Types of Forecast and Weather-Related Information Used among Tourism Businesses in Coastal North Carolina

Emily P. Ayscue
- Purpose
- Methods
- Analysis/Results
  - User Profile
- Implications
Purpose

➢ Create a NC Coastal Tourism Business user profile of climate and weather information

➢ Why?
  ✦ there is still a need to investigate into the end-user needs of specific industries including tourism.
  ✦ Some tourism environments have received noticeably little outreach from the global climate-monitoring network including coastal destinations (Curtis et al. 2011).
Research Questions

- What types of forecasts do tourism business owners use the most and for what purposes?
- What types of forecasts do tourism business owners use the least and why?
- What impact does business size, business age and business type have on perceived dependency on climate and weather, forecast usefulness and forecast value?
Study Area

(North Carolina Department of Cultural Resources 2013)
Sample

- Database of 3391 tourism businesses in 20 NC CAMA counties included:
  - Business name
  - Person of contact
  - Their position in the company
  - Contact information
  - US Census Bureau North American Industry Classification System (NAICS) code
Business Types

- Climate and weather dependent coastal tourism businesses identified (Curtis et al. 2009, Gamble & Leonard 2005)
- Final Categories adapted (Roehl 1998, p.63) and created:
  - Agriculture (i.e. charter boats, a pier)
  - Outdoor Recreation (i.e. golf clubs, campgrounds)
  - Accommodations (i.e. cottages, inns)
  - Food Services (i.e. chain and local restaurants, grills)
  - Parks and Heritage (i.e. historical gardens)
  - Other (i.e. historical gardens, state parks)
Sampling Procedure

- Database cross-referenced with Chamber of Commerce websites as well as the internet and updated accordingly
- 1089 businesses were contacted with 177 completed surveys = 16.3% response rate
Survey Design

- Online survey through Qualtrics September 2013-January 2014
- Pilot test list created with NC tourism business owners/managers located outside the study area
Analysis

- Descriptives
- Factor Analysis
- ANOVA
- MANOVA
Variables

 gevThông tin

 ➢ Independent Variables:
  ➢ Business Size: Microbusiness, Small Business (SBA 2013)
  ➢ Business Age: Young, Middle-Aged, Old (Robb 2002)

 ➢ Dependent Variables:
  ➢ Forecast value (Murphy 1993)
  ➢ Forecast Usefulness (Klopper et al. 2006; Roncolli et al. 2009)
  ➢ Perceived Dependency on Climate and Weather
General Descriptives of Respondents

- Majority either the business owner or manager
- Almost all had some level of college education
- Most represented a small business
- Most represented old businesses
- Almost all indicated some level of dependency on climate and weather
Perceived Climate and Weather Dependency of All Respondents

- Very Dependent: 38%
- Somewhat Dependent: 34%
- Dependent: 21%
- Not Dependent: 6%
- Not Sure: 1%
Sources of Climate and Weather Information

- Local New Station
- Website
- Smartphone
- Other

- None: 4%
- One Source: 52%
- Two Sources: 15%
- Three Sources: 15%
- Four Sources: 14%

Internet Sources
- Wunderground.com
- FryingPanTower.com
- Reefcast.com
- Weather.com
- AccuWeather.com
- NWS.gov

Local News Sources
- Local radio stations
- Chamber-of-commerce emails
- Island word-of-mouth!

Unique Comments
- “I stick my head out the window.”
- “Combination of several local and national resources. NOT weather channel”
Types of Forecasts Used

Other Types of Forecasts

- Wunderground.com
- Offshore Wx Reports
- Hurricane Forecasts (3 respondents)
- Radar
- Weather in Motion
- Marine Weather Forecast

“Use all depending on the tides, road conditions, ferry wind limits and if in busy part of the season”

“We look at the size of our beach before storms to decide if we need to bring in sand, since the nourishment we have not done this. We compare the size of the beach and the sand blowing to hourly weather forecast to add sand fence when needed.”
How Hourly Forecasts are Used

“Go or no go for charter”
“Inventory control”
“Golf is an outdoor game. I keep golfers advised of weather conditions.”
“Whether to keep employees on the job site or not”
“Showing properties”
“Logistics such as windstorms coming up and needing to pull pool umbrellas, etc.”
“Guest questions”
“If a bad storm is coming, we need to take care of items outside of our business (ie: patio furniture, rocking chairs, etc.)”

