relationships between surfer perception of water pollution risk and the decision to surf. That is, are surfers who identify water pollution as a risk more or less likely to impact the decision to surf? Our analysis demonstrated that other than the association already determined between water quality risk and the decision to surf (see above paragraph) the only other factor that correlated with water pollution impacting the decision to surf was age. That is, as the age of the surfer increase, so do the odds of them stating that water pollution will impact their decision to surf.

Although we approached our research from the angle of risk, water quality, and decision making, the ideas and concepts that arose in the analysis of our interview data led us to the conclusion that the prevailing theme of our interview data was the idea that the surfers in our study hold a great deal of local ecological knowledge. Local ecological knowledge (LEK) is a knowledge system acquired through extensive and intensive relationship with one's environment of surroundings and has been recognized as an important information source for scientists and policy makers (Miller et al. 2014, Nursey-Brag et al. 2014, Tengo et al. 2014, Tàbara and Chabay 2013, Thorton and Maciejewski Scheer 2012).

Five subthemes that emerged from our analysis and supported our conclusion of the presence of LEK in the surfing population. These subthemes are:

- *Experience-Awareness-Knowledge*
- *Lifestyle*
- *Stewardship*
- *General Environmental Observations*
- *Factors Influencing Water Quality*

The Subthemes of '*Factors Influencing Water Quality*' and '*General Environmental Observations*' had almost total participation from interviewees (19 and 17 interviewees contributed to '*Factors Influencing Water Quality*' and '*General Environmental Observations*' respectively), while the membership within the Subthemes of '*Experience-Awareness-Knowledge*', '*Lifestyle*', and '*Stewardship*' were less populated accounting for 10, 7, and 10 interviewee contributors, respectively. Figure 4 illustrates the how parent codes and subthemes coalesce to support the major theme of LEK. Subthemes are summarized in Table 8. Under the umbrella theme of 'Evidence of Local Ecological Knowledge' all 20 interviewees contributed codes. Supplemental information regarding the Codes, Parent Codes, Subthemes, and Major Theme and corresponding respondent and reference numbers is provided in the Appendix.

We find it important to note here that interviewees contributed to the overarching theme of surfer LEK in varying degrees. That is, surfer LEK is not uniform across the participants in our study, nor should it be expected to be in the general surfing population. What we show in our study is a spectrum of surfer LEK. Indeed, one of our interviewees (Interviewee #9) only contributed a single reference to the overarching theme of surfer LEK, representing 0.6% of the total contribution, while another (Interviewee #7) contributed 17 references, accounting for 10% of the total contribution to surfer LEK (Figure 5). It should also be noted that interviewees contribute unevenly in terms of subthemes. Some surfers only noted one subtheme while others touched on multiple. Only 4 of the surfers we interviewed mentioned all 5 subthemes (Figure 5).

