VALUING PLACE THROUGH RESOURCES:

INCORPORATING MULTI-DIMENSIONAL VALUES IN DECISION PROCESSES

A Dissertation

by

ERIC KARSTEN BARDENHAGEN

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

May 2011

Major Subject: Urban and Regional Sciences

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Approved by:

Chair of Committee,	George O. Rogers
Committee Members,	Forster O. Ndubisi
	Jon E. Rodiek
	Ronald A. Kaiser
Head of Department,	Forster O. Ndubisi

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ABSTRACT

Valuing Place through Resources: Incorporating Multi-dimensional Values in Decision Processes. (May 2011)

Eric Karsten Bardenhagen, B.A., Valparaiso University; MLA, Texas A&M University
Chair of Advisory Committee: Dr. George O. Rogers

Including values for non-market natural and cultural resources in decision processes present challenges to resource managers. This dissertation uses a place-based resource-driven approach to assess the values associated with non-market resources in a national park. Existing valuation methods produce reliable measures for market resources, but are criticized for their inability to express values beyond uni-dimensional monetary values. Expressed values of park visitors for the natural and cultural resources within a national park are analyzed in order to quantitatively depict multiple dimensions of value for each resource relative to all others. Resulting abstract value-spaces are used to depict stakeholder group values and illustrate shared and unique values that can aid in decision processes. Value spaces are also used to examine the effects of resource losses on expressed values. These are observed through potential impact scenarios and can inform long-range planning and adaptation efforts.

This research finds that a two-dimensional value space, representing aesthetic and functional qualities of resources can be formed to depict the values for included resources relative to one another. A core set of resources commonly valued by all major stakeholder groups is easily identifiable. Direct comparisons of value spaces for groups provides clear distinctions between group values for specific resources. Finally, subjecting value spaces to resource loss scenarios, indicates consistent changes in values while patterns of resource values remain stable, which can be used in participation and in conflict resolution efforts. These findings provide previously unobservable insight

regarding the similarities and differences of group values and value stability as resource managers seek public input, resolve conflicts and craft long-range resource plans.

This methodology establishes a basic framework for assessing relative resource values, non-monetarily, and along multiple dimensions. Value spaces can be used to proactively inform planning and decision processes from initial problem identification, establishment of alternative solutions and through assessments of implementation.

And, by the way, who estimates the value of the crop which nature yields in the still wilder fields unimproved by man? The crop of English hay is carefully weighed, the moisture calculated, the silicates and the potash; but in all dells and pond-holes in the woods and pastures and swamps grows a rich and various crop only unreaped by man.

Thoreau, Walden, The Bean Field (1950)

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Finally, eternal thanks to my wife Rebecca for her support and willingness to participate in this grand experiment, to my children, and to all of my extended family for their constant support and encouragement.

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CHAPTER I

INTRODUCTION

Environmental and resource decision makers often face challenges when including values for non-market natural and cultural resources in decision processes. A variety of valuation methods are available, but suffer from a series of concerns. For example they typically use a monetary basis; they do not capture multiple dimensions of value; they are typically reactive rather than proactive; and all of these approaches lead to failures in adequately capturing non-market values. In order to more effectively incorporate the values of non-market resources into decision processes, a method is needed to assimilate multiple dimensions of value for resources and to express these non-monetarily for use prior to and during planning and decision processes.

This dissertation will use a *place-based resource-driven* valuation approach to measure the multi-dimensional value structures for resources, relative to one another, within a national park. Specifically, it will examine the shared and unique value structures between multiple user groups. It will also use a scenario-based approach to examine value structure changes resulting from resource loss. Observations of these effects will be used to provide insight into decision process approaches that can be used to proactively engage the public and other stakeholders in long range planning and policy decisions.

The significance of a place-based resource-driven approach is in its ability to meaningfully express the importance of natural and cultural resources that are often valued highly, but difficult to measure. Further, planning and policy decisions that affect resources are often in *response* to alternatives that do not include a broad understanding of the value of these non-market resources (Bingham et al., 1995; Loomis, 2000; NRC, 2005). This is in contrast to one of the primary goals of planning to incorporate

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This dissertation follows the style of *Ecological Economics*.

proactively, a community's values in plans, policies and decisions, establishing the importance of including values held by stakeholders within decision processes (Brody et al., 2003). There are, however, many challenges to be addressed even if significant public input is employed. As Friedmann (1987) discusses, planning and decision processes "…face certain common methodological problems, such as making forecasts, obtaining appropriate forms of citizen participation, and constructing models useful in exploring alternative action-strategies." Yet planners must confront these challenges and consistently seek methods to present technical knowledge in ways to effectively inform public actions (Friedmann, 1987).

One aspect of these needs is the inclusion of values for non-market resources in planning decision processes in order to better inform both decision makers and the public (Bingham et al., 1995; de Groot, 2006). These values can be combined with other inputs such as expert opinions, economic, political, and geophysical information to both proactively and more holistically assess the positive or negative impacts of decisions on resources. Combining greater representations of these non-market values provide decision makers and managers a more complete view of the comprehensive value, including aesthetic value, of the resources affected.

The approach to establish place-based resource-driven valuation is through a preference survey distributed to multiple interested individuals and stakeholder groups of Cape Lookout National Seashore in North Carolina. This survey uses preference data, based on ratings along multiple value dimensions, for significant resources within the park. These data are then analyzed using factor analysis to create standardized abstract representations of values for multiple resources, relative to one another, in a value space based on factor scores. Using this value space as a basis, differences among value spaces for self-reported group affiliations and resulting from resource change scenarios are examined.

The original concept of the place-based resource-driven approach and creation of abstract value spaces is described in the paper Natural and Cultural Resource Valuation: A Place-Based, Resource-Driven Approach by Rogers and Bardenhagen (2010). While this paper concluded with the creation of a single abstract value space and discussion of its possible implications, it is the intent of this dissertation is to extend this method in order to examine differences in value structures between stakeholder groups and as a result of resource change. Brief descriptions of the methods and findings of Rogers and Bardenhagen (2010) will be included in this dissertation to serve as a background reference to the methods and findings of this new work.

This dissertation will be presented in the following manner: A review of the literature will be drawn primarily from four areas. First, a short exploration of the literature centered on environmental values describes the bases for our value systems and explains how multiple value dimensions for natural and cultural resources are held. Second, the literature in ecological economics describes the available methods to assess resource values, dominated by willingness-to-pay measures that typically assess a single dimension of value, most often monetary. Third, the environmental decision process literature describes decision processes that institutions typically use such as cost-benefit analysis and NEPA processes. Fourth, literature dealing with group formation, specifically in respect to recreation specialization and its effects on attitudes and perceptions of resources will be explored.

Theory will be presented in a manner that outlines two basic research constructs. The first addresses the differences in values that can be expected when differing groups are compared. Aspects related to group formation and function, specialization, attitudes and place attachment will be drawn upon to provide a context for expectations of group differences and implications of these differences. The second addresses changes in available resources, due to potential impacts, that are expected to change value spaces. Discussion related to resource uniqueness, interconnections and ties to local history and cultures will be drawn upon as expectations of value space changes and implications are presented.

A set of methodologies, initially based on those outlined in Rogers and Bardenhagen (2010), will then be presented. These will first briefly describe the creation of a value space from user preference data. Next, stakeholder groups will be described and methods to observe difference among group values will be outlined. Finally, resource change (loss) scenarios will be discussed and methods to observe changes in resulting value structures will be described.

Findings and discussion will be similarly structured beginning with a presentation of findings and discussion of an initial value space for all survey respondents. Following that, detailed findings and discussion will then be presented for differences among groups and as a result of changes in resources.

Finally, conclusions will outline the implications for planners and resource managers not only in the context of national parks, preserves and open spaces, but also for community planners attempting to balance the multiple needs of residents and the natural and cultural resources within their community. Place-based resource-driven valuation will be discussed as a way to inform decision makers well in advance of critical problem identification and alternatives creation stages of a decision process. Lastly, the opportunities and challenges of using this method in venues outside of national parks and at various scales will be discussed.

The existing literature suggests that most resource management and decision processes are based on single dimension values and reactive to potential future outcomes. Unfortunately, any time a resource is valued in only one dimension, when multiple dimensions are present, the resource is undervalued; and as a consequence it is likely to result in overuse. Thus a more comprehensive approach to decision information must be used; one that more fully represents the diverse breadth of resources in a community, that incorporates multiple dimensions of values for those resources, and that includes direct input on from a broad range of available stakeholders (Rogers and Bardenhagen, 2010). This dissertation utilizes a methodology to address these goals in order to better understand the needs of stakeholder group and the effects of resource changes in an effort to provide useful proactive decision information.

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

Humans, view our complex landscapes not along single dimensions, but holistically, as blends of the unique natural and cultural resources from which they are formed (Antrop, 2005). Thus, resource valuation is an area of study that demands a transdisciplinary approach, taking into account the ways that humans hold and express **values**, the tools of **ecological economics** that are currently used to measure resource values, the environmental **decision processes** that guide changes to our landscapes and finally, the ways in which **group formation** around specific resources affects attitudes and behaviors. These four literatures will be explored to place the use of resource valuation in the context of long range planning and to expose the gaps in these sets of literature that can be addressed by this study.

Environmental values

The nature of value

At the outset, it is important to understand value as an anthropogenic activity that reflects our degree of general importance or desire for a thing (Bingham et al., 1995; de Groot and Steg, 2008). Morris (1956, p. 9) states, "The term 'value' is one of the Great Words, and, like other such words ('science', 'religion', 'art', 'morality', 'philosophy'), its meaning is multiple and complex". The values placed on natural and cultural resources are no exception. They can be seen as inherently multi-dimensional concepts for both individuals and communities (de Groot and Steg, 2008; Heal, 2000). They are built upon physical function and benefit to humans, innate human nature and needs, and cultural/social traditions (Friedmann, 1987). Thus, any measuring of these values, especially those in complex landscapes, needs to be approached with the understanding that these values reflect diverse populations and that similar values for resources can even have differing underlying reasons for that value (Stern and Dietz, 1994). As is discussed by Kluckhohn and Strodbeck (1961), humans operate under a base set of universal cultural principles that guide our preferences, values and ultimately our actions. As different groups are observed however, the unique ordering of these principles brings about patterns that collectively form integrated sets of beliefs or value orientations of each group. Thus, these value orientations for resources may vary widely across individuals and groups (Kluckhohn and Strodtbeck, 1961; Rokeach, 1973).

These values are rooted in our cultures and established in the early years of one's life; they are understood to be stable over time once adulthood is reached (Morris, 1956; Rokeach, 1973; Stern and Dietz, 1994), especially for those resources that exhibit high degrees of place attachment and that are regarded as permanent features of our landscapes or foundations of a culture (Friedmann, 1987; Ribe, 2005). The difficulty of just how to capture this multi-dimensionality of value across numerous groups is discussed by Parsons and Shils (1951) in which they reflect on attempts by many to deduce a comprehensive set of value classifications such as aesthetic, intrinsic, extrinsic, economic, etc.. It quickly becomes apparent that these classifications are unlimited, constrained only by the narrowness of each class term. Hence, they propose that analysis of values be thought of in terms of dimensions, which can be fit to the relevant physical, social and cultural contexts at hand (Parsons and Shils, 1951). Of particular interest are the social and cultural contexts, which can expand the set(s) of values for resources beyond readily measurable physical aspects to gain a more holistic understanding the values that specific resources represent. Values tied to culture or to natural phenomena often cannot be observed on their own, but only emerge when expressed by individuals or groups that are part of that culture (Stephenson, 2008). Ndubisi (1988, 1991) uses an understanding of this concept to make a key connection to the context of long range planning by using value orientations, drawn from the patterning of cultural principles, to structure alternative proposed courses of action in a community. Further, an understanding of dominant and variant value orientations within and between groups is especially useful when dealing with multiple groups on complex planning issues (Ndubisi, 1991).

The importance of place

When discussing values as a social construct, it must be considered that the value held for a resource is firmly rooted to its geographic place and in the context of other resources in that place (Stephenson, 2008). Just as value is formed by perceived importance, it is also tied to place. These physical spaces become “centers of meaning” constructed by our own experiences in them (Tuan, 1977; Williams et al., 1992). Thus, places cannot be treated as commodity, or as things that can be easily replicated or used interchangeably across our landscapes. Rather, they are tied to meaning, which, in turn, is tied to individual experiences in that geographic space (Stephenson, 2008). As a result, the extent to which we are connected to and understand the resources and landscapes around us has a profound effect on how we both value and enjoy them (Beatley, 2004). As E.O. Wilson (1984, p.2) states, “… to the degree that we come to understand other organisms, we will place a greater value on them, and on ourselves.” Daily et. al. (2009, p.21) extend this to decision information and positive outcomes by stating: “In theory, if we can help individuals and institutions to recognize the value of nature, then this should greatly increase investments in conservation, while at the same time fostering human well-being.”

The role of participation

Another key element in resource planning decisions is the concept that the establishment of values, tied to specific places, will be more meaningful as decision information when those values are obtained through the participation of a broad range of stakeholders. Planning decisions should seek to include all key institutions, actors and citizens, ideally with participation taking place outside of the normal channels of politics, in order to work toward a goal of authentic consensus (Friedmann, 1987). While not all decision processes benefit from stakeholder deliberation, there is growing consensus that diverse stakeholder participation enhances the ability of planners to make planning decisions in a more holistic way (Beatley and Manning, 1997; Brody et al., 2003; Dietz et al., 2008; Wondolleck and Yaffee, 2000). The processes and procedures, by which input is gained, however, has been called into question by some. As an example, Innes and Booher (2004) point to failings of our current models of participation. They argue that citizen participation has become dominated by legal requirements that fuel polarizing stances, mistrust and dominant organized factions that drown out other relevant voices. Their alternative approach points to collaborative participation that does not place policy makers on one side and citizens on the other. Rather, the entire spectrum of stakeholders, including citizens, organizations, businesses and non-profits, as well as planners and administrators themselves must take part in the entire process. Further, these efforts must respect and build upon local knowledge in creating plans and policies that are not reactive, but focused on anticipating future problems and needs.

Active participation in decision processes adds process legitimacy in the eyes of the public, enables greater participant capacity through learning, motivation and an ability to reach consensus on prioritizing preference items in plans (Dietz et al., 2008). Active participation can also expose interests and values held by each group involved in the process. With clearly articulated values for each group, there exists an opportunity to set aside polarizing demands and positions and to begin negotiations from more commonly held values, or along broad areas of agreement. Planners can then craft policies that will satisfy the needs and respond to the value sets of each group (Campbell, 1996). Further, active participation broadens the range of perspectives to be considered, forwarding learning of other positions and values. When multiple groups involved in the decision process are able to understand the thinking of those around them, the result can lead to better informed decisions that have at least the potential of broader outcome acceptance (Hall and Davis, 2007).