Outdoor Event Planning (5 respondents)
“Whether or not to set up outdoor displays”
“To set up wedding on beach or inside”
# Hourly Forecast Use by Business Type

<table>
<thead>
<tr>
<th>Business Type</th>
<th>Operational Decision-Making</th>
<th>Risk Management</th>
<th>Marketing</th>
<th>Investment Decisions</th>
<th>Sustainability</th>
<th>Landscaping</th>
<th>Finance and Budgeting</th>
<th>Other</th>
<th>Total Usage Score by Business Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>24%</td>
<td>43%</td>
<td>9%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>14%</td>
<td>14%</td>
<td>21</td>
</tr>
<tr>
<td>Outdoor Recreation</td>
<td>34%</td>
<td>36%</td>
<td>11%</td>
<td>2%</td>
<td>2%</td>
<td>2%</td>
<td>9%</td>
<td>4%</td>
<td>47</td>
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<tr>
<td>Accommodations</td>
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<td>30%</td>
<td>22%</td>
<td>4%</td>
<td>0%</td>
<td>7%</td>
<td>7%</td>
<td>15%</td>
<td>27</td>
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<tr>
<td>Food Services</td>
<td>46%</td>
<td>20%</td>
<td>14%</td>
<td>2%</td>
<td>2%</td>
<td>4%</td>
<td>10%</td>
<td>2%</td>
<td>50</td>
</tr>
<tr>
<td>Parks and Heritage</td>
<td>29%</td>
<td>29%</td>
<td>12%</td>
<td>0%</td>
<td>0%</td>
<td>6%</td>
<td>6%</td>
<td>18%</td>
<td>17</td>
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<tr>
<td>Other</td>
<td>27%</td>
<td>37%</td>
<td>0%</td>
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<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>36%</td>
<td>11</td>
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<tr>
<td>Total Times for a Specific Use</td>
<td>56</td>
<td>53</td>
<td>22</td>
<td>3</td>
<td>2</td>
<td>6</td>
<td>14</td>
<td>17</td>
<td></td>
</tr>
</tbody>
</table>
### Non-Use of Hourly Forecasts by Business Type

<table>
<thead>
<tr>
<th>Business Type</th>
<th>Did Not Know They Were Available</th>
<th>Too Technical</th>
<th>Not Important</th>
<th>Other Reason</th>
<th>Total not Using Hourly Forecasts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>9%</td>
<td>0%</td>
<td>55%</td>
<td>36%</td>
<td>10</td>
</tr>
<tr>
<td>Outdoor Recreation</td>
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<td>9%</td>
<td>73%</td>
<td>18%</td>
<td>11</td>
</tr>
<tr>
<td>Accommodations</td>
<td>0%</td>
<td>3%</td>
<td>74%</td>
<td>22%</td>
<td>27</td>
</tr>
<tr>
<td>Food Services</td>
<td>4%</td>
<td>4%</td>
<td>66%</td>
<td>26%</td>
<td>27</td>
</tr>
<tr>
<td>Parks and Heritage</td>
<td>0%</td>
<td>17%</td>
<td>66%</td>
<td>17%</td>
<td>5</td>
</tr>
<tr>
<td>Other</td>
<td>0%</td>
<td>0%</td>
<td>60%</td>
<td>40%</td>
<td>5</td>
</tr>
</tbody>
</table>

**Other Reasons Why Hourly Forecasts are Not Used**

- Not enough time to make changes to our plans (2 respondents)
- “Weather is usually unpredictable”
- “Planning is longer ranged”
- “Do use if looking at wind conditions for ferries”
- “Reservations are made months in advance. Need weekly forecast to appease people calling just ahead of arrival that want to”
- “Usually too busy serving the patrons to check hourly”
- “Travelers to our area travel an average 1-5 hrs. to get to our business...we find hourly forecasts change often”
- “Only Used during periods of bad weather”
How Daily Forecasts are Used

- Operational Decision Making
- Risk Management
- Marketing
- Sustainability Practices
- Investment Decisions
- Landscaping
- Finance and Budgeting
- Other

Other Ways Daily Forecasts are Used

- Special Event Cancellation Notices, or determine late/early start/end times (3 respondents)
- “Scheduling out of building procedures”
- “Used when conversing with potential and current vacation renters”
- “Whether to work or not - outside construction”
- “Number of walk-ins”
- “people eat rain or shine”
- “Menu choices, quantity of prep”
- “Outside dining”
- “Outdoor entertainment”
- “State Park”
- “Educational programs / field trips”
- “Whether or not to set up outdoor displays”
### Daily Forecast Use by Business Type