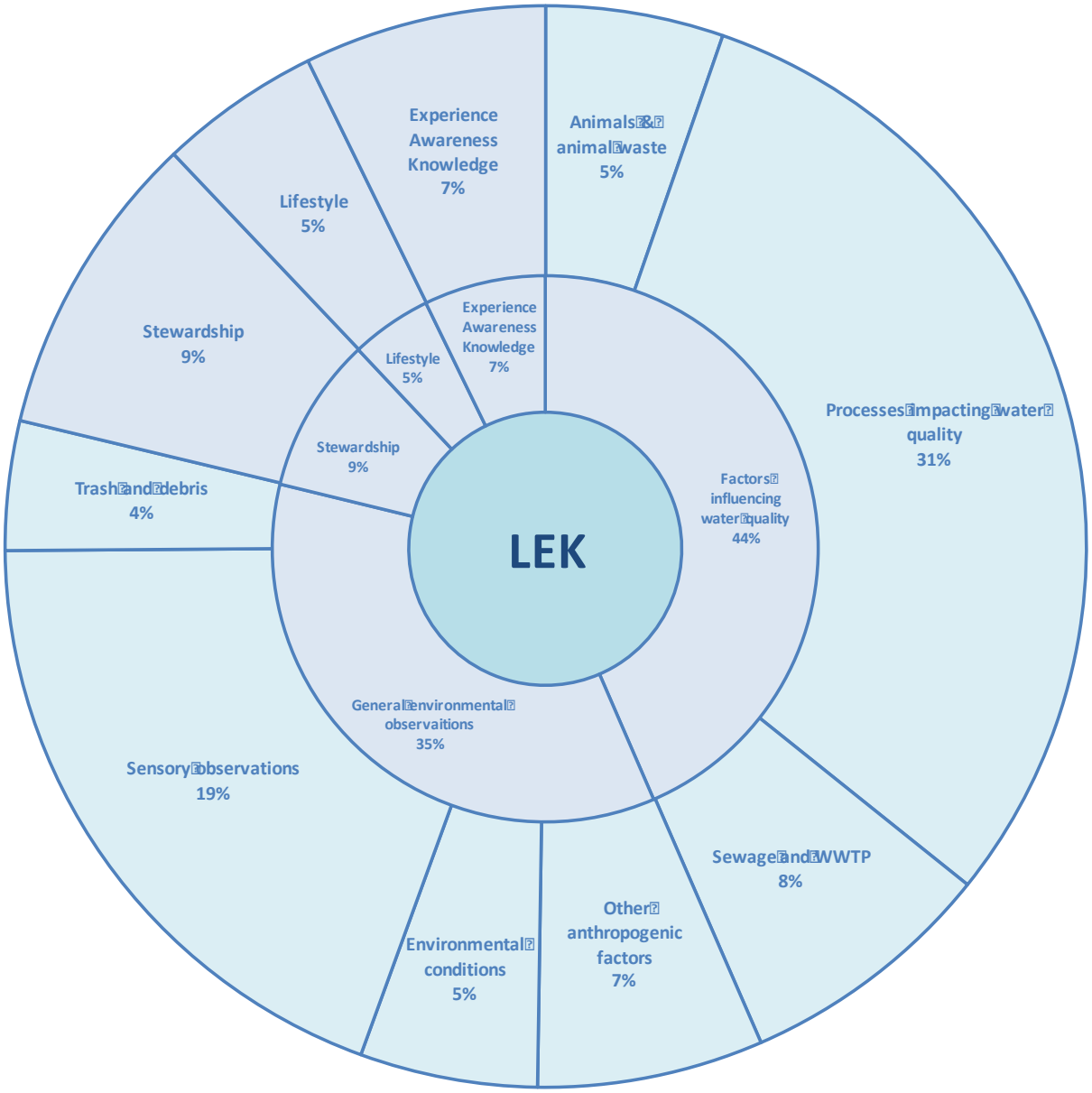

Figure 4. Sunburst graph representing Major theme (center), subthemes (middle), and parent codes (outer). Each level is equal to 100% and all percentages refer to contribution to the major theme of LEK.