Ecological economics

The literature in environmental values discusses the diversity of values; however, specific methods to incorporate these values are not discussed. Ecological economics provides numerous methods for placing value on both market and non-market natural and cultural resources. The realization that resources embody multiple sets of values and the desire to quantify that value for use in decision processes is hardly a new concept. As an example, the writings of George Perkins Marsh in the mid 19th century can be seen as prescient in his observing and explaining interconnections between resources in nature and his understanding that each embodies multiple types of value, some of which could not be easily ascertained. Indeed Marsh presents issues that advances in science would only begin to more clearly understand in the decades and centuries to come as is evidenced by the following from *Man and Nature*.

> …our inability to assign definite values to these causes of the disturbance of natural arrangements is not a reason for ignoring the existence of such causes in any general view of the relations between man and nature, and we are never justified in assuming a force to be insignificant because its measure is unknown, or even because no physical effect can now be traced to it as its origin. The collection of phenomena must precede the analysis of them…
>
> (Marsh and Lowenthal, 2003, p. 465)

It was not until Ciriacy-Wantrup (1947) introduced the idea that individuals can express their own spending limits or "willingness-to-pay" (WTP) for certain non-market resources and that these values can then be used in aggregate among groups as quantifiable measures of preference and therefore value. While Ciriacy-Wantrup formed the concept that WTP can be utilized to express non-market values, this was not operationalized until Davis (1963) developed the first survey of WTP, using data collected actual travel costs to correlate the results. This paved the way for eventual widespread use in the coming decades of WTP measures, which would become dominated by Contingent Valuation (CV) that measures preference levels for hypothetical outcomes in terms of monetary expenditures. There was, however, a need (that still remains) to increase the base of information that is taken into account in understanding resource values. Krutilla (1967) raised concerns about the continued wanton use of scarce resources justified by only a partial understanding of values. He highlighted the need to account for the entire social value of resources, values often falling outside of the purely economic demand curve. Much progress has since been made in using revealed preference, stated preference and blended techniques to ascertain values for non-market resources, which in turn can be used to inform decision processes. Summaries of valuation tools in these three classifications follow.

Revealed preferences

Revealed preference measures use observed behaviors to predict future [spending] behaviors (Heal, 2000) from which monetary values are assigned for certain resources or their services. These measures give us the ability to understand consumer values in the choices they make from which we can imply that they hold the resource or service in question as valuable. Whether this includes direct purchase of goods, selection of one set of goods over another or the choice of one location over another, each is revealing their preference and/or willingness to pay for a certain good or service (Heal, 2000). The following are common revealed preference valuation techniques.

Market prices

Market prices are simply reflections of what individuals are willing to pay (in established commercial markets) for a particular resource or the services that it provides. These include resources that are bought and sold for at least one of the range of services that they provide (Heal, 2000). A simple example of this would be the price that one is willing to pay for the timber harvest of a woodlot, drawing on established timber markets. This method has the benefit of being easily measured in monetary terms and the relative ease of finding data. However, it is limited to measuring only one good or service provided at the exclusion of any other value dimensions that may held for that resource (Farber et al., 2006). It is also limited to the specific local market in which it occurs, and is seldom generalizable to other natural resources.

Travel cost method

The travel cost method (TCM), often used in valuing recreational resources, uses implied values measured by the costs one is willing to incur to visit or experience a resource. Based on behavior, this method is often used in valuing recreational resources. For example, an individual's willingness to pay a given amount (e.g., $300) to visit a historic site, indicates a particular value ($300) for that resource (Heal, 2000). By combining the travel costs of many visitors and comparing them against other resources, demand curves can be created for individual resources. Estimates can be formed around what additional dollar amounts a visitor would pay for improved or increased resources. While this method can accurately reflect both the monetary value of an existing resource as well as the value that an expanded or additional resource would represent, it still places a single value on a resource that may include complex sets of dimensions that cross multiple social and cultural value sets. As an example, individuals may choose to visit more than one resource on a particular trip, thus clouding the degree to which costs truly represent the value for any one resource. Allocating one monetary amount to each resource cannot completely express the complexities these values (Hanley, 1992; Loomis, 2000).

Hedonic pricing

Finally, Hedonic Pricing seeks to identify specific aspects of a resource that consumers find more preferable to other aspects of that resource and thus will have a dominant effect on how that resource is valued (Heal, 2000). This is particularly useful when the service provided by the resource is not marketed such as prominent views or adjacency to open space. The classic example of the hedonic pricing method is in placing a value on a beautiful view as it relates to home prices. In theory, one could find two identical homes, one with and one without a desirable view. The difference in home price could be attributed to the value of the view. Statistically, other variables beyond views can be controlled for and a value can be established (Hanley, 1992; Heal, 2000). Procuring data to use in a hedonic pricing application can be difficult due to the complex nature of variables that can affect prices as well as the variety of measurement scales that accompany these variables. Multi-collinearity and assumptions of efficiently operating markets also can become problematic. Finally, it must be considered that though the these complexities can be controlled statistically, the final outcome of a value derived by the means of hedonic pricing measures a single service of a resource, not the combined services of a resource or even the resource itself (Hanley, 1992; Heal, 2000).

Stated preference measures

Differing from revealed preferences relying on observed behavior, stated preference approaches use survey methods to form estimates of value (willingness-to-pay) from responses to hypothetical scenarios posed to respondents.

Contingent valuation

The most prominent method within this category is Contingent Valuation (CV) which asks a selected sample population to place a monetary value on a resource in relation to a presented alternative and then uses that data to extrapolate the value that the whole population would hold for that resource. This has the benefit of capturing values for a broad range of resources and their services, whether they are marketed or not. It also is beneficial in that it seeks to measure future impacts or losses, which enables its use in guiding planning decisions (Daly and Farley, 2004; Farber et al., 2006; Heal, 2000). Limitations, however, include the possibility of biased or strategic responses related to scenario impacts and the hypothetical nature of the process which can lead to inflated value estimations. As well, great variations in the reliability of stated values have been found when comparing studies that have employed CV (Loomis, 2000). This has brought about the concern that individuals will overstate their willingness to pay either because of the hypothetical nature of the question or as a result of the free rider effect (Heal, 2000; Loomis, 2000). Despite its benefits and usefulness, CV still uses the individuals as the unit of analysis that place single values on individual resources which are not necessarily valued relative to one another. Even if different respondents place similar values on a specific resource, they may be doing so for very different reasons. Those differences are not captured by the single dimension that CV measures. Finally, while CV still under-represents many non-market values, nonetheless, it can be seen as moving in the right direction. Understanding that resources provide greater worth than simply the sum of multiple independent monetary values and that CV is just one of a "plurality" of measures that can be used is important to more fully valuing our landscapes (Arrow et al., 1993; Farber et al., 2002) simply purchased outright (Beatley, 1994).

Non-economic stated preference measures

There are several methods that incorporate non-economic information into measures that address some of the complexities that dealing with natural and cultural resources entails. Contingent Choice, Conjoint Analysis and the Analytic Hierarchy Process, are three methods related to CV, that are able to capture some of the underlying reasons for individual choices by way of attributes associated with each hypothetical scenario.

Contingent choice

Similar to CV is the Contingent Choice Method. Here, respondents are asked to make tradeoffs between sets of hypothetical scenarios in order to express a preference for a particular resource outcome (Daly, 2004; Farber et al., 2006; Heal, 2000). The method differs from CV in that it does not directly ask respondents to state value in dollars, but rather to make tradeoffs between iterations of alternatives presented. Once the choice preferences of a respondent are known, then values can be inferred based on the costs of these choices (King and Mazzotta, 2000). Thus it can be used as an economic method, or a non-economic means of assessing value. This method can shed light on individual choices for actions, which can provide needed information for decision makers rather than presenting only monetary values. However, there are some limitations to the method. First, since only a limited number of options are presented, respondents may have difficulty choosing options that they are either unfamiliar with or that they would not normally agree with. On the other hand, care needs to be taken to not inundate respondents with too many tradeoffs and attributes to choose among and risk confusing or losing the attention of the respondent. Finally, this method still does not address the underlying reasons that explain why respondents may choose particular tradeoffs or attributes (King and Mazzotta, 2000), which means that intrinsic value can be inferred from the choices made at best.

Conjoint analysis

Another stated preference method, one that is also conceptually similar to CV, is Conjoint Analysis. In this method, respondents are presented with a number of alternative options, with each option having a set of related attributes for which the respondent is asked to either place a value or rank on each attribute. Statistical analysis of these ranks is used to understand the importance or value contributed by each attribute (National Research Council, 2005; Seip and Wenstop, 2006). A key benefit of this method, as an improvement upon CV, is its focus on capturing the diversity of preferences on the individual level (Champ et al., 2003). While the use of conjoint analysis has become rather widespread in marketing, its use in valuing non-market resources is still growing. A key limitation in this area is the difficulty in presenting scenarios and attributes that show clear linkages between the choice and the attribute set. One example explains that people may be able to easily see linkages between wetland quality and bird health, thus ranking or valuing attributes will be clearly understood, whereas they may have difficulty valuing attributes when the scenario includes the linkages between wetland quality and flood risks (National Research Council, 2005).

Analytic hierarchy process

A third methodology based on attribute tradeoffs is the Analytic Hierarchy Process (AHP). In this method, developed by Saaty in the 1970s, respondents are asked to make subtle tradeoffs between attributes surrounding an alternative (Duke and Aull-Hyde, 2002). It begins with a definition of the problem to be solved and the forming of options, a decision hierarchy is then developed with intermediate levels of criteria and attributes to be compared against each option. Once respondents have made tradeoffs between the various pairs of attributes or criteria, previously assigned weights are added together until a priority ranking is obtained. Unlike conjoint analysis, this method does not use statistical analysis to arrive at inferred values, but its results are still argued to be highly comparable to the conjoint analysis (Duke and Aull-Hyde, 2002; Saaty, 2008). It has two main benefits; first, it is able to assess respondent preferences for one attribute relative to another which allows priority listings to be created. Also, since it is non-statistical in nature, sample sizes are not a constraint to this analysis. Limitations to this method include the potential for bias that can result from small numbers of respondents, which could be controlled with larger sample sizes. Secondly, this process makes an assumption that there is a great deal of commensurability among respondents' ratings, which may or may not be the case (Duke and Aull-Hyde, 2002).

Blended techniques

Multi-Criteria Analysis (MCA) is a family of decision approaches that can be used to determine the preferences of participants from among multiple decision options on the basis of the ability of each option to satisfy multiple criteria. This "family" of techniques includes Multiple Criteria Decision Analysis, Multi-Attribute Prioritization, Choice Experiment and others, though each is only a subtle shift in emphasis from the overall MCA approach. In MCA, each decision option is rated by respondents against each criterion. Criteria are then weighted to reflect respondent ratings and an evaluation matrix is formed. From this, numerous analysis methods can be employed to rank the options or provide option scores (Hajkowicz, 2007). The actual measurement can, but does not need to, include monetary terms. This allows both monetary and non-monetary criteria to be assessed within one measure. A key benefit of MCA is not that it provides a ready answer to decision makers, but rather, to give them a greater understanding of the preferences their constituents hold (Hajkowicz, 2007; Munda et al., 1994). By including multiple attributes that make up a non-market resource such as a historic landscape, respondents are able to more easily make subtle choices rather than taking an "all or nothing" approach as is found in contingent valuation. As well, respondents have the opportunity to express their value preferences multiple times because each of the options shown will also include common attributes against which the option is ranked (Hanley et al., 1998). While it can provide greater insight, it must be understood that not all social and economic dimensions can be captured by this method. Further, when blending economic, social and ecological criteria, care needs to be taken that differences in time scales, spatial scales and measurement levels of variables are understood by respondents (Munda et al., 1994).

An interesting adaptation of MCA that has recently been introduced for use in ecosystem management is a multi-attribute prioritization method, the Deliberative Attribute Prioritization Procedure (DAPP). In this method, a stakeholder-led deliberative process was added to the pair-wise comparison process of MCA in order to take into account the complexities of decision options that deal with, among others, ethical, ecological and monetary values (Randhir and Shriver, 2009).

However, the tradeoffs made through these processes require that respondents react to each provided scenario and thus do not incorporate value dimensions that may lie outside of the choices presented (Duke and Aull-Hyde, 2002; Farber et al., 2006; Hanley et al., 1998; Heal, 2000). While this does solve the limitations of the "all or nothing" approach found in CV, it still relies on pre-defined alternative scenarios and can be challenged by differences in temporal, scale and unit comparisons that become difficult for respondents to comprehend (Munda et al., 1994).

Cost-based approaches

Finally two related approaches seek to either measure Replacement Costs or Damage Costs Avoided and can be used to establish measures of value for resources. Heal (2000) relates the example of the Catskill watershed in New York that serves as a primary source for New York City's drinking water. The city was faced with the options of either protecting the watershed or constructing mechanized filtration plants. In that case, construction of the plants and operating costs would total approximately $9 billion. Using a replacement cost strategy, one could say that the watershed had a value of at least $9 billion. Damage costs avoided are employed in much the same manner and are simply used when looking at potential future impacts. Data needed for this approach can be easier to assemble and can be tailored to fit the needs of the given problem. However, this method will only account for the value of one service that the resource is providing. In the above example, the drinking water provision of the Catskill watershed was valued at $9 billion. The ecosystem, social and cultural services that this region provides both for humans and resident species is a vast and complex system. To place a value on only a single dimension of the services it provides to humans will represent only a tiny fraction part of its overall value.

Each of the above methods for placing value on non-market resources offers something to the task of assembling resource value information to be used in decision processes. While none of the methods offer the ability to codify all resource values into one single measure, they are, nonetheless, moving in the right direction. Indeed, in most cases, multiple sets of measures can be employed to develop a "plurality" of measures in order to form a more holistic representation of resource values (Arrow et al., 1993; Farber et al., 2002).

Each of the existing resource valuation methods described above are summarized in Table 1. which presents comparisons of the basic characteristics, uses and limitations of each method.