<table>
<thead>
<tr>
<th>Business Type</th>
<th>Operational Decision-Making</th>
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<th>Other</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>39%</td>
<td>39%</td>
<td>5%</td>
<td>2%</td>
<td>0%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>41</td>
</tr>
<tr>
<td>Outdoor Recreation</td>
<td>34%</td>
<td>34%</td>
<td>10%</td>
<td>2%</td>
<td>4%</td>
<td>2%</td>
<td>14%</td>
<td>0%</td>
<td>50</td>
</tr>
<tr>
<td>Accommodations</td>
<td>25%</td>
<td>28%</td>
<td>19%</td>
<td>0%</td>
<td>0%</td>
<td>6%</td>
<td>11%</td>
<td>11%</td>
<td>36</td>
</tr>
<tr>
<td>Food Services</td>
<td>40%</td>
<td>23%</td>
<td>10%</td>
<td>2%</td>
<td>2%</td>
<td>2%</td>
<td>12%</td>
<td>9%</td>
<td>57</td>
</tr>
<tr>
<td>Parks and Heritage</td>
<td>32%</td>
<td>26%</td>
<td>11%</td>
<td>0%</td>
<td>5%</td>
<td>5%</td>
<td>0%</td>
<td>21%</td>
<td>19</td>
</tr>
<tr>
<td>Other</td>
<td>30%</td>
<td>20%</td>
<td>10%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>10%</td>
<td>30%</td>
<td>10</td>
</tr>
<tr>
<td>Total Times for a Specific Uses</td>
<td>74</td>
<td>63</td>
<td>23</td>
<td>3</td>
<td>4</td>
<td>7</td>
<td>21</td>
<td>18</td>
<td></td>
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</tbody>
</table>
## Non-Use of Daily Forecasts by Business Type

<table>
<thead>
<tr>
<th></th>
<th>Did Not Know They Were Available</th>
<th>Too Technical</th>
<th>Not Important</th>
<th>Other Reason</th>
<th>Total Not Using Daily Forecasts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>100%</td>
<td>1</td>
</tr>
<tr>
<td>Outdoor Recreation</td>
<td>0%</td>
<td>18%</td>
<td>27%</td>
<td>55%</td>
<td>11</td>
</tr>
<tr>
<td>Accommodations</td>
<td>0%</td>
<td>5%</td>
<td>57%</td>
<td>38%</td>
<td>21</td>
</tr>
<tr>
<td>Food Services</td>
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<td>0%</td>
<td>80%</td>
<td>20%</td>
<td>22</td>
</tr>
<tr>
<td>Parks and Heritage</td>
<td>0%</td>
<td>33%</td>
<td>67%</td>
<td>0%</td>
<td>3</td>
</tr>
<tr>
<td>Other</td>
<td>0%</td>
<td>17%</td>
<td>33%</td>
<td>50%</td>
<td>6</td>
</tr>
</tbody>
</table>

### Other Reasons Why Daily Forecasts are Not Used

- “Not enough detail”
- “Weather is unpredictable”
- “Not precise enough”
- “Can’t make the weather different”
- “Too short term”
- “Not always important, used to plan outdoor events & staffing during poor weather”
How Weekly Forecasts are Used

### Operational Decision Making

- Risk Management
- Marketing
- Sustainability Practice
- Investment Decisions
- Landscaping
- Finance and Budgeting
- Other

### Other Ways Weekly Forecasts are Used

- Customer education/Guest Info (3 respondents)
- Special Events cancellation decisions (3 respondents)
- “During the shoulder seasons, I use weekly forecast to determine which days to operate”
- “People eat rain or shine”
- “Stock and inventories”
- “Scheduling out of building procedures”
- “Tournaments may be rescheduled due to a rainy forecast.”
- “To predict occupancy”
- “Specials on accommodations or storm related needs”
- “Planning”
- “Weather affects our guests decisions to come or stay home”
- “Trying to ward off cancellations at the last minute when people think it might rain a day during their vacation”
- “What days to go to the beach”
- “Outside dining”
- “Scheduling outdoor group activities”
### Weekly Forecast Use by Business Type