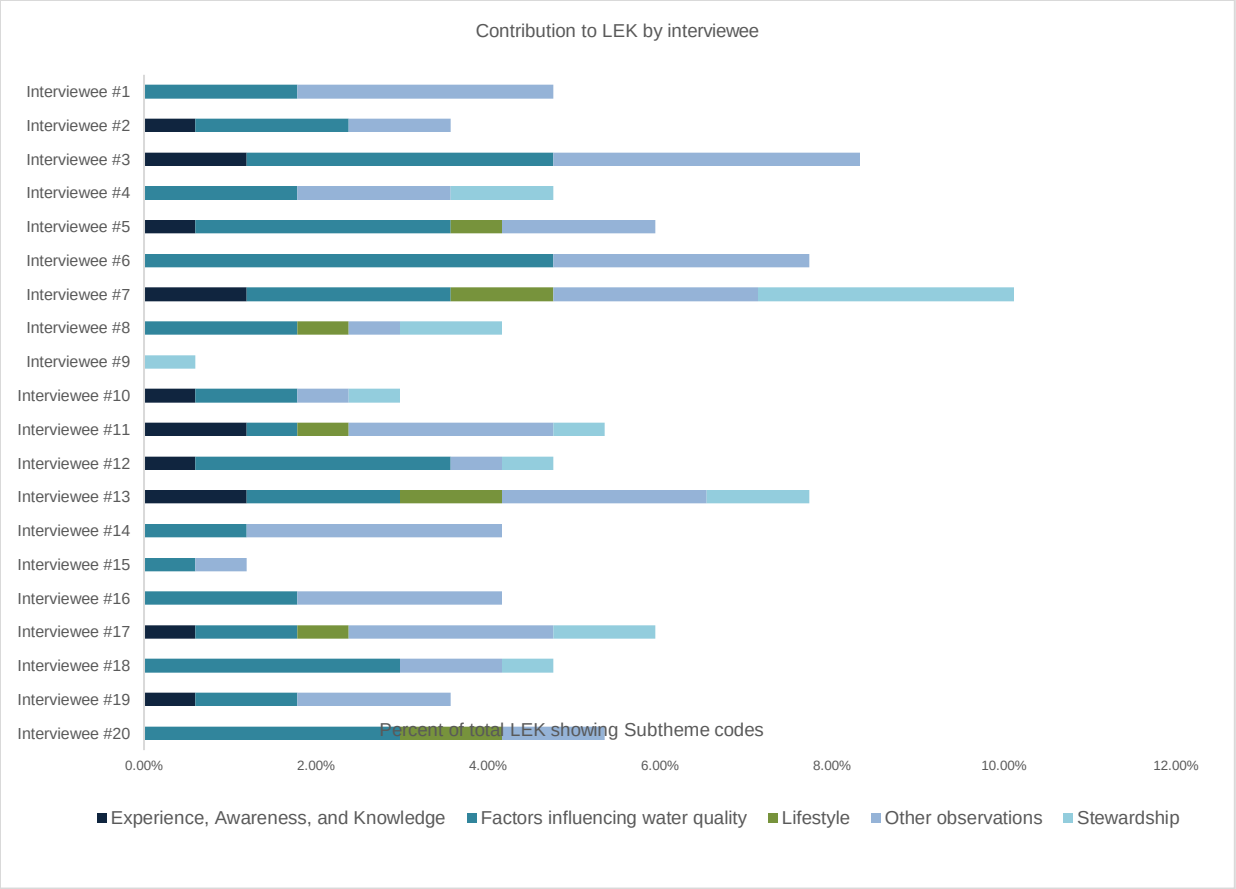

Figure 5. Chart illustrating range of contributions to the major theme of surfer LEK by interviewees including subtheme delineation. The x-axis represents the percentage each interviewee contributed to the major theme of surfer LEK.

Table 8. Factors that influence the formation of LEK in surfers

Primary subthemes	**Explanation**
Experience-Awareness-Knowledge	The idea that experience drives knowledge. Experienced surfers develop LEK from time spent in the water and years of experience. Additionally, awareness of surroundings builds LEK. When surfers are constantly aware and paying attention to their surrounding it makes them more conscious of the ecosystem and environmental changes around them.
Lifestyle	The lifestyle that surfers chose to pursue is conducive to the acquisition of LEK. Given the nature of the sport surfers spend long periods of time in the coastal environment.
Stewardship	Surfers depend on the coastal ecosystem to pursue their sport. Considering that the inherent link between surfing and the natural environment surfers have a sense of stewardship for the ecosystem in which they recreate.
General Environmental Observations	Bearing in mind the amount of time spent in the water surfers notice many things about the water. Some observations are necessary to understand the sport such as swell height, wind, tides, and coastal bathymetry.
Factors Influencing Water Quality	Given that surfers are in the water so frequently; they notice changes in the water quality. Storms often accompany periods of high surf and surfers are aware of factors such as rain and runoff that influence coastal water quality. Surfers are also aware of the anthropogenic impacts on water quality.

Given that local ecological knowledge was the major theme that emerged from our interviews and that presence of LEK was not uniform across surfers, we wanted to understand what types of factors influence LEK in the surfing population. We were interested in what variables or factors could influence surfer LEK. There were many questions that we wanted to answer: Is there an association between LEK and age of the surfer? Is there an association between LEK and the state of residence of a surfer? Are surfers at certain beaches more likely to see something questionable in the water? Does membership in an environmental organization have an impact? Are surfers who participate in riskier surf behavior such has surfing during or after a storm or surfing during an advisory more likely to notice water quality?

We explored this relationship with the use of statistical analysis. Using both the chi-squared test of independence and logistic regression we found a significant association between surfer LEK and membership in an organization, surfing during a storm, surfing during a posted beach water quality advisory, attributing sickness to surfing, and a surfer's experience in number of years surfed. Furthermore, to understand how these significant independent variables can act together to influence presence of surfer LEK we built a regression model to predict the presence of surfer LEK.

Results from our logistic regression model (logit model) suggest that a surfer is more likely to have LEK if they have attributed becoming sick to surfing, if they have surfed during a water quality advisory or are members of a surf or environmental group. Surfers are also more likely to have LEK if they have more experience surfing (measured in years surfed) (Table 9).

Table 9. Logit model of LEK and model predictability

Predictor	***β***	**Wald χ^2**	**p**	**Odds ratio (e^{β})**
Membership	0.703	4.781	0.029*	2.020
Surfing experience (years)	0.034	4.679	0.031*	1.035
Surfing in advisory	1.028	12.152	0.000*	2.795
Sickness due to surfing	1.470	19.944	0.000*	4.348
Predictability of Model				
Overall percent correct (%)			71.9	
R^2 (Cox and Snell)			0.236	

**significant*

RECOMMENDATIONS

This study sheds light on an underrepresented group that is more prone to water quality risks than other beachgoer groups. Though surf research exists, many of the studies are focused on west coast surfers and Australia (Scarfe et al. 2009). To the best of our knowledge this is the first study to focus on the surfing population in the Gulf of Maine and eastern North Atlantic. Over the past several decades the popularity of the surfing has increased throughout all sectors of society, some even calling it the 'new golf' in business circles (Stone 2015, Boddy 2014). Additionally, with better technology in terms of surf gear, specifically wetsuits, surfing is becoming more and more popular in regions with cold water temperatures (Callard 2014, Bodry 2012). Given this, it is important for beach managers and other policy makers to understand this population who not only frequents beaches more often but are also more likely to visit a beach and enter the water during periods of poor water quality. Surfers desire improved access to water quality information so that they are able to make informed decisions about when to enter the water. Furthermore, we show through multiple lines of evidence that surfers in ME and NH are very knowledgeable about the ecosystem in which they recreate. Through the process of in-