Table 1. Existing resource valuation method comparisons

	Valuation Method (Primary Reference)	Data	Quantitative	Measure	Dimensions	Proactive	Uses in Decision Processes	Key Limitations
Revealed Preference	**Market Prices** (Heal, 2000)	Sales	Yes	$	1	No	Alternatives creation and assessment	Measures single service, Generalizable only to local markets
	Travel Costs (Hanley, 1992)	Expressed Values	Yes	$	1	No	Alternatives creation and assessment	Single monetary value difficult to "unbundle" for complex resource sets
	Hedonic Pricing (Heal, 2000)	Sales & Characteristics	Yes	$	1	No	Alternatives creation and assessment	Complex variables with differing scales, Measures only a single service
Expressed Preference	**Contingent Valuation** (Farber et al., 2006)	Expressed Values	Yes	$	1	No	Alternatives assessment	Relies on fixed alternatives that may affect multiple resources, Overstated values
	Contingent Choice (Farber et al., 2006)	Expressed Choices	Yes/No	$ +	1	No	Alternatives assessment	Fixed alternative scenarios, trade-offs may be difficult to distinguish
	Conjoint Analysis (National Research Council, 2005)	Expressed Choices/Values	Yes/No	$ +	2+	No	Alternatives assessment	Difficulty in showing clear linkages between preferred attributes and monetary value, especially with differing scales (geographic or temporal)
	Analytic Hierarchy Process (Duke and Aull-Hyde, 2002)	Expressed Choices	No	Ranking	2+	No	Alternatives assessment	Pre-defined attribute weights, small sample issues. Benefit: relative rankings
	Place-Based Resource-Driven Valuation (Rogers and Bardenhagen, 2010)	Expressed Values	Yes	Relative Values	2+	Yes	Problem Formation through consensus alternative selection	Relative values do not directly tie to specific alternatives or to dollar values
Blended	**Multi-Criteria Analysis** (Hajkowicz, 2001)	Expressed Choices/Values	Yes/No	$ +	2+	No	Alternatives assessment	Respondent difficulties when combining preferences across multiple scales and types.
Cost Based	**Replacement Costs** (Heal, 2000)	Market prices	Yes	Monetary	1	No	Alternatives creation and assessment	Single monetary measure for often complex sets of services
	Damage Costs Avoided (Heal, 2000)	Market prices	Yes	Monetary	1	No	Alternatives creation and assessment	Single monetary measure for often complex sets of services

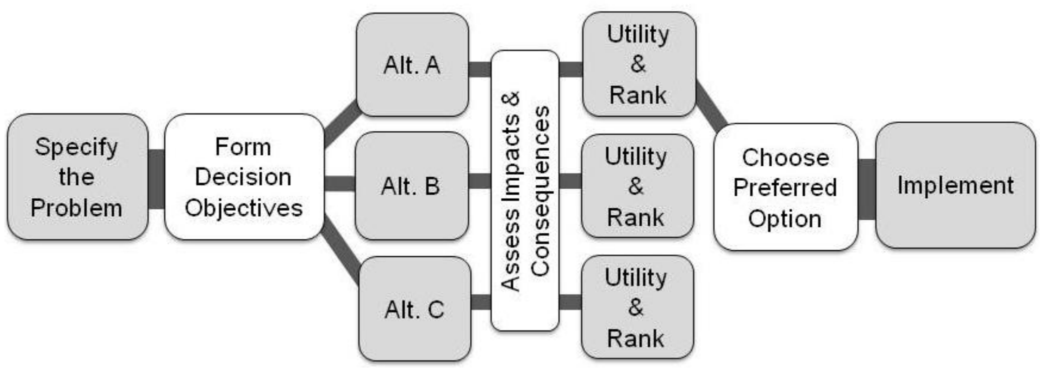
Environmental decision processes

Many authors acknowledge that institutional level decisions that include impacts on natural or cultural resources often involve problems that require complex sets of information (Bingham et al., 1995; de Groot, 2006; Seip and Wenstop, 2006). In this light, decision makers that have access to more information surrounding the problem at hand and from a greater number of perspectives, have a greater opportunity to make better-informed choices (Hall and Davis, 2007). To deal with these complex sets of information, institutions often use, either by choice or by mandate, some form of Cost Benefit Analysis (CBA) or the National Environmental Policy Act (NEPA) process for arriving at decisions that affect natural and cultural resources. These processes seek to inform decision makers as to how scarce resources can be utilized for the greatest good (CBA) and to form a standardized framework (NEPA) that organizes varying and disparate information and multiple stakeholder inputs in order to further the decision process (Arrow et al., 1996; Canter and Clark, 1997; Seip and Wenstop, 2006). These processes attempt to incorporate the complexities of dealing with diverse sets of resources and stakeholders. Several shortcomings have become apparent, including, 1. differences between citizen and consumer values, 2. ecosystem complexities, 3. the uniqueness of some resources and the irreversibility of impacts to them, 4. difficulties in intergenerational accounting, and 5. sociopolitical and cultural value differences. These shortcomings will each be discussed in greater detail below.

<u>Cost benefit analysis</u>

CBA can be viewed simply as systematic thinking about decision-making. At this level, few would oppose efforts by decision makers to think in systematic ways about alternative courses of action and their consequences (Kelman, 1981). In CBA, an outcome is positive if the measurable benefits of an action are likely to exceed the measurable costs anticipated. Further, when assessing a range of options, the one that produces the maximum ratio of benefit to costs is the most desired action (Arrow et al., 1996; Kelman, 1981). This seems to be a rational way to approach the problem, however, as O'Neill and Spash (2000) point out, these approaches measure a combined strength of preference *intensity* without addressing the strength or weakness of potentially multiple underlying *reasons* for those preferences. In these cases, easily constructed values (e.g. timber harvests, increased tourism visits) have an advantage over more problematic types of value such as social, cultural, psychological, ethical considerations and preferences resulting in "optimal" decisions that may not reflect, or at least under-represent, the complex preferences of the community.

This process includes the six basic steps of specifying the problem, forming decision objectives, identifying alternatives and their attendant impacts, evaluation of alternatives and ranking of utility for each, selecting a preferred alternative and implementing that chosen alternative. A simplified graphic illustration of the general structure of this process is shown in Figure 1 below.



(Noble, 2006; Partidário and Clark, 2000; Seip and Wenstop, 2006)

Figure 1. Illustration of a simplified linear decision process

The types of data that CBA can utilize are broad, though there is one overriding principle; CBA seeks to express benefits and costs within one common measurement scale which is typically monetary. This allows for meaningful "apples-to-apples" comparisons to be made even when dealing with diverse sets of resources (Kelman, 1981). As CBA attempts to use values obtained through many of the techniques described above this can at times lead one to believe that "apples-to-oranges" value comparisons are possible (e.g. preservation of ocean views versus shoreline residential development) (Daily et al., 2009). This may lead to an assumption that just because the benefits are deemed to outweigh costs that the proposed action is "right". However, when natural and cultural resources are being valued, issues arise as the more ephemeral resources are examined. Resources such as scenic views, clean air, clear water, areas of quiet solitude provide value to many individuals, yet these are difficult to quantify, especially in monetary terms (Kelman, 1981; Snyder, 2003). Since some costs can be measured directly (e.g. the cost of materials, the costs of compliance with a regulation), secondary consideration is often given to those costs that can only be measured indirectly and as a result, they are liable to either be ignored or discounted due to their non-economic (usually qualitative) nature (Arrow et al., 1996; Hanley, 1992; Stephenson, 2008). Further, culture and geographic/environmental context greatly studies in impact both our perception and our behaviors (Triandis, 1973). These intangible elements form place, but are not easily taken into account by decision makers. Hence, given the low number of intangible values that decision makers can reasonably consider, (Rokeach, 1973; Simon, 1982) these are easily and often ignored. Ribe (Ribe, 2002, p.758) very succinctly describes the difficulty of including intangible and often subjective values into decision processes in the following:

> "Instead, final authorities who select plans for implementation must make judgments about the perceived social acceptability of alternatives using informed, administrative discretion, often based on ad hoc understandings or guesses about social acceptability, just as in decisions made by elected officials. These decisions are made from the totality of many different topical impact assessments, public comments, and, inevitably, politics. This process is intended to allow only more objective assessments to affect choices, to prevent any formal assessment of social acceptability that might trump all other assessments, and to

rest final decision assessments not with specialists but with decision makers who are vested with such powers."

Several primary difficulties arise when using CBA to place value on a mix of market and non-market resources and subsequently to make decisions based on that information. Five basic problems with CBA, as identified by several authors are as follow:

1. *Differences between citizen and consumer values* –Individuals reveal preferences, and thus set prices, by acting as consumers in established markets. Acting as a citizen in a larger society, however, can reveal markedly different preferences among individuals (Hanley, 1992; Kelman, 1981).
2. *The complexity of Ecosystems* – CBA needs to deal with known quantities. In dealing with ecosystems, however, 1.) precise impacts to many primary processes are difficult to identify, 2.) time lags from time of impact to effect are problematic, and 3.) second- and third-order impacts that result from the many interactions between ecosystem elements are difficult to fully understand and quantify. These issues become dynamic externalities that CBA cannot accurately account for (Hanley, 1992).
3. *Irreversibility and uniqueness of resources* – CBA holds a primary assumption that all elements within the analysis can have a stable price attached (i.e. a compensation amount for the "losers") (Hanley, 1992). There are, however, some resources which are considered as "priceless" and thus it is not possible to assign a meaningful price. Additionally, it may not even be technically possible to restore a resource to its previous condition; or it may not be culturally acceptable to do so. (Bingham et al., 1995; Hanley, 1992)
4. *Intergenerational equity and discounting* – Some impacts span multiple generations and when dealing with projects that have long-term benefits or costs, the use of a discount rate is often employed. The setting of the discount rate to be used, however, becomes one of a political debate that can cloud the decision process with

uncertainty regarding either present or future benefits and costs, or both (Hanley, 1992).

5. *Sociopolitical and cultural value differences* – Value structures are not static when dealing with multiple groups, communities or cultures. In addition, improved decision-making may not be assumed to serve as a substitute for collectively made political decisions, especially those that deal with distributive rights and deeply revered cultural resources (Bingham et al., 1995; Ndubisi, 1988, 1991; Snyder, 2003; Spash, 1997).

For these reasons, care should be taken to assure that quantitative factors and economic efficiency do not come to dominate important qualitative factors in decision-making (Arrow et al., 1996; Hanley, 1992). Beatley (1994, p.50) describes this as the "ethical myopia of benefit-cost techniques". In some cases of non-market resources, if an economic advantage can be established to impact or even to remove or destroy a resource, the basis for this action is often very narrowly defined. Even if economic benefits can be found to outweigh costs in a particular situation, many very real, yet less easily measured dimensions of value are not represented (Ascher and Steelman, 2006; Beatley, 1994).

As a result, the use of CBA as a primary decision-making process it is not able to capture many of the complex values that can be attached to natural and cultural resources. This is not a reason to abandon the process nor should CBA be avoided entirely. Economic efficiency still has a place as one of the vital criteria to be considered. As a means of weighing multiple effects of a particular action, it can still contribute to the decision process in a useful manner, though it must be seen as useful framework for providing information to the process, but not one that supersedes all other values, especially those not able to be captured within CBA (Arrow et al., 1996; Hanley, 1992).

A final issue, related to CBA and NEPA is that these decision approaches most often react once a problem has been recognized or established, and defined. The appearance of the problem becomes the impetus to formulate alternative solutions based on known information, and to implement a selected alternative solution. Problems are commonly thought to be “given” to decision makers whether individuals or communities, and are seen as static, tangible and wholly formed. Ackoff (1974) makes the point that problems are actually abstractions and can be shifted, re-focused and even re-framed, depending upon the dynamic information and sets of individuals that are utilized to conceive the problem.

Group formation and recreation specialization

Another way to gain insight into the preferences, values and behaviors of that can be taken into account during planning and decision processes is to understand the groups associated with a place and its resources. Through a process of self categorization, groups form as individuals seek others that share similar interests or seek to fulfill some unmet need, whether that be to forward a cause, expand skill sets or to serve as a social outlet. These groups help establish and reinforce common attitudes, beliefs, values and behavioral norms of the individuals that are associated with them (Ashforth and Mael, 1989; Stets and Burke, 2000). As recreational groups form, it has been shown, most notably by Bryan (1977), that these groups tend to form a natural progression of options for participants to follow from the lowest levels of involvement and ability (e.g. novice skill and socially oriented groups) to greater involvement and more skilled abilities (e.g. expert skill and single-issue focused groups)(Bryan, 1977; Scott and Shafer, 2001). The systematic study of the differences that these recreational groups exhibit has come to be known as recreation specialization.

These groups, by their very nature, do not represent homogeneous sets of values and thus, can and should receive careful consideration by resource managers and policy decision makers. To assume homogeneity across groups is to miss valuable insights that can be gained from an understanding of the amount and characteristics of heterogeneity among groups (Scott and Shafer, 2001). Broadly diverse sets of visitors and stakeholders can indeed complicate the efforts of resource managers who try to both protect important resources while also offering many recreational opportunities to visitors, but it is critically important to understand these differences in order to identify problems, during participation and deliberation efforts, and throughout ongoing management (Oh and Ditton, 2006).

Recreation specialization has become an accepted approach to understand the multi-dimensional nature of the attitudinal and behavioral norms found within recreation groups (Oh and Ditton, 2006). Being able to identify these group differences offers finer sets of information not typically reflected in aggregated willingness-to-pay value information (Oh et al., 2005). Further, it has been argued that along this continuum of recreational groups from novice/low involvement to expert/high involvement, there is often a relationship to resource appreciation, willingness-to-pay, and support of protective resource management practices that increases as level of involvement or specialization increases (Oh and Ditton, 2006). More specifically, Virden and Schreyer (1988) have asserted that as specialization increases, resource attribute preferences expressed by groups become both more extreme and less diffuse.

Finally, understanding the different groups affiliated with a place and the underlying preferences that guide their values and behavioral norms can be beneficial for resource managers in understanding how changes to regulations and resource availability will impact each group differently (Oh and Ditton, 2006; Virden and Schreyer, 1988). Further, with accurate assessments of value differences among different groups, planning efforts can be focused to better meet the needs of these populations (Bricker and Kerstetter, 2000; Virden and Schreyer, 1988).

Gaps in the literature

The environmental values literature emphasizes values as multi-dimensional reflections of the unique places and landscapes that humans experience. It also discusses the role of participation in expanding the range of perspectives considered and as an aid to prioritize preferences. What is not discussed is a way to measure these multi-dimensional values relative to one another in a way that enables prioritization of resources.

Ecological economics provides many methods to assess services provided and to assign value, even to non-market resources. However, in the end, these methods still rely on uni-dimensional monetary values, which cannot capture many dimensions of value. Additionally, each of the methods discussed are reactive in that they rely on either observed past behaviors or on pre-established alternative scenarios from which to assign values. There is no method discussed that can assign values for resources relative to one another to allow their use in proactive decisions.

The literature in environmental decision processes acknowledges the complex nature of many decision processes and provides structures by which to assemble both values and input in structured decision models. Again, these are reactionary in nature and, especially in the case of CBA; deal in single dimension monetary values. The literature does discuss the range and diversity of groups along with their shared and unique value sets, which can and should be factored into a decision. The gap, however, is that there are no ways presented to deal with multiple dimensions of values, especially for intangible resources, within the same analysis.

In summary, a method to value resources relative to one another is needed that can take into account these complexities and to serve as an additional tool for decision makers. Additionally, an ability to observe the shared versus unique value sets that groups hold for certain resources is needed in order to provide decision information that reflects these group values. Finally, the ability to use this measure in a proactive way, prior to problem definition or the establishment of alternative scenarios is needed.

One alternative, however, has been put forward as an additional tool for decision makers in order to fill some of these gaps. In Rogers and Bardenhagen (2010) a method is developed to assess the values of multiple non-market natural and cultural resources. This approach does not monetize values, but rather, using expressed values of active stakeholders, obtains resource ratings along five value types. These include each resource's importance to the fundamental character of the park, its scenic beauty, park visitation, the park's ability to operate, and the ability of each resource to be replaced. These multiple dimensions of value are used to create, via factor analysis, an abstract value space which depicts all resources relative to one another in a two dimensional space representing aesthetic and functional qualities of each resource. While many previous approaches have attempted to value resources based on single measures or combinations of measures as described above, this approach is unique. It values resources outside of, or prior to the formation of problem statements or alternatives selection. The result is resource value information that can add to the context for environmental decision-making and that proactively contributes throughout the decision process.