<table>
<thead>
<tr>
<th></th>
<th>Operational Decision-Making</th>
<th>Risk Management</th>
<th>Marketing</th>
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<th>Other</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>15%</td>
<td>20%</td>
<td>15%</td>
<td>28%</td>
<td>20%</td>
<td>11%</td>
<td>17%</td>
<td>21%</td>
<td>43</td>
</tr>
<tr>
<td>Outdoor Recreation</td>
<td>32%</td>
<td>28%</td>
<td>16%</td>
<td>4%</td>
<td>2%</td>
<td>4%</td>
<td>12%</td>
<td>2%</td>
<td>50</td>
</tr>
<tr>
<td>Accommodations</td>
<td>27%</td>
<td>24%</td>
<td>20%</td>
<td>2%</td>
<td>0%</td>
<td>5%</td>
<td>9%</td>
<td>13%</td>
<td>55</td>
</tr>
<tr>
<td>Food Services</td>
<td>42%</td>
<td>16%</td>
<td>15%</td>
<td>3%</td>
<td>3%</td>
<td>1%</td>
<td>17%</td>
<td>3%</td>
<td>69</td>
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<tr>
<td>Parks and Heritage</td>
<td>29%</td>
<td>29%</td>
<td>14%</td>
<td>0%</td>
<td>5%</td>
<td>9%</td>
<td>0%</td>
<td>14%</td>
<td>21</td>
</tr>
<tr>
<td>Other</td>
<td>25%</td>
<td>33%</td>
<td>8%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>17%</td>
<td>17%</td>
<td>12</td>
</tr>
<tr>
<td><strong>Total Times for a Specific Uses</strong></td>
<td><strong>81</strong></td>
<td><strong>60</strong></td>
<td><strong>39</strong></td>
<td><strong>7</strong></td>
<td><strong>5</strong></td>
<td><strong>9</strong></td>
<td><strong>30</strong></td>
<td><strong>19</strong></td>
<td></td>
</tr>
</tbody>
</table>
Non-Use of Weekly Forecasts by Business Type

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<tr>
<th></th>
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<th>Other Reason</th>
<th>Total not Using Weekly Forecasts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>0%</td>
<td>0%</td>
<td>20%</td>
<td>80%</td>
<td>5</td>
</tr>
<tr>
<td>Outdoor Recreation</td>
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<td>8%</td>
<td>25%</td>
<td>67%</td>
<td>12</td>
</tr>
<tr>
<td>Accommodations</td>
<td>0%</td>
<td>0%</td>
<td>27%</td>
<td>36%</td>
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</tr>
<tr>
<td>Food Services</td>
<td>0%</td>
<td>11%</td>
<td>61%</td>
<td>28%</td>
<td>18</td>
</tr>
<tr>
<td>Parks and Heritage</td>
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<td>33%</td>
<td>67%</td>
<td>0%</td>
<td>2</td>
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<tr>
<td>Other</td>
<td>0%</td>
<td>0%</td>
<td>50%</td>
<td>50%</td>
<td>6</td>
</tr>
</tbody>
</table>

Other Reasons Why Weekly Forecasts are Not Used

- Unreliable (5 respondents)
- Not enough detail (3 respondents)
- Too short term (2 respondents)
- Not applicable (3 respondents)
Factor Analysis

**Forecast Value**

- Short-Range Value ($\alpha = .738$)
- Long-Range Value ($\alpha = .738$)

**Forecast Usefulness**

- Short-Range Usefulness ($\alpha = .876$)
- Long-Range Usefulness ($\alpha = .735$)
Statistically significant difference in levels of Perceived Climate and Weather Dependency based on Business type F (5, 171) = 10.785; p < .05.

<table>
<thead>
<tr>
<th>Perceived Dependency on Climate and Weather</th>
<th>Agriculture (M = 4.52 ± 1.0)</th>
<th>Outdoor Recreation (M = 4.55 ± .80)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodations (M = 3.15 ± 1.5, p = .001)</td>
<td>&lt;</td>
<td></td>
</tr>
<tr>
<td>Food Services (M = 2.91 ± 1.3, p = .000)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other (M = 3.08 ± 1.5, p = .016)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Accommodations (M = 3.15 ± 1.5, p = .00)
Food Services (M = 2.91 ± 1.3, p = .00)
Parks and Heritage (M = 3.29 ± 1.5, p = .026)
Other (M = 3.08 ± 1.5, p = .007)
MANOVA

Statistically significant difference in forecast value based on business type F (15, 466.436) = 1.996; p = .014; Wilk’s λ = .842; partial η² = .056; power = .940.