depth interviews and intercept surveys on the beaches, we discovered that surfers in our study area know a great deal about the water in which they surf; they hold LEK. Given the fact that surfing itself is such an intertwined relationship between the natural coastal systems and the human environment, it is well reasoned that this population would have a deep understanding about the ecosystem in which they recreate. We show here that surfers are knowledgeable of the ecological factors that are inherently experienced in the sport of surfing. Given their use of the surfsphere, the coastal zone where wave riders recreate, surfers develop greater understanding of a number of environmental factors around them and can provide valuable knowledge to scientists and policy makers. Given our findings, we make the following three recommendations:

Recommendation 1: Recognize surfers as key stakeholders in ME & NH coastal management decisions

Our research shows that surfers in our study area hold a wealth of LEK that can prove valuable to scientists and policy makers. They are aware of the factors that contribute to water quality such as animals and animal waste (Mallin et al. 2000), sewage and WWTPs (McLeellan et a. 2010), and the processes that impact water quality such as rain, runoff, and rivers (Surbeck et al. 2006, Ackerman and Weisberg 2003). There is also literature to support the idea that surfers can be excellent stewards of their environment (Martin 2014, ASBPA 2011, Taylor 2007) as well as keen participants in citizen science (Brewin et al. 2015), building their case for inclusion in beach management decisions. Though the majority of surfers in our study are highly educated (Table 5), this education was not significantly associated with LEK. Instead we find that surfers are more likely to have LEK is they have surfed for longer or hold membership in an environmental or surf group. Thus when interested in including surfers who are knowledgeable of the local environment to act as representatives for the surf community in stakeholder meetings, it would prove beneficial to take into account these two important factors. Engagement with local surf groups or local chapters of the Surfrider Foundation could also be important relationships to foster when attempting to include surfers as stakeholders in our coastal beaches. Additionally, we have learned throughout this research that local surf shops are a hub of surf activity along the coast and could potentially be an important and centralized point of connection when communicating with the surfing population.

Recommendation 2: Ensure all beachgoers have equal access to water quality information

Nearly half of the surfers surveyed in this study indicated that water pollution would impact their decision to surf. Therefore, it is important that water quality information be shared with the surfing community. Surfers overwhelmingly (97%) want to know about water quality at their local surf spot (Table 5) yet this information is not always easily accessible. For instance, during one sampling session we surveyed surfers at a beach where there was an active beach water quality advisory. Of the sample of surfers that were surveyed that day, all reported that they had never surfed during a posted water quality advisory, despite just surfing in one. Another example of surfers not having improved access to water quality information occurred during another sampling session. At this particular beach surfers are only allowed to surf before 11am or after 5pm. There were many surfers in the water that morning but it wasn't until after 11am that a volunteer posted the water quality advisory sign and flag. By that time surfers had already been exposed to the water without the option of making an informed decision. Though not empirical, this anecdotal evidence tells the story that water quality information may not be available or easily accessible to surfers in our region.

Surfers in this study were asked the ways in which they'd like to see water quality information shared with their community. The most preferred method of communication was through surf

forecasting websites (Table 7). Surfers make frequent use of these websites to check for surf conditions, such as wave height, wind direction, and swell interval, at specific surf locales. Partnering with these surf forecasting websites (magicseaweed.com, surfline.com, swellinfo.com) to provide water quality information on the same sites where surfers check the surf forecast would allow surfers better access to water quality information. Surfers also frequent the beach at different times than the typical beachgoer (Bradley and Hancock 2003). They'll go early in the morning, later in the evening, in the shoulder seasons and during the winter months. Therefore, when advisory signs are posted at the beaches it is essential that they are posted at times when all beachgoers have access to them. Further work could be done to ensure that beach advisory signs are available at all points of beach access and in clear view to those entering the beach.

Recommendation 3: Target surfers for educational campaign about health risks of water quality

This study shed light on the incidence of 'risky surf behaviors' in the surfing population of southern ME and NH. These risky behaviors of surfing during or after a storm and surfing during an advisory are related to an increased risk of exposure to water borne pathogens (Harding et al. 2014, Tseng and Jiang 2012, Stone et al 2008). When devising beach management strategies around the issue of water quality it is important to target populations who are more at risk. This is observed in other forms of risk communication, for example air quality alerts from the National Weather Service target individuals such as children, the elderly, and individuals suffering from asthma (NWS 2016). We found that a majority of surfers surfed during storm events and over a third knowingly surfed during a posted beach water quality advisory (Table 5). These results raised a number of questions. Are surfers willingly surfing during a posted advisory knowing the risks of impaired water, do they understand the risks but question the science or policy behind the advisories, or are they unaware of the risks that are associated with surfing in an advisory? Our research did not address these questions, however, future research could investigate the reasons behind the choice to knowingly surf during a water quality advisory. However, until these questions can be answered it is important that information regarding risks of water quality should be made available to the surfing population so that they are at least afforded the opportunity to make informed decision about whether or not to enter the water. Furthermore, though not a majority, over a quarter of surfers surveyed indicated they had attributed surfing to sickness (Table 5). Though not an epidemiological study, this shows that surfers in Maine and New Hampshire are attributing sickness to surfing, demonstrating a need for improved beach management and communication of water quality risk to this vulnerable population.