CHAPTER III

THEORY

As presented by the gaps in the literature, dominant present methods of assessing resource values are inadequate in their ability to capture multiple dimensions of value. A place-based resource-driven approach, however, can capture these values, incorporating multiple dimensions of value, and present them in a value space (Rogers and Bardenhagen, 2010). Greater insights, however, are possible by understanding the role that both stakeholder groups and changes to the resource base play in shaping these value spaces. So the questions become: 1. How do stakeholder group values affect the representation of value spaces? and 2. How do changes in resource base drive differences in value spaces?

Group differences and values

The first construct simply posits that *different groups will present differing value spaces.* While a statement such as this is, on the face of it, would seem obvious, it is important to understand how and why groups form, how values are shaped and reinforced, what role place plays in shaping these values, and, most importantly, how can this inform decision processes.

Group formation

At the most base level, humans seek out social groups in order to classify themselves and those around them into differing social categories. This enables humans to order the social context into an understandable structure and to be able to define others as being in one or more parts of this structure (Ashforth and Mael, 1989). Secondly this structuring allows an individual to place him or herself within this social context (Stets and Burke, 2000). Because of this desire to place oneself socially, groups form around shared beliefs, attitudes and values that provide a sense of belonging and a social reference, whether through actions that exemplify these beliefs or only symbolically through affiliation alone (Ashforth and Mael, 1989). Social groups, however, are not static, but are constantly seeking to reinforce core values through recruitment of like-minded individuals as a means of preserving the organization. Porras and Collins (1994) describe this as holding a core ideology which is a product of core purpose and core values that define strong organizations. As members remain in the group they will either come to identify themselves more strongly with the attitudes, behaviors and values of the group, thus seeing their membership as adding to their uniqueness or social distinction (Ashforth and Mael, 1989). Or, they will not wish to conform to these value sets and leave the group. This, however, does not necessarily always result in a downward progression from group involvement to non-involvement but can also work in the reverse fashion toward more focused or specialized value sets. Recall that that as put forth by Bryan (1977) these groups tend to offer a range of options for participants to follow from the lowest levels of involvement and ability to greater involvement and more skilled abilities. As individuals come to understand the core ideologies within a group (or lack thereof), they will seek those which best fit with their own personal value sets and that distinguish them within the social context (Ashforth and Mael, 1989).

The role of place

Just as group affiliations direct and focus value sets in a self-reinforcing manner, it is important to understand what role places play in influencing the values that these groups hold. In the context of stakeholder groups formed around places such as a national park, value sets are inextricably tied to the places and the resources that they are comprised of. Over time, places become imbued with meaning and both groups and individuals form attachments to them which are not only social relationships, but are highly spatial as well (Kyle et al., 2004; Stephenson, 2008). In this context, place is not amorphous, but has definite boundaries and, as Stephenson (2008) argues, is not interchangeable with other places or landscapes. This place attachment can stem from several different influences as outlined by Kyle, et al. (2004) . First, places provide emotional responses that stem from personal experiences in a place. As an example, an annual family vacation to a specific beach may develop over time into a dearly held value for that beach due to the emotional ties to the place. Second, places are tied to self identity through personal history and culture. In this manner a person or group may hold high value for a place due to the cultural heritage it represents, whether or not those in the group have extensive histories with the place. Third, a place can be valued based on its ability to fulfill some desired activity or to signify behavioral intentions, whether or not those intentions are acted upon. In this case, this can be directly valued, for example, as a fisherman that is able to access fishing areas, or intrinsically valued as with a wilderness area that serves to protect endangered species but does not directly support visitors. Finally, resources within a place can serve as icons with which social groups can identify, either positively in that there is an endorsement of the resource as a symbol of group values, or negatively, as representing things outside of core group ideologies (Hull et al., 1994).

In summary, value sets that individuals hold are formed and reinforced by the groups in which they associate, as well as by their experiences and attachment to the place itself. With this understanding it is clear that *individuals and groups with differing value sets will perceive (and value) resources differently*, thus presenting challenges to managers of those resources. However, if these resource managers can actively engage these divergent groups in expressing their values using a place-based resource-driven approach, several benefits arise. First, it enables decision makers to enter into long-range planning efforts with an understanding of group values prior to the creation of alternatives. Second, comparisons of value spaces can point to areas of consensus as well as contention that can be used when conflicts over land uses or policies arise. Disputes can then be approached with an understanding of common values as well as divergent values, thus informing facilitation and consensus building efforts. Third, a proactive approach to understanding group value preferences during times of relative calm allows for its use during times of crisis when broad input may either not be available or difficult to ascertain objectively.

Resource change and values

The second research construct deals with changes to resource inventories and states that *changes in resources will bring about changes in value spaces*. Understanding that the values humans hold for resources are tied to place and culture, changes in resources will be reflected in the value spaces that represent collections of those resources. Further, the interest and usefulness of being able to observe value space change is not simply in the observation of the change itself, but in the specific characteristics of changes such as direction, magnitude and breadth of change in resource values that can inform decision makers.

In the context of national parks, resource inventories and even specific resources themselves are in constant and consistent states of change. These changes can be in the physical attributes of the resource (e.g. presence, absence or structural change), in changes to the surrounding landscape context upon which the resource depends (e.g. loss of infrastructure used to access a resource), or in imposed limits to the availability of the resource (e.g. posted beaches). The underlying reasons for these changes can also be multi-faceted. Natural occurrences such as weather events or other phenomena (e.g. earthquakes, floods, and drought) are commonly observed drivers of change that can at times bring disastrous or even catastrophic change. Planned or unplanned human actions (e.g. presidential inaugurations or oil spills) can as well bring about massive changes to valued resources, but have an element of human agency involved. Finally, policy shifts, whether related to causes such as budgetary constraints or due to efforts to preserve the very resources in question, can become drivers of resource change.

The impacts of these changes, however, will not be uniform, but rather will depend upon the variations in the duration, severity, and importantly, geographic and social aspects of the change. As the values humans hold for resources are based on long-term attitudes, experiences and cultural connections (Stephenson, 2008; Stern and Dietz, 1994), impacts that are severe, long-term or even irreversible, are those that are most relevant to the study of value change. Additionally, impacts will not be uniform in their human affects. Impacts such as loss of use or function, loss of cultural identity and geographic separation will have varying affects on differing sets of individuals or groups.

With resource changes, particularly those that are long-term, irreversible, or related to the cultural history of a place, a shift will occur in how the remaining resources are perceived and valued. This is because the place is now defined differently. Further, the fundamental nature of the place may have changed, at least for some set of stakeholders or groups. These are the insights that resource managers need when either contemplating or responding to changes in resources.

So, why is it important that resource managers and decision makers understand the ways in which value spaces change as a result of changes in the resource base of a place? Dynamic changes are constantly a threat to resources of all kinds. Most are unpredictable, at least in their timing, but not necessarily in the scope of their impact. If resource managers, decision makers and planners can use value spaces proactively to understand shifts in values as a result of differing scenarios (especially the scale and direction of the change), then resulting plans and actions can be informed by these efforts. For example, a hurricane striking a coastal shoreline may not be predictable in when it will occur, but the potential characteristics of its impacts can be gleaned from past experiences. In this case, impacts may be limited geographically (e.g. major impacts to northern resources, minimal impacts to southern resources) or only affect certain types of resources in a long-term manner (e.g. natural resources recover but cultural resources face irreversible loss). These impacts will be immediate but will require recovery decisions that may have long-term impacts on the way a place is valued. Another example, this time slow-progressing, is in the pending effects of sea level rise. The same coastal shoreline may receive some of the same impacts as with a hurricane strike, but in this scenario, the effects can be expected to take place over long periods of time. In this case, long range planning, informed by the values of constituents and stakeholders, can be used to plan for protecting, documenting or adapting these resources from future loss.

CHAPTER IV

METHODS

Value space concept and creation

Rogers and Bardenhagen (2010) developed a place-based resource driven approach to natural and cultural resource valuation, to address the multi-dimensionality of resource values and to provide broader information to environmental decision makers and resource managers. This approach is place-based in that it seeks to understand the value of resources tied geographically and culturally to a specific place. It is also resource driven as the value of the place or community is reflected in the values obtained for the individual resources for the place. These values are expressed in multiple dimensions and become the primary means to the creation of a multi-dimensional value space that expresses these resource values relative to one another. A brief overview of the methodology developed is presented below. A more detailed explanation is provided in Rogers and Bardenhagen (2010).

The methodology presented results in the creation and basic interpretation of value space obtained from analysis of respondent value preferences. This dissertation extends this research and its findings to explore two theoretical concepts related to relative resource values. First, a diverse set of stakeholder groups are compared to look for similarities and/or differences in value structures and the drivers of these patterns. Implications for this first level of analysis deal with the ability of decision makers to understand value overlaps among groups, guidance in soliciting public participation and information to be used in conflict resolution. Secondly, value space stability is explored as significant resources or groupings of resources are removed from the analysis (representing resource loss). Implications for this second level value space comparisons relate to providing decision makers with a better understanding of the impacts of resource loss which can prompt discussions of proactive long-range planning efforts.

Findings and discussion related to changes among groups and changes in resources will be provided in Chapters V-VII.

Setting

This resource valuation methodology was developed using data obtained during the creation of a storm recovery plan for Cape Lookout National Seashore located along the outer banks of North Carolina. Cape Lookout is a 90 km long barrier island system within the National Park Service (see Figure 2).

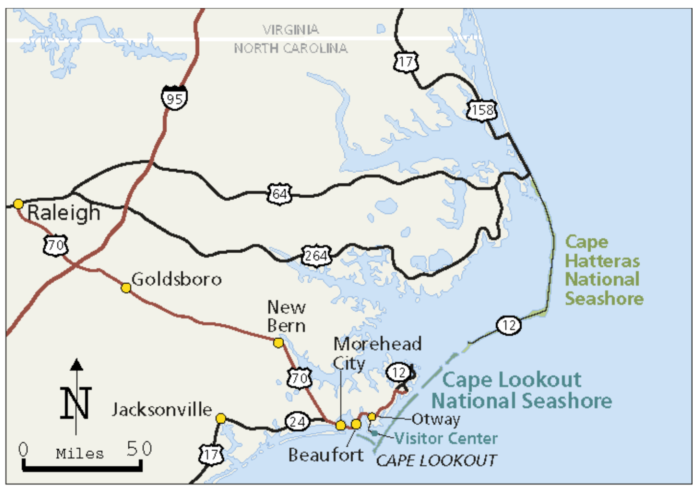


Figure 2. Location map of Cape Lookout National Seashore (National Park Service, 2010).

This planning process was primarily intended to provide a guide by which park administration, staff and external incident response teams could effectively assess resource loss and craft recovery alternatives following damaging storms. It became apparent that many resources found within the park were non-market, yet had great value to park visitors and are primary drivers of visitation.

Cape Lookout is home to a broad range of resources that can be categorized into three basic categories. First, this barrier island park is home to many natural resources that include diverse of plant and animal species living in the dune and beach, ocean fisheries and maritime forest ecosystems. Included are four listed endangered species within the park as well as a legislatively-protected herd of wild horses, the Shackleford Banks Horses. Second, cultural resources include historic Portsmouth Village and Cape Lookout Village, the iconic Cape Lookout Lighthouse, two lighthouse keeper's quarters, two life saving stations, a former Coast Guard station and numerous homes. All of these provide a way to better understand and experience the long history of seafaring communities of coastal North Carolina. Third, many infrastructure resources, that often work to support the visitation of the above natural and cultural resources, include resources and systems such as docks, sand and paved roads, restrooms, visitor centers, water and septic systems, communication facilities and maintained waterways.

In order to help these planners and responders to better understand resource priorities, a methodology was conceived to value the major resources of the park, whether market or non-market, in a way that created values relative to one another. While this methodology does not specifically create decision directives in a formulaic way, it provides empirically-based insight and information to decision makers as they work to protect the diverse resources of the park.

<u>Stakeholder survey</u>

To gather data that would be used to value resources, a stakeholder survey was created and deployed. Survey respondents were notified of the survey location in several ways. First, park staff and volunteers were provided information on the survey through an internal park communication. Second, staff at the nearby Core Sound Waterfowl Museum distributed the survey and cover letter to their extensive contact list. Third, individual stakeholder and interest groups, identified through a park-provided listing of existing "community partnerships" were individually contacted regarding the survey. Finally, a brief news story with the survey website location appeared in the Beaufort, NC newspaper "The Gam", in September 2008.

In the survey, important park resources were identified by respondent selection of up to ten resources "most important to the park" from a provided list. This list included 13 natural resources, 13 cultural resources, 25 infrastructure resources, and the ability for respondents to write in two resources not presented. The list of resources was derived from an existing resource inventory list provided by the park. In some cases, listed resources (e.g. individual water wells or specific boardwalks) were aggregated as a single listing for a set of resources. Additionally, several resources (e.g. Aesthetic Environmental Experiences and specific endangered species) were added through discussions with park resource specialists. This web-based survey, which took respondents on average 15.2 minutes to complete, identified 49 important resources from the list of 51 and asked respondents to rate each of their ten selected resources with respect to five value types. These included "fundamental character," "attracting visitors," "scenic beauty," and "ability to operate". These ratings of expressed importance used a zero-to-ten Thurstone scale in which zero indicated "not at all important" and ten "extremely important". Ratings for the value type "ability to be replaced" were also expressed on a Thurstone scale in which zero indicated "not able to be replaced" and ten represented "easily replaced". The use of the eleven-point Thurstone scale allowed for a meaningful zero to be represented with respect to respondents that found that a resource was "not at all important" or "not able to be replaced", as well as those that found resources to be "extremely important" or "easily replaced" using a rating of ten. While this scale has the appearance of an interval measure, it is not implicitly interval. However due to the fineness of the scale, and both meaningful zero and ten points, it was treated as an interval measure.

In addition to resource selection and rating questions, several other visitation and demographically-focused questions were included in the survey. This research, however, utilizes one resource selection question, five questions rating resources by value type, a group affiliation question and a question related to the respondent's place of residence (ZIP code).

With a web-based survey method it is difficult to determine precise response rates, however, of the 219 individuals that opened the survey website, 178 (83%) selected up to ten resources as most important to the park. Of these, 153 (70%) respondents completed all five of the rating questions, group affiliation and place of residence questions. Related to selected resources, of the 49 initially listed resources (several unique write-in resources were recorded, though none by more than one respondent), 47 were included in two or more respondent's top-ten-selections. Minimum respondent selection thresholds up to four were tested, however, due to the small effects each larger threshold had on the subsequent factor analysis loadings and the ability to still calculate means of shared value with two respondents, a threshold of two was chosen. The mean rating, standard deviation, and number of ratings for each resource is presented in Table 2.