Significant univariate main effects for business types was obtained for short-range value F (5, 171) = 4.385; p = .001; partial η² = .114; power = .964.

Short-Range Forecast Value

Accommodations (M = 1.98 + 1.0, p = .001) < Agriculture (M = 3.17 + 1.0)

Accommodations (M = 1.98 + 1.0, p = .034) < Outdoor Recreation (M = 2.79 + 1.3)
### User Profile

<table>
<thead>
<tr>
<th>Industry</th>
<th>Average Education Level</th>
<th>Average Business Size</th>
<th>Average Business Age</th>
<th>Average Perceived Dependency</th>
<th>Most Useful Forecast</th>
<th>Most Popular Use of This Forecast Type</th>
<th>Least Useful Forecast</th>
<th>Most Valuable Forecast</th>
<th>Least Valuable Forecast</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>4-Years of College</td>
<td>Small Business</td>
<td>Middle-Aged</td>
<td>Very Dependent</td>
<td>Weekly</td>
<td>Operational Decision-Making &amp; Risk Management</td>
<td>Seasonal</td>
<td>Daily</td>
<td>Seasonal</td>
</tr>
<tr>
<td>Outdoor Recreation</td>
<td>Some College/No Degree</td>
<td>Small Business</td>
<td>Middle-Aged</td>
<td>Very Dependent</td>
<td>Daily and Weekly</td>
<td>Operational Decision-Making</td>
<td>Seasonal</td>
<td>Daily</td>
<td>Seasonal</td>
</tr>
<tr>
<td>Food Services</td>
<td>Some College/No Degree</td>
<td>Small Business</td>
<td>Middle-Aged</td>
<td>Not Sure</td>
<td>Weekly</td>
<td>Operational Decision-Making</td>
<td>Seasonal</td>
<td>Weekly</td>
<td>Monthly</td>
</tr>
<tr>
<td>Parks and Heritage</td>
<td>Post-Graduate</td>
<td>Small Business</td>
<td>Middle-Aged</td>
<td>Not Sure</td>
<td>Weekly</td>
<td>Operational Decision-Making &amp; Risk Management</td>
<td>Seasonal</td>
<td>Daily</td>
<td>Seasonal</td>
</tr>
<tr>
<td>Accommodations</td>
<td>Some College/No Degree</td>
<td>Small Business</td>
<td>Middle-Aged</td>
<td>Not Sure</td>
<td>Weekly</td>
<td>Operational Decision-Making</td>
<td>Monthly</td>
<td>Weekly</td>
<td>Seasonal</td>
</tr>
<tr>
<td>Other</td>
<td>Some College/No Degree</td>
<td>Small Business</td>
<td>Old</td>
<td>Not Sure</td>
<td>Weekly</td>
<td>Risk Management</td>
<td>Monthly</td>
<td>Weekly</td>
<td>Monthly and Seasonal</td>
</tr>
</tbody>
</table>
Discussion

- Forecast usefulness partly predicted by value and relevance/importance (Ziervogel & Downing 2004) to the business.
- Other factors that seem to impact forecast use include:
  - perceived dependency on climate and weather
  - forecast accuracy (Hartmann et al. 2002)
  - forecast reliability
  - lack of detail in forecasts
    - cloud cover predictions could help develop a likelihood scale for sunshine or cloud cover.
- Marketing strategies can be long or short-term
Discussion

- Forecasts can be a barrier to business
- Indicated forecast unimportance may relate to:
  - uncertainty in climate and weather dependency
  - Habitual use of climate and weather forecast distorting actual extent of use
- Thought that alternate sources of climate and weather data would entail wind, flora and fauna as forecast indicators (Roncolli 2009).
- Technical language is a suggested barrier to forecast use (Ziervogel and Downing 2004).
- Potential users may not even know a forecast is available (Ziervogel & Downing 2004)
Implications

- Partnerships between indoor and outdoor businesses in the event of adverse weather
- Outreach to sectors uncertain about their climate and weather dependency through targeted resources
- Forecasts outside of precipitation and temperature are also useful.
THANK YOU

Dr. Scott Curtis: Chair
Dr. Huili Hao: Committee Member
Dr. Burrell Montz: Committee Member
Questions?