FINAL THOUGHTS

Surfers are an important, yet often overlooked population of coastal stakeholders. In terms of water quality risk, they are one of the most vulnerable beach-going populations given the length of time spent in the water, frequency of beach visits and water contact, likelihood of water ingestion, and propensity to surf during conditions of poor water quality. Though some surfers may not take into account water quality risk in the decision to go surfing, this study shows that over 95% of surfers in our study are interested in knowing about water quality at their local surf spot. Surfers are a vulnerable population of beach goers and our work demonstrates that there is a heightened need for a broader communication effort to ensure that all beach stakeholders are provided with information concerning risk.

Further investigation into the knowledge around issues of water quality and risk in the surfing community could illuminate reasons why surfers knowingly choose to surf in advisories. New

studies that seek to understand the knowledge of water quality risks in the surfing population could provide useful insights into new methods of risk communications, especially in this region where water quality is an issue of growing concern.

Additionally, our research shows that surfers not only can contribute valuable data to the field of science and are capable of providing useful insights for beach and water quality management, they also hold a wealth of local ecological knowledge. Given that surfers frequent the beaches during times of poor water quality, their contribution of LEK is of value to beach managers and policy makers. LEK is an important factor to include in coastal management decisions and when interested in knowledge pertaining to local water quality experienced surfers are arguably the one best provider of that information.

By providing LEK about water quality at their local surf spots, surfers can act as the 'canaries in the coal mine'. Surfers are at the front lines of the social ecological system that is our coastal environment. The love of the sport and the reliance on a healthy coastal system for the continuation of their form of coastal recreation make surfers ideal candidates not only for the contribution of valuable LEK, but as strong stewards of coastal health. Engaging with this important stakeholder group could prove invaluable to beach managers and their efforts to maintain healthy and clean waters for all.

ADDITIONAL RESOURCES

Data Discovery Center houses data sets from research projects funded by the ME and NH EPSCoR program.
Our full data set can be accessed here: http://ddc-surfers.sr.unh.edu/
We have several journal articles that are currently under review at peer reviewed publications and are happy to share those upon request. Please contact Dr. Shannon Rogers, shrogers@plymouth.edu, with any questions.

AKNOWLEDGEMENTS

We wish to thank all of the surfers who participated in our research, the Plymouth State Center for the Environment, and New England Sustainability Consortium. Funding for this research was provided by the National Science Foundation award #1330641. The findings represent the views of the authors only and not the NSF or its employees.

WORKS CITED

Ackerman, Drew, and Stephen B. Weisberg. 2003. “Relationship between Rainfall and Beach Bacterial Concentrations on Santa Monica Bay Beaches.” *Journal of Water and Health* 1 (2): 85–89.

American Shore and Beach Association (ASBPA). 2011. “Surfers as Coastal Protection Stakeholders.” *ASBPA Science and Technology Committee White Paper*. http://www.asbpa.org/publications/white_papers/Surfing_White_Paper_FINAL.pdf.

Bazeley P. 2007. *Qualitative Data Analysis with NVivo*. 2nd edition. Los Angeles: SAGE Publications. 232 p.

Berg, Bruce. 2004. *Qualitative Research Methods for the Social Sciences*. 5th ed. Boston: Pearson.

Bodry, Catherine. 2012. “The World’s Iciest Surf Spots.” *BBC*, April. http://www.bbc.com/travel/story/20120417-the-worlds-iciest-surf-spots.

Boddy, Ash. 2014. “Why Surfing Is the New Golf.” *The Inertia*, May. http://www.theinertia.com/surf/why-surfing-is-the-new-golf/.

Bradley, Graham, and Chris Hancock. 2003. “Increased Risk of Non-Seasonal and Body Immersion Recreational Marine Bathers Contacting Indicator Microorganisms of Sewage Pollution.” *Marine Pollution Bulletin* 46 (6): 791–94. doi:10.1016/S0025-326X(03)00089-4.

Brewin, Robert J. W., Lee de Mora, Thomas Jackson, Thomas G. Brewin, and Jamie Shutler. 2015. “On the Potential of Surfers to Monitor Environmental Indicators in the Coastal Zone.” *PLOS ONE* 10 (7): e0127706. doi:10.1371/journal.pone.0127706.