Table 2. Descriptive statistics for each resource, (Rogers and Bardenhagen, 2010) adopted

	Important to Character				Important to Scenic Beauty				Important to Visitation				Important to Operations				Able to be Replaced			
Resource Name	N	Mean	SD	Rank	N	Mean	SD	Rank	N	Mean	SD	Rank	N	Mean	SD	RANK	N	Mean	SD	Rank
CL Lighthouse	131	9.70	1.08	1	136	9.75	1.03	1	136	9.65	1.21	1	132	7.75	3.58	1	135	0.89	2.00	9
Shackleford Banks Horses	68	9.34	1.20	2	69	9.38	1.13	2	69	9.48	0.93	2	67	5.96	3.71	4	68	1.18	2.49	16
CL 1873 Keeper's Quarters	71	8.82	1.81	3	71	8.75	1.95	3	72	8.42	1.97	3	71	6.68	3.28	3	73	1.16	1.99	15
Dune & Beach Systems	62	9.40	1.52	4	63	9.44	1.58	5	64	9.25	1.68	4	63	8.05	3.16	2	63	1.37	2.47	14
PV Methodist Church	67	8.63	2.01	5	68	8.85	1.75	4	68	8.50	2.26	5	68	5.49	3.69	6	68	1.10	2.61	17
PV Life Saving Station	58	8.84	1.91	6	56	8.66	1.91	6	57	7.79	2.70	6	57	5.21	3.70	10	57	1.07	2.20	22
CL Life Saving Station	54	8.89	1.72	7	55	8.80	1.65	7	55	7.98	2.22	7	51	5.61	3.55	11	53	1.42	2.52	18
Salt Marsh	50	9.32	1.42	8	50	9.66	0.82	8	51	8.47	2.01	8	51	7.49	3.57	5	51	1.20	2.32	23
Ocean & Sound Fisheries	47	9.32	1.67	9	47	8.53	2.73	9	47	9.04	1.85	9	47	7.70	3.30	7	48	1.81	2.77	13
Historic Cemeteries (6)	47	8.70	2.02	10	44	7.93	2.50	14	45	7.98	2.79	13	45	5.49	3.51	16	45	0.27	1.50	43
CL Coast Guard Station	45	8.93	1.60	11	44	8.48	1.89	10	46	7.96	2.09	10	43	6.35	3.43	13	46	1.50	2.14	19
PV Historic Houses (16)	45	8.73	1.84	12	44	8.30	2.31	12	44	8.27	2.09	11	44	5.75	3.40	15	44	1.25	2.50	25
PV P.O & General Store	46	8.24	2.16	13	46	8.04	2.31	11	46	7.35	2.95	15	45	5.20	3.47	19	46	1.09	2.56	27
Restrooms	52	6.85	3.21	14	50	4.32	3.48	22	50	7.24	2.97	12	47	7.47	2.77	8	51	8.04	2.73	1
PV Schoolhouse	40	8.75	1.94	15	41	8.22	2.33	15	41	8.17	2.47	16	40	5.98	3.41	18	41	1.15	2.64	28
Maritime Forests	38	9.00	2.19	16	38	9.26	1.93	13	38	8.32	1.89	18	38	6.76	3.48	14	37	0.76	1.64	38
GI Fish Camp Cottages (21)	38	8.55	2.44	17	38	6.84	3.08	20	38	9.13	2.04	14	37	7.51	3.01	12	37	6.16	3.36	2
Lighthouse Visitor Center	40	7.55	2.64	18	40	6.75	2.92	19	40	7.93	2.49	17	38	7.87	2.13	9	39	5.46	3.29	3
CL 1907 Keeper's Quarters	34	8.85	1.70	19	33	8.52	1.95	18	33	8.06	2.30	21	32	5.78	3.37	23	32	0.97	1.89	36
Tidal Flats	34	8.82	2.62	20	33	9.27	1.96	16	33	8.48	2.14	20	33	7.36	3.68	17	33	1.21	2.56	30
Endangered Sea Turtles	36	8.31	1.77	21	36	7.81	2.83	17	38	7.45	2.39	19	38	4.32	3.66	24	38	1.74	3.12	21
CL Area Historic Houses	29	8.59	1.79	22	30	8.53	2.05	21	30	7.70	2.67	22	27	5.15	3.45	26	30	1.07	2.16	34
Roads	30	7.73	2.41	23	29	5.93	3.21	24	30	7.33	2.88	24	29	7.69	3.11	20	30	7.03	3.02	4
LP Cabins (20)	26	8.15	2.56	24	26	6.08	2.84	25	26	8.88	1.99	23	26	7.81	2.81	21	25	6.80	3.32	5
Aesthetic Env. experiences	20	9.70	0.80	25	20	10.00	0.00	23	20	9.95	0.22	25	20	6.90	4.09	27	19	1.53	2.87	37
Dockage Areas (6)	22	8.59	1.94	26	22	6.68	2.92	27	22	8.36	2.28	26	21	9.33	1.46	22	22	7.09	3.39	7
Water Systems (3)	21	7.81	2.27	27	21	5.57	3.76	30	21	7.67	2.73	27	20	7.50	3.05	25	21	7.52	3.04	6
Truck & Off Road Vehicle	17	9.29	1.00	28	16	7.00	3.25	31	16	8.38	2.28	29	16	8.38	2.13	28	16	6.69	3.14	10
Migratory Birds & Habitats	18	8.56	2.38	29	18	8.67	2.22	26	19	8.32	2.38	28	18	5.56	3.79	31	18	1.00	1.68	40
South Core Banks Jetty	15	9.27	1.44	30	15	8.33	2.47	28	15	7.80	2.34	31	15	5.93	3.43	33	15	2.67	3.22	31
Other Nesting Shorebirds	15	9.00	1.14	31	13	9.15	1.14	29	13	7.92	2.18	34	12	5.33	3.37	35	13	0.92	1.38	44
Shelters & Pavilions	18	6.78	2.44	32	16	5.44	2.53	34	18	7.39	2.43	30	18	6.50	2.46	29	18	7.28	2.70	8
Parking Lots	15	8.00	2.42	33	15	5.33	3.83	35	15	7.13	2.56	33	15	7.53	3.04	30	15	7.13	3.44	11
Pedestrian Trails &	13	7.85	2.44	34	14	6.86	2.38	32	13	8.38	1.85	32	14	6.57	3.30	32	14	7.07	2.09	12
Beafort's Bottlenosed	10	8.20	2.58	35	11	8.09	2.59	33	10	7.70	2.63	35	10	3.30	3.62	42	11	1.09	1.92	45
Les & Sally's Env. Camp	8	8.50	2.14	36	8	5.25	3.77	38	8	6.75	3.15	37	8	6.38	3.42	37	8	3.38	3.54	39
Pipng Plover-Endangered	8	8.00	2.14	37	9	6.67	3.20	36	8	6.00	3.12	38	8	2.13	2.47	45	9	0.22	0.44	47
Harkers Island Marina	7	8.71	1.60	38	7	7.86	2.34	37	7	8.29	1.80	36	7	7.86	3.67	36	7	4.86	4.10	32
Maint. & Equip. Bldgs.	8	6.38	3.34	39	8	3.63	1.51	41	8	5.00	2.56	40	8	9.00	1.20	34	8	7.50	1.41	24
Sea-Beach Amaranth-EP	5	8.80	2.38	40	4	7.50	3.00	40	4	6.50	3.11	42	3	5.67	5.13	45	4	1.50	3.00	46
RV Dump Stations	8	5.25	3.88	41	9	3.11	3.95	42	9	4.89	4.20	39	8	5.75	3.77	39	9	7.56	2.88	20
Bridges	5	8.00	3.08	42	5	6.60	3.21	39	5	8.00	3.46	41	5	8.40	3.58	40	5	6.40	3.29	35
Fuel Storage Areas (4)	6	5.33	4.08	43	6	3.17	3.71	44	6	3.67	4.23	44	6	8.33	2.34	38	6	8.83	1.17	26
GI Generator Shed	4	7.00	2.45	44	5	1.20	1.10	47	5	2.00	1.58	46	4	5.50	4.80	44	5	9.20	0.84	29
Administration Building	4	6.00	4.32	45	4	3.00	4.76	45	4	4.25	4.19	45	4	9.25	1.50	41	4	8.25	1.26	33
Ranger Cabins at LP (2)	3	8.00	1.73	46	3	8.00	2.65	43	3	8.67	1.53	43	3	9.00	1.73	43	3	4.33	4.93	42
Ranger Cabins at GI Camps	2	6.50	2.12	47	2	4.00	1.41	46	2	2.50	0.71	47	2	7.50	2.12	47	2	8.50	0.71	41

CL=Cape Lookout, PV = Portsmouth Village, GI = Great Island,LP = Long Point, EP = Endangered Plant, Env. Environmental

Creation of a value space

Following the theoretical proposition that value is comprised of multiple types or dimensions of that value, and that these values can be expressed, relative to one another, in one space, a value space was created for the 47 rated resources at Cape Lookout. This concept was based partly on the work of Slovic et al (1981; 1986) in which the authors recognized that there were multiple dimensions to perceived risk. In their studies, 30 risks along 18 risk characteristics were used to produce two underlying abstract dimensions which they observed as characterizing dread and unknown. This current research created a similar space using these techniques to establish preference values for resources within Cape Lookout.

Mean ratings for each resource form distributional measures along each of the five value types and these data were then used as five variables to perform a factor analysis which seeks to combine the common variance of multiple variables into a smaller number of factors that are unique to one another and orthogonal in their relationships. Factor scores, which form the underlying data that creates factor loadings, can then be plotted to reveal an abstract multi-dimensional space that is standardized in all directions and based on the number of factors retained (Cohen, 2003).

In this case, as presented in Rogers and Bardenhagen (2010), a two factor model was produced as is shown in Figure 3. The illustration of the value space here is to explain the methodology used in this previous work. A more detailed discussion of factor analysis results and interpretation of the space will be undertaken in Chapter V.

Rotation

In this case, rotation was used to more clearly display the resulting structure of value data. Several orthogonal rotation options are available to achieve this including Varimax, Quartimax and Equamax as the most popular. In each case, the underlying data and variance explained remain unchanged, but the factor loadings are re-expressed in a way that factor loadings are larger on the few dominant factors. This can, in some cases, lead to loss of interpretable information where nearly identical cross-loadings on one variable are present and the rotation “assigns” the loading of that variable to one factor or the other. In this present case, Quartimax rotation was chosen due to the clarity of interpretation that it provided as well as the minimal effect that it had on cross-loadings (Osborne, 2008; StataCorp, 2001).

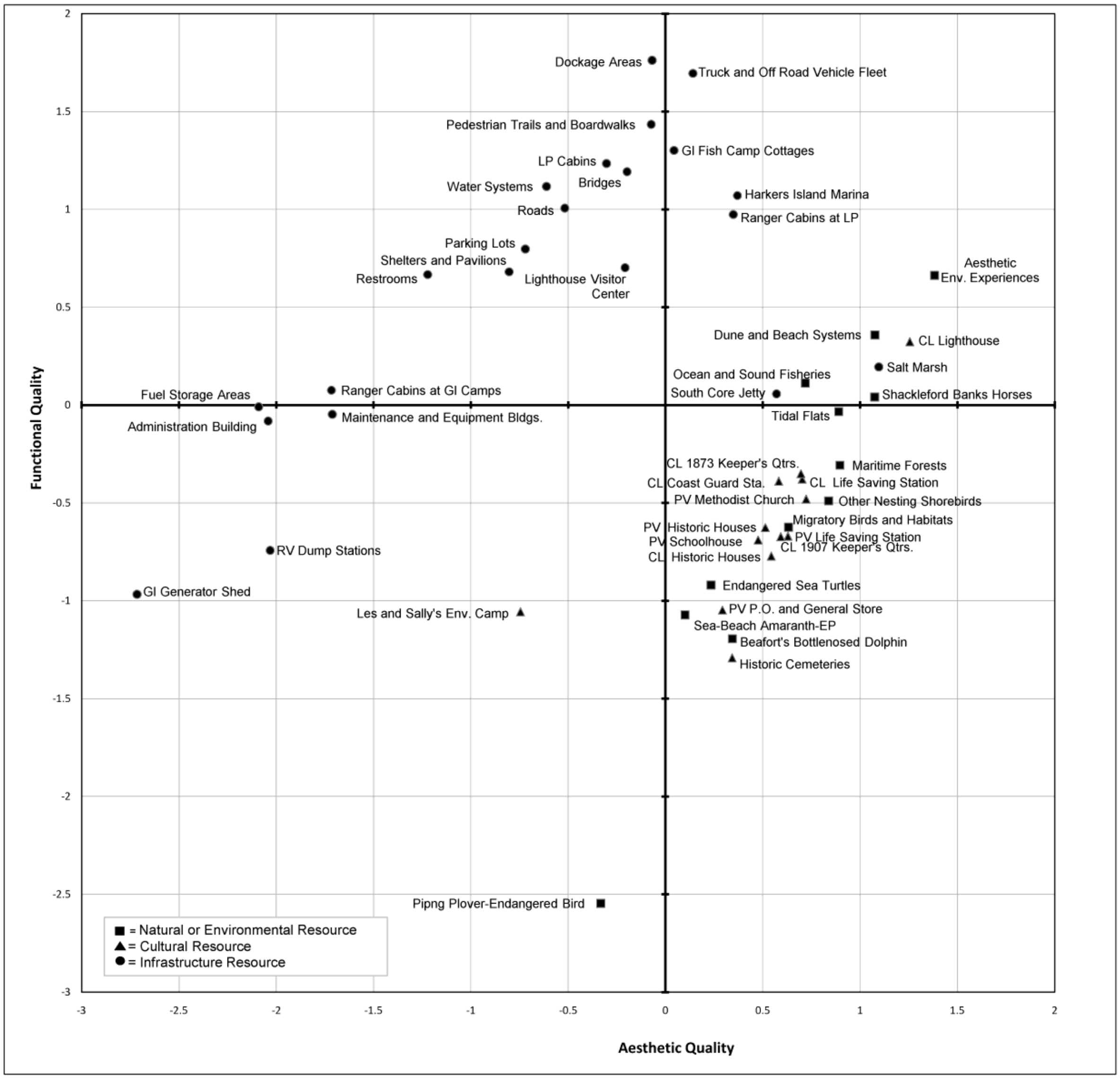


Figure 3. Value space for all respondents, (Rogers and Bardenhagen, 2010) adopted

Value spaces and movements among groups

As discussed in the literature review, stakeholder and interest groups tend to form and be focused on specific resource types and/or recreational opportunities. The sample of 153 respondents to the survey conducted at Cape Lookout reflects a diverse set of interest groups and the data associated with each group can be analyzed to observe similarities and differences in values that can then inform decision approaches. As a part of the survey, respondents were asked whether they are member of a provided list of 22 individual interest and stakeholder groups that are actively engaged with the park in some way. Respondents were also allowed to write in groups that they are members of that were not listed. From these responses, 17 groups were represented by at least two respondents that completed resource rankings in the survey as shown in Table 2. These 17 groups represented 118 of the 153 (77%) total respondents to the survey. Seven write-in groups were recorded (some multiple times) that were actually duplicates of listed groups and these were added to their appropriate listed group. An additional two groups, Local and Non-Local Respondents were created from the data based on their geographic proximity to the park and measured in GIS using ZIP code information provided by respondents. None of the write-in groups had two or more members that completed resource rankings.