Callard, Sarah. 2014. “The Rise of Cold-Water Surfing.” *The Telegraph*, November, sec. activity-and-adventure. http://www.telegraph.co.uk/travel/activity-and-adventure/The-rise-of-cold-water-surfing/.

Cho J, Lee E-H. 2014. “Reducing Confusion about Grounded Theory and Qualitative Content Analysis: Similarities and Differences.” *The Qualitative Report*. 2014. 19(32):1–20.

Dorfman, Mark, and Angela Haren. 2013. “Testing the Waters: A Guide to Water Quality at Vacation Beaches.” National Resource Defence Coucil. https://www.nrdc.org/sites/default/files/ttw2013.pdf.

DPA 2015. “Maine Office of Tourism – Visitor Tracking Research Summer 2015 – Seasonal Topline.” *DPA*. October 2015. https://visitmaine.com/assets/downloads/2015_Summer_Seasonal_Topline.pdf

Dwight, Ryan H., Dean B. Baker, Jan C. Semenza, and Betty H. Olson. 2004. “Health Effects Associated with Recreational Coastal Water Use: Urban versus Rural California.” *American Journal of Public Health* 94 (4): 565–67.

Harding, Anna K., David L. Stone, Andres Cardenas, and Virginia Lesser. 2015. “Risk Behaviors and Self-Reported Illnesses among Pacific Northwest Surfers.” *Journal of Water and Health* 13 (1): 230–42. doi:10.2166/wh.2014.231.

Heaney, Christopher D., Elizabeth Sams, Alfred P. Dufour, Kristen P. Brenner, Richard A. Haugland, Eunice Chern, Steve Wing, et al. 2012. “Fecal Indicators in Sand, Sand Contact, and Risk of Enteric Illness among Beachgoers.” *Epidemiology (Cambridge, Mass.)* 23 (1): 95–106. doi:10.1097/EDE.0b013e31823b504c.

Jones, Steve. 2011. “Microbial pathogens and biotoxins”. *State of the Gulf of Maine Report.* Gulf of Maine Council on the Marine Environment. http://www.gulfofmaine.org/state-of-the-gulf/

Lazarow, N. 2007. “The Value of Coastal Recreational Resources: A Case Study Approach to Examine the Value of Recreational Surfing to Specific Locales.” *Journal of Coastal Research* 50 (50): 12–20.

Lazarow, Neil, Marc L. Miller, and Boyd Blackwell. 2009. “The Value of Recreational Surfing to Society.” *Tourism in Marine Environments* 5 (2-1): 145–58. doi:10.3727/154427308787716749.

Leeworthy, Vernon R., J. Michael Bowker, Justin D. Hospital, and Edward A. Stone. 2005. “Projected Participation in Marine Recreation: 2005 & 2010. National Survey on Recreation and the