Data limitations and a descriptive model approach

The method above describes how factor analysis can be successfully run and value spaces for self-reported groups as will be described below can be created from the resultant factor scores. However, the non-generalizable sample, smaller sub-sets of respondents in these groups and reduced sets of valued resources all challenge the utility of traditional hypothesis testing to create an explanatory model with these data. Factor analysis can be conducted as either exploratory or confirmatory. In exploratory factor analysis the underlying factor structure, those variables that cannot be measured directly, is sought without any prior conceptions of that structure. In the case of exploratory factor analysis, the end goal is to express and observe these latent and underlying structures and not to progress to hypothesis testing that presents relationships between input variables and the latent variables (Long, 1983; Mulaik, 1971). Once latent variables have been identified, confirmatory factor analysis can be used and through hypothesis testing, relationships between input variables and each factor can be explained (Kim and Mueller, 1978; Long, 1983). While in confirmatory factor analysis sample sizes of 200 or greater are generally sought, in exploratory factor analysis, strict rules regarding sample sizes are not in place (Mundfrom et al., 2005). Rather, some argue that high loadings should serve as a guide and suggest that minimum loadings should explain 10% or more of the variance with the other variables in each factor, which equates to a loading of .32 or greater. Further, with fewer than three items in each factor, levels of .50 should be sought (Osborne, 2008). The data examined herein presented clear loadings for each factor and allowed a loading threshold of .50 to be used.

Further there is a controversy in the literature about the level of interpretation that can be gained (based on the limited hypothesis-testing abilities) from the use of factor analysis. One view as summarized in Grice (2001) postulates that factor scores that represent estimates have issues of indeterminacy in that differing results can be computed from the same data, thus ruling out hypothesis testing of factor results. An opposing view argues that even if some elements of factor analysis are based on estimates or are coarse in nature, when performed in a consistent manner, it remains a helpful tool in uncovering previously unobservable relationships and latent variables that would not be observable when looking at often numerous input variables (Loehlin and Kroonenberg, 1999; McIntire and Miller, 2007). The work in this dissertation seeks to uncover these unobserved relationships and approaches these limitations in a manner best explained by Gorsuch (1974) . In his text on factor analysis, he argues that interpretations of exploratory factor analysis are *post-hoc* and that no interpretation should be regarded as final, but rather as indications of relationships that lead to further analysis. These further analyses can be to confirm the initial factor interpretations with more robust data or to inform future analyses through different methodological approaches.

The work undertaken both in the development of value spaces by Rogers and Bardenhagen (2010), and in the further analysis of the effects of groups and resource change is inherently a pilot study to ascertain the ability to value resources relative to one another in a standardized Euclidian space, outside of the traditional methods of ecological economics as discussed in Chapter II. This study approaches the research questions posed in Chapter III, through descriptive techniques that seek to identify trends in value movements and relationships that can provide insight to decision makers and to become the basis for future explanatory research with broader samples. As well this methodology, as noted in Rogers and Bardenhagen (2010), and herein, is intended to provide an additional tool for assessment of resource value, that can be used in conjunction with other methods described in Chapter II.

Table 3. Group affiliations as identified by respondents

Group Name	Number of Responses	Number of Resources Rated
Local Respondents*	70	40
Non-Local Respondents*	55	42
Core Sound Waterfowl Museum	37	34
Fishing Groups**	19	32
Business Associations***	14	26
Friends of Portsmouth Island	14	22
Friends of CALO NS	12	26
Foundation for Shackleford Horses	7	25
NC Coastal Federation	7	28
Boy Scouts of America	6	30
Girl Scouts of America	4	26
OuterBanks Lighthouse Society	3	18
NC Maritime Museum	3	17
Outer Banks Preservation Association	2	16
Carteret Wildlife Club	2	13

* Local respondents include those within a 20 mile buffer area of any part of the park boundary, Non-Local Respondents include all outside the 20-mile buffer area.

** Fishing Groups is a result of the aggregation of four similar fishing-related groups

*** Business Associations is a result of the aggregation of two business-related groups

<u>Group selection criteria and rationale</u>

In order to perform analyses of group value structures and comparisons between groups, the first eight groups shown in Table 3 were chosen plus the full sample of all respondents. These groups were chosen based on four criteria. First, as driven by the theory that groups with differing stated missions and focus will have differing value structures, diversity among groups was considered. Second, the degree to which overlaps in the resources that groups chose and rated was considered. Third, greater numbers of respondents within each group was preferred. Fourth, results from factor analysis from each group needed to return two factors and factor loadings along those two dimensions were to be similar and not opposed to each other. Table 4 illustrates these criteria for each group included in initial analyses.

Table 4. Groups chosen for analysis

Group Name	Number of Responses	Resources shared with all other groups	Factor 1 Loadings		Factor 2 Loadings	
All Respondents	153	100%	Beauty Character Visitation	.98 .90 .86	Operations Replace	.73 .52
Local Respondents	70	89%	Beauty Character Visitation	.88 .75 .68	Operate	.65
Non-Local Respondents	55	85%	Beauty Character Visitation	.97 .89 .81	Operate Replace	.73 .55
Core Sound Waterfowl Museum	37	72%	Beauty Character Visitation	.92 .88 .65	Replace Operate	.71 .67
Fishing Groups	19	68%	Beauty Character Visitation	.97 .73 .54	Operate	.72
Business Associations	14	55%	Beauty Character	.91 .57	Visitation Operate	.62 .60
Friends of Portsmouth Island	14	55%	Beauty	.87	Visitation Operate Character	.79 .75 .71
Friends of CALO NS	12	53%	Beauty Character	.86 .74	Operate Visitation	.77 .76
Foundation for Shackleford Horses	7	47%	Beauty Character	.91 .76	Operate Replace	.70 .59

<u>Examination of commonly held resources</u>

In order to address the first research construct, that *different groups will present differing value spaces*, several aspects of group values, as depicted in value spaces, will be analyzed. As a first step in comparing value spaces among selected groups, an examination of commonly held resources among groups will be undertaken. Part of this is reflected in Table 3 above as the percentage of resources shared with other groups.

Specific resources commonly held by all chosen groups and smaller sub-sets of groups will be presented. This question will be examined by first observing the specific resources and resource types that are shared by declining numbers of groups. The theory that visibility and interactivity of resources plays a role, will also be discussed.

Next, an analysis of the percentage of groups sharing value for a resource and the distance from a mean value will be undertaken. More specifically, how tightly do the values cluster around the mean as shared value increases? In this case, the mean value is represented by the location in the value space for "all respondents" and can be considered as a centroid of values. The distance between this centroid value point and that of a specific group can be simply calculated as the length of the hypotenuse of a hypothetical triangle resulting from the X and Y distances away from the centroid. This is calculated through Microsoft Excel® formula based on Equation 1.

Equation 1.

$$d=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$$

where x_i, y_i describe any single point in the XY space.

Specifically, this examination will look to see whether resources that are shared by a greater proportion of groups will have smaller average distances from the centroid, and thus, more compact and stable values. It is important to note that if the total of respondents within all groups equaled "all respondents" (i.e. everyone was a member of one group), then this centroid point would, by definition, be observed as the mean of all values. In this analysis, however, due to some respondents not completing all ratings, low group respondent representations and many individuals not belonging to a group, this centroid cannot represent the true mean of the groups being observed.

Value ranges for resources

A second way to look at the relationships of groups to value spaces is to look to see whether resources that occupy a more positive position in the value space exhibit a more concentrated values among groups. More concentrated values would represent an inherent stability in how the particular resource is valued, and thus greater value consensus, while more diffuse ranges of values would represent less stability and consensus. In order to do this, values for specific resources and by individual groups will need to be plotted within a value space. As previously discussed, the resulting factor scores for each resource becomes a set of XY coordinates that represent its place in the value space. When looking to observe the values of specific groups, each group's factor scores (XY) for that resource can be plotted in a two dimensional value space. When all are plotted, the resulting field of points can be observed as the *Value Range* for that resource across all groups. To determine the boundary of this range, the minimum area containing those points, known as a minimum convex polygon, is fitted around each of the data points. In this way, the resulting polygon can be best described as "stretching a rubber band" around the point field. Each point on this perimeter becomes the vertex of the resulting irregular polygon and points that lie within the polygon still contribute to the range, but do not extend its boundaries. The value point for the centroid is again used as a reference to compare the location of and size of the value range to this point. If there were a case in which every respondent was associated with a group, then by definition the centroid would lie inside the value range polygon. Not all respondents, however, can be expected to be a part of an organized group, and thus, not all centroids will fall inside a value range polygon, though the. Minimum convex polygons for each resource that is fully shared across groups will be calculated in Microsoft Excel® using a function based on the following Equation 2.

Equation 2.

$$\hat{A} = \frac{[x_1(y_n - y_2) + \sum_{i-2}^{n-1} x_i\,(y_{i-1} - y_{i+1}) + x_n(y_{n-1} - y_1)]}{2}$$

where x_i, y_i describe any single point in the XY space (White and Garrott, 1990).

An example of this technique, though through a drawn, not a calculated polygon, is presented in Slovic et al. (1986) and used to qualitatively explain the relative size of the hazard value ranges, their locations within the value space and the amount of overlap with other hazards. This method of calculating a minimum convex polygon is also used as a tool to effectively express the home ranges of animals. Criticisms of the method include that it considers only an abstract space, that is unable to reflect geographical limitations such as physical barriers to animal movement, and that it is sensitive to non-matching sample sizes (White and Garrott, 1990). The inherent abstract nature of the value space and consistent numbers of groups that are plotted negates these concerns. Figure 4 illustrates a simple minimum convex polygon for three resources.

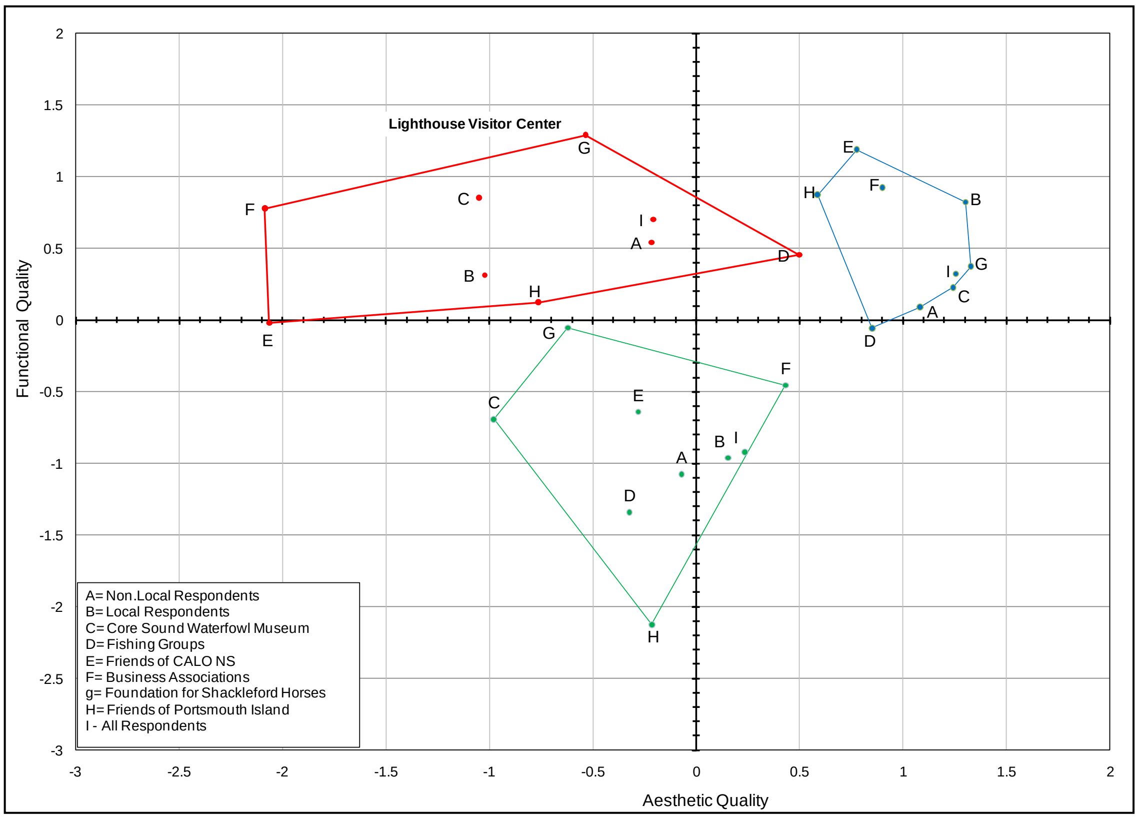


Figure 4. Value ranges for three resources

Comparing value ranges

When looking to compare value ranges for resources, two basic indicators can provide insight to decision makers considering actions that will affect these resources. First, the size of the polygon serves as an indicator of the stability of the value for a resource across groups. Smaller value ranges reflect a more homogeneous value for that resource while larger value ranges indicate real differences in how individual groups value a resource. Second, the location of that value range provides information as well. Does the value range polygon remain in largely positive, or negative, areas of the value space? Is it positive for one factor, but negative for the second factor?

More specifically, is there a relationship that can be observed in the location of the value centroid and the size of the resulting value range polygon as the mean moves from positive areas of the value space to negative areas? To address these questions, the area of each minimum convex polygons created for all shared resources will be calculated in Microsoft Excel® using a function based on the Equation 3.

Equation 3.

$$\frac{(x_1y_2 - y_1x_2) + (x_2y_3 - y_2x_3) \ldots + (x_ny_1 - y_nx_1)}{2}$$

where x_i, y_i describe any single point in the XY space *(Page, 2009).*

Value range areas can then be compared to corresponding centroid locations with respect to individual factor scores or combined (XY) locations within the value space in order to see if the proposed relationship of greater concentration of values as resources become more positive is observed.

Comparing specific stakeholder groups

A third method by which changes in value spaces among groups will be to look at individual resources to observe differences between distinct groups. As discussed in theory, different groups will exhibit different values for specific resources and that these differences will be greater for groups with more divergent group missions and specializations. As a means of determining more the differences between specific resource values held by stakeholder groups, pairs of groups will be compared. Table 5 lists the specific groups that will be used in these comparisons.

Table 5. Paired groups chosen for direct comparison

Group Name	Number of Responses	# Shared Resources	Resource Types		
			Cultural	Natural	Infrastructrure
Local Respondents*	70	36	12	11	13
Non-Local Respondents*	55				
Fishing Groups**	19	19	12	5	2
Business Associations***	14				
Friends of Portsmouth Island	14	20	13	5	2
Foundation for Shackleford Horses	7				
* Local respondents include those within a 20 mile buffer area of any part of the park boundary, Non-Local Respondents include all outside the 20-mile buffer area.					
** Fishing Groups is a result of the aggregation of four similar fishing-related groups					
*** Business Associations is a result of the aggregation of two business-related groups					

These groups represent a variety of differing missions and group specializations that can explore relationships put forth in theory. The first pairing, local and non-local respondents are not based on self-reported data, but rather derived from responses to a survey question of a respondent's ZIP code. A buffer of twenty miles from the perimeter of the park was created and ZIP code centroids used to determine whether a respondent was considered local or non-local. This analysis seeks to understand whether there are sizeable shifts in value for certain types of resources depending upon a respondent's location. Next, the Friends of Portsmouth Island and the Foundation for Shackleford Horses reflect differences both geographically, (e.g. each group focuses on resources found at the opposite ends of the 90 km long collection of islands) and on largely cultural versus natural resources. Finally, Fishing Groups and Business Associations will be examined between these groups that are either recreationally focused or business/tourism oriented.

Value ranges will be created for the resources shared between each chosen pair of groups and polygons will represent all resources chosen by each group. Areas will again be calculated and differences or similarities between the value range size and location within the value space will again be examined. To more clearly understand differences between groups, actual value locations for shared resources will be compared by calculating the Euclidean distance between each set of paired values. This raw distance will then be used to separate into groupings those resources that are very similarly valued, those moderately similar and those that exhibit divergent values. Because the value spaces and specific resources will be illustrated graphically as well as in a table format, it will also be possible to understand whether divergent values are a result of differences in one single factor or a combination of two factors within the value space. Finally, resources that are uniquely valued by each group can be expected to present interesting findings with respect to the specific focus of each group. These will again be presented within the graphic value spaces as well as in a table format. Differences in values for specific resources and the potential to influence public participation and decision process efforts will be discussed in Chapter V. Findings.

Value space movements due to resource base changes

As discussed in the literature review and in theory, the unique resources that make up a place are integral to the values that individuals express for that place. The sample of 153 respondents to the survey conducted at Cape Lookout provided ratings for 47 distinct individual or resource sets. The second research construct put forth in Chapter III states that *changes in resources will bring about changes in value spaces.* Using the value space created for all respondents as a reference, changes to the value space as a result of loss of resources within that space can be observed. To do this, several resource loss scenarios will be presented including the following:

1. Major loss of cultural resources on Portsmouth Island due to a storm event such as a direct hurricane impact to the northern portion of Cape Lookout that spares resources southern park resources. Portsmouth Village represents a vitally important set of historic homes and structures within a landscape that presents a portrait of some of the early cultural history of the outer banks region of North Carolina. Loss of these structures and this historic landscape would be considered an irreversible loss.

2. Major loss of natural resources as a result of human actions such as a major spill or other drastic change to the ocean and sound waters (e.g. oil spill or creation of a dead zone, etc.) surrounding Cape Lookout. In a scenario such as this, sensitive flora and fauna such as salt marshes, endangered species, ocean and sound fisheries and shorebirds would be severely impacted and subject to long-term losses.

3. Loss of rental cabins and other infrastructure resources for overnight park use as a result of recreational use policy changes. A change such as this would not represent a physical loss of resources, but rather a loss of resource availability. Loss of two cabin camp areas and support infrastructure, RV facilities and parking lots could be expected with a policy change such as this.

4. Two further scenarios depicting disastrous impacts (broader in geographic and physical scope than scenarios 1-3) that affect northern and southern areas of the park. These could be expected to fundamentally change the physical and cultural aspects of the park.

It should be noted that in each of the scenarios described above, these methods will look for observations related to resource *loss*. However, it is reasonable to believe that resource *gain* would also have an effect on value spaces in scenarios that add resources. These data, however, do not present a clear way to explore this concept.

For each scenario, value spaces will be created for all post-scenario resources. Within a single value space illustration, individual value ranges will be depicted for the all (47) resources as well as for remaining resources (post-impact). These will be constructed, and areas calculated for each, as previously described. Pre- and post-loss value space locations for included resources will also be included. In order to observe the distance of the change in value space location (pre to post-loss), Euclidean distances will again be calculated using the method described previously. These calculations will use the pre-loss value location for each resource as the reference and calculate the distance to the post-loss location. Results and discussion of these scenarios are presented in Chapter V.

CHAPTER V

FINDINGS OF SHARED VALUES

In this chapter, two sets of findings will be presented. First, findings and discussion of the creation of a value space for all respondents will be discussed. Second, commonly-valued resources among all self-reported and data-derived groups will be examined.

Value space for all respondents

The first assessment to be discussed is the formation of a value space for all respondents to the survey described in Chapter IV. A brief description of the findings follows, though greater detail can be found in Rogers and Bardenhagen (2010).

As was expected, when looking at the ratings for each of the value types, importance to character, scenic beauty visitation and operations received the highest average ratings of 8.2, 7.2, 7.5 and 6.7 respectively. This follows the reasoning that resources were selected by respondents as those they felt were most important to the park. As well, ability to be replaced had an average rating of 3.8, which follows the reasoning that respondents felt that many of their top-ten resources were not easily replaced.

Factor analysis results for all means (found in Table 1, descriptive statistics) revealed two factors with eigenvalues of 3.230 and .887, respectively. Factor one was driven by scenic beauty, character and visitation with loadings of 0.98, 0.90, and 0.86 respectively. This factor explained 80.7% of the variance in the value space. Factor two accounted for the remaining variance (22%) and was driven by operations and the ability to be replaced with loadings of 0.521 and 0.728 respectively. Table 6 below includes results of the factor analysis.

Table 6. Factor loadings for the value-space of mean ratings using quartimax rotation, (Rogers and Bardenhagen, 2010) adopted

	Mean Ratings	
	Aesthetic Quality Factor 1	Functional Quality Factor 2
Eigenvalue	3.23	0.887
Character	0.901	0.001
Scenic Beauty	0.98	-0.074
Visitation	0.864	0.284
Operations	-0.208	0.728
Replaceable	-0.818	0.521
Variance Explained	0.807	0.222

Cronbach's Alpha = 0.84
Shaded cells contain loadings >.05, which reflects loadings that dominate the factor.

A graphic representation of the value space was obtained by using the retained factor scores as XY points plotted in a standardized-space. The location of each resource is represented relative to all other resources and all resources by value type can be found in Figure 5 below.

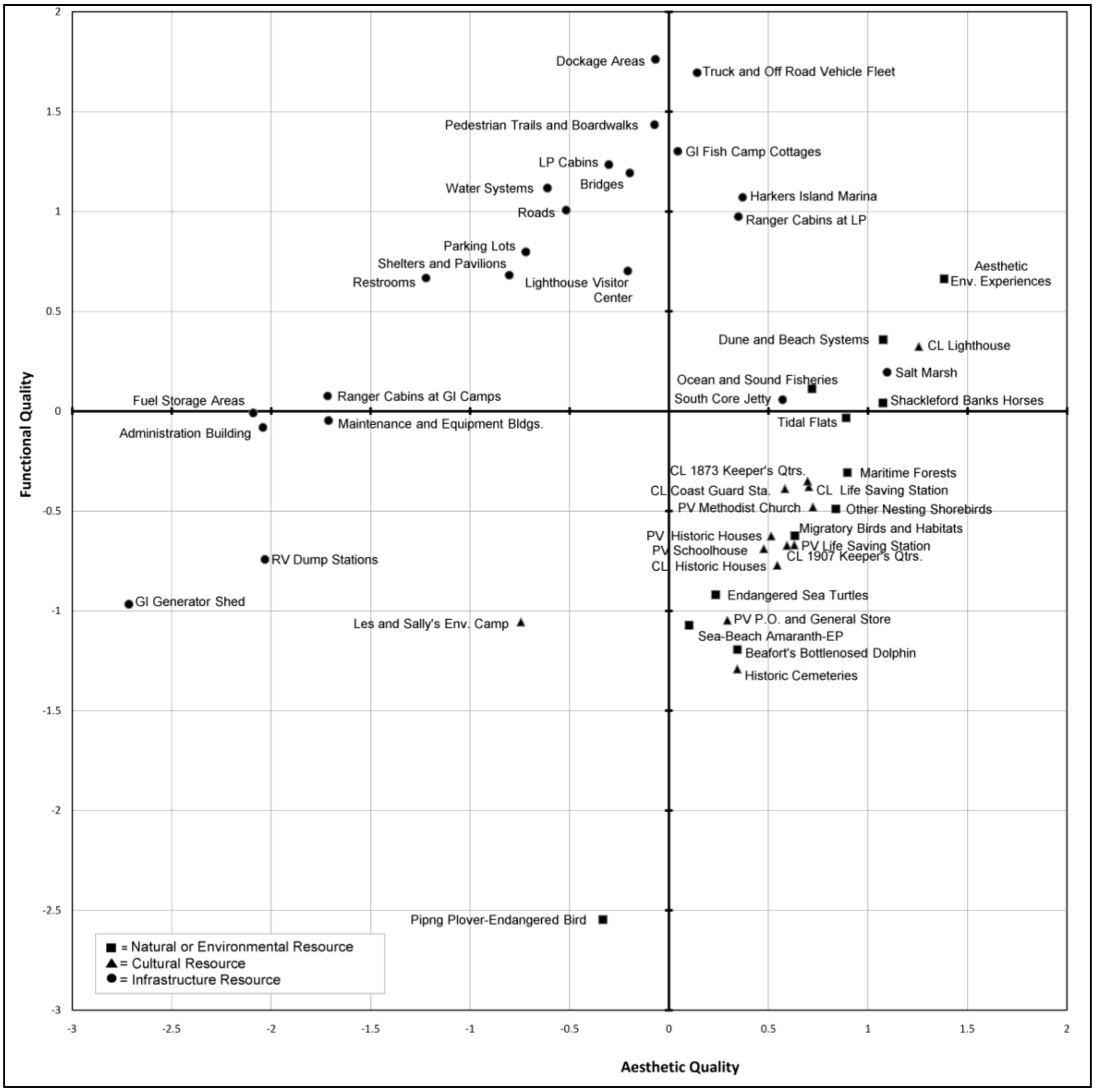


Figure 5. Value space for all respondents, Figure 3 revisited, (Rogers and Bardenhagen, 2010) adopted

In this value space, the X-axis, representing factor one, which is driven by beauty, character and visitation, appears to reflect a measure of aesthetic quality. Along this continuum, resources on the left side of the axis such as maintenance sheds, storage and disposal areas and infrastructure buildings reflect limited aesthetic quality. On the other hand, the resources on the right portions of the axis exhibit high degrees of aesthetic quality as found in the Shackleford Banks Horses, Cape Lookout Lighthouse, Salt Marshes and Dune and Beach Systems found here.

Along the Y-axis, functional quality is represented, with resources such as dockage, roads and cabins reflecting highly positive values; and fragile resources including the Piping Plover (*Charadrius melodus*), Beaufort's Bottlenose Dolphin (*Tursiops truncates*) and Historic Cemeteries reflecting negative values.

Looking at types of resources, some patterns also emerge. In this Euclidian space, the upper left quadrant is occupied solely by infrastructure resources. Cultural resources, along with many environmental resources, dominate the lower-right quadrant. Endangered species tend toward the middle of the aesthetic quality but are extremely low on functional quality as reflected in their importance to operations and ability to be replaced. These patterns provide illustrations in how various resource types are valued and the impacts differing impacts that they have on visitors to Cape Lookout. With a majority of both cultural resources and natural resources occupying the lower right quadrant of the space there are great areas of overlap, suggesting interdependencies among resources. When comparing specific resources such as the Shackleford Banks Horses, Cape Lookout Lighthouse, Dune and Beach Systems, Tidal Flats, and Salt Marshes, which are all found in the upper-right quadrant (positive in both dimensions), it can be said that impacts to these resources are likely to directly impact visitor experiences. At the same time, endangered or rare resources such as the sea turtles, Piping Plover and Historic Cemeteries have negative functional qualities and near zero aesthetic quality. This seems to express the fact that these resources are in many ways irreplaceable, they are also less likely to be experienced by most visitors, and thus would less directly impact visitor experiences.

This method represents a way to value resources individually, yet within the context of the place. Identified and rated resources, whether uniquely valued or interconnected, become the "capital" upon which the park draws in order to create sets of visitor experiences all combine to make Cape Lookout more than just the sum of all resources (Hawken et al., 1999). The worth of the value space is in its ability to present patterns of relationships between resources relative to one another that can inform resource management, long-range planning, and policy.

Commonly valued resources

As driven by theory, important decision information can be obtained by observing the values that stakeholder groups hold. Recreational and stakeholder groups form in order to take part in recreational opportunities and cultural offerings afforded by the resources present in the park. Many also exist for the purpose of protecting these resources and the ability of future generations to gain from the services that the resources provide. Thus, an initial examination into the resources that are valued commonly by some or all groups can provide insight into which resources form a "core" set of resources that significantly contribute to the unique character and experiences of the park. This discussion will also look at the resource types that are commonly valued. Each of the groups discussed in Chapter IV and listed in Table 4, fit most or all of the criteria discussed that allow for meaningful comparisons between and among groups to be pursued and are used herein.

For the first set of analysis, the degree to which each group shares values for resources in common with other groups (regardless of where that actual value lies in the value space), is an important consideration. Table 7 below illustrates the resources rated (held in some value) by each of the groups being considered. The "All Respondents" group is included in the table, and indeed all resources are represented in this group, however, by definition, its represented resources are the product of each of the groups below it and not included in the discussion following.

Table 7. Shared resources by group

	Group	Resources Shared with All Other Groups (%)
	All Respondents	100%
	Non-Local Respondents	89%
	Local Respondents	85%
Self-Reported Groups	Core Sound Waterfowl Museum	72%
	Fishing Groups	68%
	Friends of CALO NS	55%
	Business Associations	55%
	Foundation for Shackleford Horses	53%
	Friends of Portsmouth Island	47%

Resource	# Groups	Percent of Eight Groups Sharing Resource
Lighthouse Visitor Center	8	100%
PV Schoolhouse	8	100%
PV Methodist Church	8	100%
PV P.O. and General Store	8	100%
PV Life Saving Station	8	100%
PV Historic Houses	8	100%
Historic Cemeteries	8	100%
CL Lighthouse	8	100%
CL Life Saving Station	8	100%
CL 1873 Keeper's Qtrs.	8	100%
CL 1907 Keeper's Qtrs.	8	100%
CL Coast Guard Station	8	100%
CL Area Historic Houses	8	100%
Endangered Sea Turtles	8	100%
Shackleford Banks Horses	8	100%
Dune and Beach Systems	8	100%
Salt Marsh	8	100%
Tidal Flats	8	100%
Restrooms	7	88%
LP Cabins	7	88%
Les and Sally's Env. Camp	6	75%
Shelters and Pavilions	6	75%
Maritime Forests	6	75%
Ocean and Sound Fisheries	6	75%
Migratory Birds and Habitats	6	75%
GI Fish Camp Cottages	5	63%
Aesthetic Env. experiences	5	63%
Dockage Areas	5	63%
Pipng Plover-Endangered Bird	4	50%
Other Nesting Shorebirds	4	50%
Beafort's Bottlenosed Dolphin	4	50%
Roads	4	50%
South Core Banks Jetty	4	50%
Parking Lots	3	38%
Pedestrian Trails and Boardwalks	3	38%
Water Systems	3	38%
Truck and Off Road Vehicle Fleet	3	38%
Maintenance and Equipment Bldgs.	2	25%
GI Generator Shed	2	25%
Fuel Storage Areas	2	25%
RV Dump Stations	2	25%
Harkers Island Marina	2	25%
Administration Building	1	13%
Ranger Cabins at LP	1	13%
Ranger Cabins at GI Camps	1	13%
Bridges	1	13%
Sea-Beach Amaranth-EP	0	0%

What is immediately observable is that 18 resources out of the total of 47 (38%) are commonly held by all groups. These include 11 of the 12 total cultural resources (92%), 5 of the 13 natural resources (38%) and only one infrastructure resource of 21 total (5%). Resources held in some value by all groups observed are listed in Table 8 below.