Environment 2000. U.S." Silver Spring, MD: Department of Commerce, National Oceanic and Atmospheric Administration, National Ocean Service. http://www.srs.fs.usda.gov/pubs/ja/ja_leeworthy002.pdf.
Leeworthy, Vernon R., and Peter C Wiley. 2001. "Current Participation Patterns in Marine Recreation. National Survey on Recreation and the Environment 2000." US Department of Commerce. National Oceanic and Atmospheric Administration. National Ocean Service.
Maine Healthy Beaches (MHB). 2015. Beach Status and Data. http://www.mainecoastdata.org/public/CurrentBeachStatus.aspx
Mallin, Michael A., Kathleen E. Williams, E. Cartier Esham, and R. Patrick Lowe. 2000. "Effect of Human Development of Bacteriological Water Quality in Coastal Watersheds." *Ecological Applications* 10 (4): 1047–56. doi:10.1890/1051-0761(2000)010[1047:EOHDOB]2.0.CO;2.
Martin, Steven Andrew, and Ilian Assenov. 2014 "Investigating the Importance of Surf Resource Sustainability Indicators: Stakeholder Perspectives for Surf Tourism Planning and Development." *Tourism Planning & Development* 11 (2): 127–48. doi:10.1080/21568316.2013.864990.
McLellan, S. L., S. M. Huse, S. R. Mueller-Spitz, E. N. Andreishcheva, and M. L. Sogin. 2010. "Diversity and Population Structure of Sewage-Derived Microorganisms in Wastewater Treatment Plant Influent." *Environmental Microbiology* 12 (2): 378–92. doi:10.1111/j.1462-2920.2009.02075.x.
National Ocean Economics Program (NOEP). 2014. "State of the US Ocean and Coastal Economies." *Center for the Blue Economy. http://www.oceaneconomics.org/Market/coastal/coastalEcon.asp*
National Weather Service. 2016. "Why Air Quality Is Important." *National Weather Service: Air Quality Safety*. Accessed April 31. http://www.nws.noaa.gov/airquality/index.shtml.
Nelsen, Chad, Linwood Pendleton, and Ryan Vaughn. 2007. "A Socioeconomic Study of Surfers at Trestles Beach." *Shore and Beach* 75 (4).
New Hampshire Department of Environmental Services (NHDES). 2015. Annual Reports for Individual Beaches. OneStop Data Search. http://www2.des.state.nh.us/DESOnestop/BasicSearch.aspx
Noy, Chaim. 2008. "Sampling Knowledge: The Hermeneutics of Snowball Sampling in Qualitative Research." *International Journal of Social Research Methodology* 11 (4): 327–44. doi:10.1080/13645570701401305.
Pendleton, Linwood. 2009. "The Economic Value of Coastal and Estuary Recreation." The Economic and Market Value of Coasts and Estuaries: What's At Stake? Restore America's Estuaries. http://www.habitat.noaa.gov/pdf/economic_and_market_valueofcoasts_and_estuaries.pdf.
Porter, Dwayne, Heath Kelsey, Madilyn Fletcher, Shannon Berry, and Sean Torres. 2010. "Recreational Beach Bacteria Modeling and Forecasting and the Consequences to Public Health and Economic Vitality." *S.C. Water Resources Conference (SCWRC)*, October. http://tigerprints.clemson.edu/scwrc/2010/2010policy/10.
Scarfe, Bradley E., Terry R. Healy, and Hamish G. Rennie. 2009. "Research-Based Surfing Literature for Coastal Management and the Science of Surfing—A Review." *Journal of Coastal Research*, May, 539–57. doi:10.2112/07-0958.1.
Slotkin, Michael H., Karen Chambliss, Alexander R. Vamosi, and Chris Lindo. 2009. "Surf Tourism, Artificial Surfing Reefs, and Environmental Sustainability." In *AIP Conference Proceedings*, 1157:207–20. AIP Publishing. doi:10.1063/1.3208024.
Sporting Goods Manufacturers Association (SGMA). 2012. "2012 Sports, Fitness, and Leisure Activities Topline Participation Report." Sporting Goods Manufacturers Association. http://assets.usta.com/assets/1/15/SGMA_Research_2012_Participation_Topline_Report.pdf.
Stone, David L., Anna K. Harding, Bruce K. Hope, and Samantha Slaughter-Mason. 2008. "Exposure Assessment and Risk of Gastrointestinal Illness among Surfers." *Journal of Toxicology and Environmental Health. Part A* 71 (24): 1603–15. doi:10.1080/15287390802414406.

Stone, Madeline. 2015. “For Tech Entrepreneurs in Silicon Beach, Surfing Is the New Golf.” *Business Insider*, March. http://www.businessinsider.com/silicon-beach-entrepreneurs-bond-over-surfing-2015-2.

Surbeck, Cristiane Q., Sunny C. Jiang, Jong Ho Ahn, and Stanley B. Grant. 2006. “Flow Fingerprinting Fecal Pollution and Suspended Solids in Stormwater Runoff from an Urban Coastal Watershed.” *Environmental Science & Technology* 40 (14): 4435–41. doi:10.1021/es060701h.

Taylor, Bron. 2007. “Surfing into Spirituality and a New, Aquatic Nature Religion.” *Journal of the American Academy of Religion* 75 (4): 923–51. doi:10.1093/jaarel/lfm067

Tseng, Linda Y., and Sunny C. Jiang. 2012. “Comparison of Recreational Health Risks Associated with Surfing and Swimming in Dry Weather and Post-Storm Conditions at Southern California Beaches Using Quantitative Microbial Risk Assessment (QMRA).” *Marine Pollution Bulletin* 64 (5): 912–18. doi:10.1016/j.marpolbul.2012.03.009.

Wagner, G. Scott, Chad Nelse, and Matt Walker. 2011. “A Socioeconomic and Recreational Profile of Surfers in the United States. A Report My Surf-First and the Surfrider Foundation.” The Surfrider Foundation. http://public.surfrider.org/files/surfrider_report_v13.pdf.

Welsh E. 2002. “Dealing with Data: Using NVivo in the Qualitative Data Analysis Process”. *Forum Qualitative Sozialforschung / Forum: Qualitative Social Research* [Internet]. May 31 [cited 2015 Jan 9];3(2). Available from: http://www.qualitative-research.net/index.php/fqs/article/view/865

APPENDIX

APPENDIX A

Emergent themes from interview data. Number of sources, (number of references).

Examples of supporting quotes	Codes	Parent codes	Subthemes	Major theme
"[I'm worried about] the number of dog walkers, don't know how many people are cleaning up after their dogs #2	Shellfish bed closures 1, (1) Maggots 1, (2) Animals and animal waste 3, (4) Dogs and dog waste 4, (4)	Animals and animal waste 6, (11)	Factors influencing water quality 19, (90)	**Evidence of local ecological knowledge** 20, (207)
"A few people have gotten sick in Ogunquit after strong rains. We all are mindful after strong rains. OOB is safest after strong rains because some reason the way the Saco river current comes out after a strong rain." #6 "On any big rain the water dumping out from all of the inland waterways; river, streams, marshes, everything changes the water quality." #12 "Pretty much any river mouth that you surf, after a storm especially, [will have poor water quality]. A couple days ago after the storm I could smell it here." #18	Fresh water 3, (6) Storms 6, (9) Runoff 8, (15) River, rivermouths 8, (15) Rain 11, (18)	Processes impacting water quality 18, (63)		
"We talk about the capacity for waste treatment. It just depends where the outflow is and how the currents are blowing, I've seen corn in the water in OOB and I'm like, eh, I'm getting out, cause you know how it is this corn." #6 "Sewage, it's a concern, I don't like being out there when it's that bad." #1	Sewage, WWTP 11, (16)	Sewage, WWTP 11, (16)		
"I worry about runoff from farms." #16 I have smelled a kind of petroleum product smell at Higgins, there is a lot of agriculture on the banks of the river that comes down #6	Boating industry 1, (3) Population 3, (5) Fertilizers, other chemicals 6, (6)	Other anthropogenic influences 8, (14)	General environmental observations 18, (73	
there's tons of runoff on an outgoing tide, so much sometimes that you can taste that's its different on a certain day #13 it stunk for a long time until the tide shifted and started going back in and then we got a break, #3	Currents, winds 3, (3) Tides 5, (8)	Environmental conditions 6, (11)		
"After big storms the color, the smell, and how you feel when you get out sometimes. Like, the earaches and the sinus and throat-nasal stuff that you get from it." #19 "We get super foul water at Higgins. When I was surfing the last storm at a rivermouth [there was] 2-3" of this brown foam on the surface that smelled like toilet." #3	Foam, scum, unusuals 2, (3) Taste 3, (4) Water color and appearance 8, (9) Smells 7, (15)	Sensory observations 14, (40)		
"Yeah there's multiple times this summer where I've done surf lessons and picked up trash out of the water." #15 "There's trash in the water and everything. Especially in the summer. When you walk down the beach and look at the seaweed piles it's just trash all over it. #14	Debris 1, (1) Pollution 1, (2) Trash 5, (6)	Trash and debris 7, (8)		

Cont. Emergent themes from interview data. Number of sources, (number of references)

Examples of supporting quotes	Codes	Parent codes	Subthemes	Major theme
"This sport has given me a huge interest in the coastline, the beach, property development and just a respect of nature really, especially where water is so dangerous you have to have respect for it." #17 "[Surfing] demands having a rhythm in the ocean and a respect for the ocean and stuff like that." #7 "The ocean's definitely not doing as well as it could and the environment itself is really becoming sick" #9	'The Ocean', 'Mother Nature' 5, (9) Stewardship 8, (9)	Stewardship 10, (19)	Stewardship 10, (19)	**Evidence of local ecological knowledge** 20, (207)
"The thing about surfing that's cool is it's not just a sport, it's an all-encompassing lifestyle, it's the only thing that's taken hold in my life, as much as anything else has. It's a super health activity, hobby, lifestyle; it is all encompassing. A lot comes with it. And comes with it a responsibility that comes with it just by doing it and I'm aware of that. It's tricky but it's fun. #17 "We go out there to enjoy it, to enjoy nature." #13 "I think people surf because it's an escape from reality, but you know once you're out in the water you leave all your emails and all that behind you're just worrying about catching the next wave. It's so nice to be able to get in the water, catch waves and leave all the land stuff behind." #7	Lifestyle 7, (10)	Lifestyle 7, (10)	Lifestyle 7, (10)	
"So being at the beach a lot, you're aware of your surroundings a lot, most people are aware of their surroundings, but when you're surfing you're immersed in your environment and you love it." #17 "It's just because they weren't knowledgeable, they're just not knowledgeable of the ocean. I think the cool thing about surfing is that you get that, which makes you a more competent person in the water." #7 "Being a surfer the majority of my life, you just start to pick up on things and you know, old timers pass on knowledge and stuff like that. " #10 "Just being a wise old man, I am 64 this will be my 51st year of surfing 51 years is that possible? Yeah, so I am you know if you did anything in your life, if you were a gardener, if you did it for 50 years you would have it down I would think. So it's just learning and seeing what's out there and experiencing, I have surfed up and down the east coast, so just experience." #11 "[Water quality would] absolutely impact decision to surf now that I'm older and wiser, not when I was younger. If water is all nasty, I won't go out." #19	Awareness and knowledge of surroundings 5, (5) Experience drives knowledge 8, (10)	Experience, awareness, Knowledge 10, (15)	Experience, awareness, knowledge 10, (15)	