Table 8. Resources chosen and rated by all groups

Cultural Resources	Natural Resources	Infrastructure Resources
PV Schoolhouse	Endangered Sea Turtles	Lighthouse Visitor Center
PV Methodist Church	Shackleford Banks Horses	
PV P.O. and General Store	Dune and Beach Systems	
PV Life Saving Station	Salt Marsh	
PV Historic Houses	Tidal Flats	
CL Lighthouse		
CL Life Saving Station		
CL 1873 Keeper's Quarters		
CL 1907 Keeper's Quarters		
CL Coast Guard Station		
CL Area Historic Houses		
Historic Cemeteries		
Note: CL= Cape Lookout, PV= Portsmouth Village		

Looking at resources shared by at least five of the eight, or 63% of groups, another ten resources (total 60%) are added. All cultural resources are now included within this stratum, as well as four additional natural resources (for a total representation of 69%), and an additional four infrastructure resources (for a total representation of 24%) within this stratum. These resources are listed in Table 9 below.

Table 9. Resources chosen and rated by five of eight groups

Cultural Resources	Natural Resources	Infrastructure Resources
Les and Sally's Environmental Camp	Maritime Forests	Restrooms
	Ocean and Sound Fisheries	Long Point Cabins
	Migratory Birds and Habitats	Shelters and Pavilions
	Aesthetic Environmental experiences	Great Island Camp Cottages
		Dockage Areas

Understanding that 18 of 47 rated resources were commonly valued by all groups points to these resources as being the most visible, most able to be interacted with, and most highly regarded resources that impact the quality of a visitor's experience at Cape Lookout. This presents a first level of information to decision makers as they consider the implications of planning and policies that may affect access to or protection of these resources. This does not negate the effects of less-shared resources or the ways in which they support these 18 resources, but it points to the importance of these top resources as visible icons that reflect the character of the park. Indeed, it could be argued that resources far less commonly valued such as roads, dockage or bridges play just as significant a role in the visitor experience due to their value as connecting infrastructure. The framing of policies and decision processes, however, should focus on the ways in which theses support, protect or enhance the access and experience of the commonly shared and highly valued resources discussed above.

CHAPTER VI

FINDINGS OF GROUP VALUE DIFFERENCES

In this chapter, two sets of findings will be presented, both of which seek to observe relationships of shared values and their locations or movement within a value space. The first asks whether more highly-shared resources hold tighter concentrations of value in the space relative to less-shared resources. The second asks whether resources that have more positive value locations in the space exhibit tighter concentrations of value relative to resources with more negative value space locations.

Shared resources and concentrations of value

In the preceding chapter, resources were only characterized as being commonly valued, regardless of where that value was placed within a resulting value space. It is important, however, to understand whether or not a resource's being commonly held has any relationship to how closely the specific value space locations are to one another. So, to revisit the question raised in methods is: what is the relationship between the percentage of groups that share values for a resource and the average distance from the mean? Here, the mean value for each resource is represented by the XY value of "all respondents", or the centroid, which becomes a 0,0 point from which the distance for each group's XY value point is measured. In this portion of the analysis only self-reported groups (6) are used in the calculations as the Non-Local and Local Respondents groups are dichotomous and all inclusive products of the data. Thus, if they were counted along with self-reported group values, double counting would occur. Distances from the centroid for each resource by group and their averages are shown in Table 10. This table also illustrates, in the left and right columns, strata that separate resources by the degree to which they are shared across groups from those shared by all six groups to those shared by two or less groups.

Table 10. Value distances from the mean by resource, group sharing strata and resource type

		Self-Reported Groups								
Strata	Resource	Core Sound Waterfowl Museum (C)	Fishing Groups (D)	Friends of CALO NS (E)	Business Associations (F)	Foundation for Shackleford Horses (G)	Friends of Portsmouth Island (H)	Average Distance from Centroid	Average Distances by Resource Type	Stratum Average Distance
18 Resources Shared by 6 Groups - 100%	Lighthouse Visitor Center	0.854	0.747	1.992	1.879	0.673	0.801	1.158	1.158	0.714
	PV Schoolhouse	0.549	0.319	1.550	1.032	1.176	0.420	0.841	0.629	
	PV Methodist Church	0.336	0.212	0.738	0.385	1.144	0.695	0.585		
	PV P.O. and General Store	0.578	0.210	1.538	0.163	0.388	0.519	0.566		
	PV Life Saving Station	0.274	0.350	0.655	0.868	0.218	0.655	0.503		
	PV Historic Houses	0.328	0.739	0.799	1.024	0.948	0.246	0.681		
	Historic Cemeteries	0.981	0.339	2.014	0.228	0.782	0.695	0.840		
	CL Lighthouse	0.095	0.554	0.990	0.699	0.089	0.866	0.549		
	CL Life Saving Station	0.344	0.840	0.497	0.462	0.920	0.093	0.526		
	CL 1873 Keeper's Qtrs.	0.446	0.490	0.908	0.489	1.182	0.489	0.667		
	CL 1907 Keeper's Qtrs.	0.587	0.607	0.764	0.612	0.371	0.372	0.552		
	CL Coast Guard Station	0.435	0.340	0.317	0.597	0.673	0.448	0.468		
	CL Area Historic Houses	1.131	0.555	0.567	1.132	0.491	0.723	0.766		
	Endangered Sea Turtles	1.235	0.699	0.585	0.504	1.217	1.286	0.921	0.830	
	Shackleford Banks Horses	0.255	1.678	1.072	0.836	0.474	0.559	0.812		
	Dune and Beach Systems	0.178	0.434	1.232	0.904	0.569	1.164	0.747		
	Salt Marsh	0.493	0.630	0.758	0.739	0.684	1.030	0.722		
	Tidal Flats	0.122	0.919	0.497	0.735	2.250	1.169	0.949		
5 Groups 83%	Restrooms	1.042	0.472	2.177	0.743		2.176	1.322	1.266	1.272
	LP Cabins	1.063	0.981		0.592	2.204	1.212	1.211		
	Les and Sally's Env. Camp	1.492		1.114	0.867	2.257	0.692	1.284	1.272	
4 Groups 67%	Shelters and Pavilions	0.437	1.084		2.080	0.414		1.004	1.004	0.750
	Maritime Forests	0.077		0.680	0.349	1.551		0.664	0.666	
	Ocean and Sound Fisheries	1.252	0.192		0.892	0.839		0.794		
	Migratory Birds and Habitats	0.269		0.278	0.884	0.729		0.540		
3 Groups 50%	Dockage Areas	0.649	0.364			1.804		0.939	1.035	0.936
	GI Fish Camp Cottages	1.520	0.834				1.038	1.130		
	Aesthetic Env. experiences	0.673		0.709	0.504			0.629	0.838	
	Pipng Plover-Endangered Bird	1.177		0.919				1.048		
2 or Less Groups - Less than 50%	Other Nesting Shorebirds	0.403		0.713				0.558	1.248	0.925
	Beafort's Bottlenosed Dolphin	2.465		1.411				1.938		
	Sea-Beach Amaranth-EP									
	Roads	1.645	0.884					1.264	0.853	
	South Core Banks Jetty	0.917	1.007					0.962		
	Parking Lots		0.127					0.127		
	Pedestrian Trails and Boardwalks	0.476						0.476		
	Water Systems		0.190					0.190		
	Truck and Off Road Vehicle Fleet		0.264					0.264		
	Maintenance and Equipment Bldgs.									
	GI Generator Shed		0.936					0.936		
	Fuel Storage Areas		1.986					1.986		
	RV Dump Stations									
	Harkers Island Marina		1.473					1.473		
	Administration Building									
	Ranger Cabins at LP									
	Ranger Cabins at GI Camps									
	Bridges									

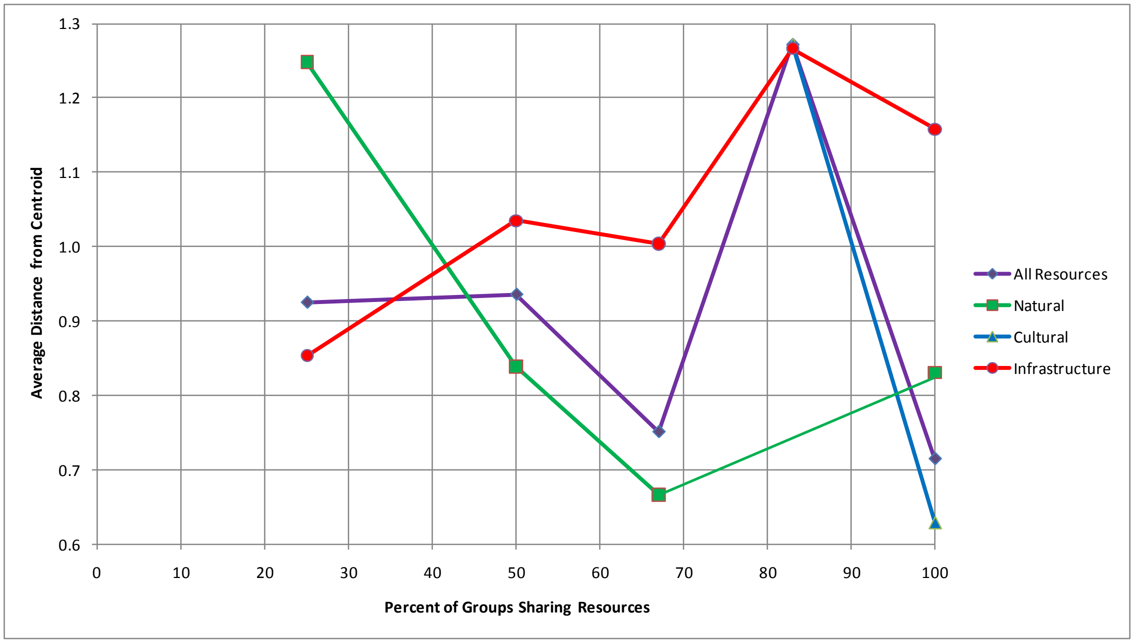


Figure 6. Group sharing of resources and compactness of values

Figure 6 above, is based on the average (across all groups) distances from the centroid for specific resource types, found in Table 7. In this plot, the X-axis represents the percent of groups that share a each resource type (natural, cultural, infrastructure and all combined), and the Y-axis represents the average distance for each of those types from the centroid. Points on each trend line represent the different strata listed in Table 7. This seeks to uncover any relationships between the degree to which resource types are shared and how closely their respective values lie in relation to the centroid. In this plot, No consistently clear pattern is evident to show that as more groups share a resource type, the values of each group will be more concentrated around the centroid. However, several observations can be made. While infrastructure resources appear to tend toward larger and less concentrated values as the percent shared increases, the two upper strata of sharing (83% and 100% shared) each include only one resource and thus it is not possible to ascertain whether the apparent trend toward less concentrated values as sharing increases would hold up if additional infrastructure resources were included at that level. Cultural resources, as described above are wholly contained within these two strata, and thus the concentration of 92% of cultural resources being shared by 100% of observed groups is more telling than the indication that there is a trend toward concentrated value as sharing increases. Indeed, the values are already concentrated and so movement is limited. Natural resource values, on the other hand, do appear to become more concentrated as sharing increases. These resources are more evenly spread among the strata and trend toward more concentrated values around the centroid until 67% of groups share these natural resources, at which point values tend to become less concentrated. Of the three resource types, natural resources exhibits the most even distribution across group strata, strengthening the observation of an overall trend toward more concentrated values. Finally, looking at all resources grouped together, no definitive trend appears as the degree to which resources are shared increases. The dramatic decline, or concentration, from 83% of groups to 100% of groups can be explained by the appearance of resources that have largely dispersed values in the 83% strata (i.e. restrooms, LP Cabins and Les and Sally's Env. Camp) moving to the high concentration of cultural resources in the 100% strata that is highly concentrated.

While the theory that as resources are more shared among groups, values for those resources will become more concentrated; is not generally observed with these data. The characteristics of highly shared and concentrated values for cultural resources was observed. Natural resource values exhibited a trend of concentrating values as sharing increased. Infrastructure resources, however, did not exhibit a meaningful trend beyond its notable absence in the strata that represent greater degrees of sharing. The tight clusterings of cultural and natural resources among the most commonly valued, however, does provide information for management and decision processes. It appears that visibility and the ability to interact with resources, as discussed in theory, have a great influence on how resources are shared among groups.

Shared resources and locations within the value space

Next, combined group values are observed for natural and cultural resources to see whether resources that have more positive value locations in the space exhibit tighter concentrations of value relative to resources with more negative value space locations. To do this, the range of values that the combined groups hold for individual natural or cultural resources must be quantified. As previously discussed, the factor scores for each resource becomes a set of XY coordinates that represent its place in the value space. When each group's point is then plotted, the resulting field of points can be observed as the *value range* for that resource across all groups. Creation of value ranges are discussed in Chapter III, Methods. A value range represents the minimum space that includes values for each of the six self-reported groups included in the analysis. Again, the centroid point, representing the value of "all respondents" in the value space is used as a reference. To observe this, the 18 resources commonly held by all groups are used and discussion of these findings is divided into natural resources and cultural resources. Infrastructure resources are not included as only one resource, the lighthouse visitor center, is present in these 18 commonly shared resources. Value ranges for natural and cultural resources are illustrated below.

In Figure 7, the five natural resources within the 18 resources commonly valued by the six self-selected groups, are represented in a value space. Value range polygons are shown with each vertex representing the value of one individual group. Also shown is the centroid location, representing all respondents and used as a reference point, for each resource. The natural resources in this value space are dominantly positive in the values held by the groups involved. Of these, 13 of 30 value points lie within the top right quadrant (both factors positive) and 10 of 30 value points lie within the bottom right quadrant (positive factor 1, negative factor 2), accounting for 23 of 30 (77%) values positive on at least one factor. Of the remaining seven value points, negative on both factors, five represent values for sea turtles and one each representing tidal flats and horses. Also included within Figure 7 is a listing of the centroid XY coordinates and the area of the value range for each of the five resources. As can be observed in Figure 7, centroid locations move from positive to negative in the following order: Dune and Beach Systems, Salt Marsh, Shackleford Banks Horses, Tidal Flats and Sea Turtles. Their respective value range areas do appear to follow the theory that as these centroids become more negative, the value ranges will become less concentrated and more diffuse.

The same analysis was carried out using the 12 cultural resources within the total of 18 resources shared across all six groups as is illustrated in Figure 8. Again, the great majority of value points were to be found in the upper right (32%) and lower right (60%) quadrants with only a small set of value points in the lower left (8%) quadrant. What becomes immediately apparent with respect to cultural resources, however, is that as in other observations, these resources are highly concentrated around one another and appear to function as units around common cultural themes or geographic locations rather than as single independent resources when it comes to how they are valued. A notable exception to this can be found in the value range of the Cape Lookout

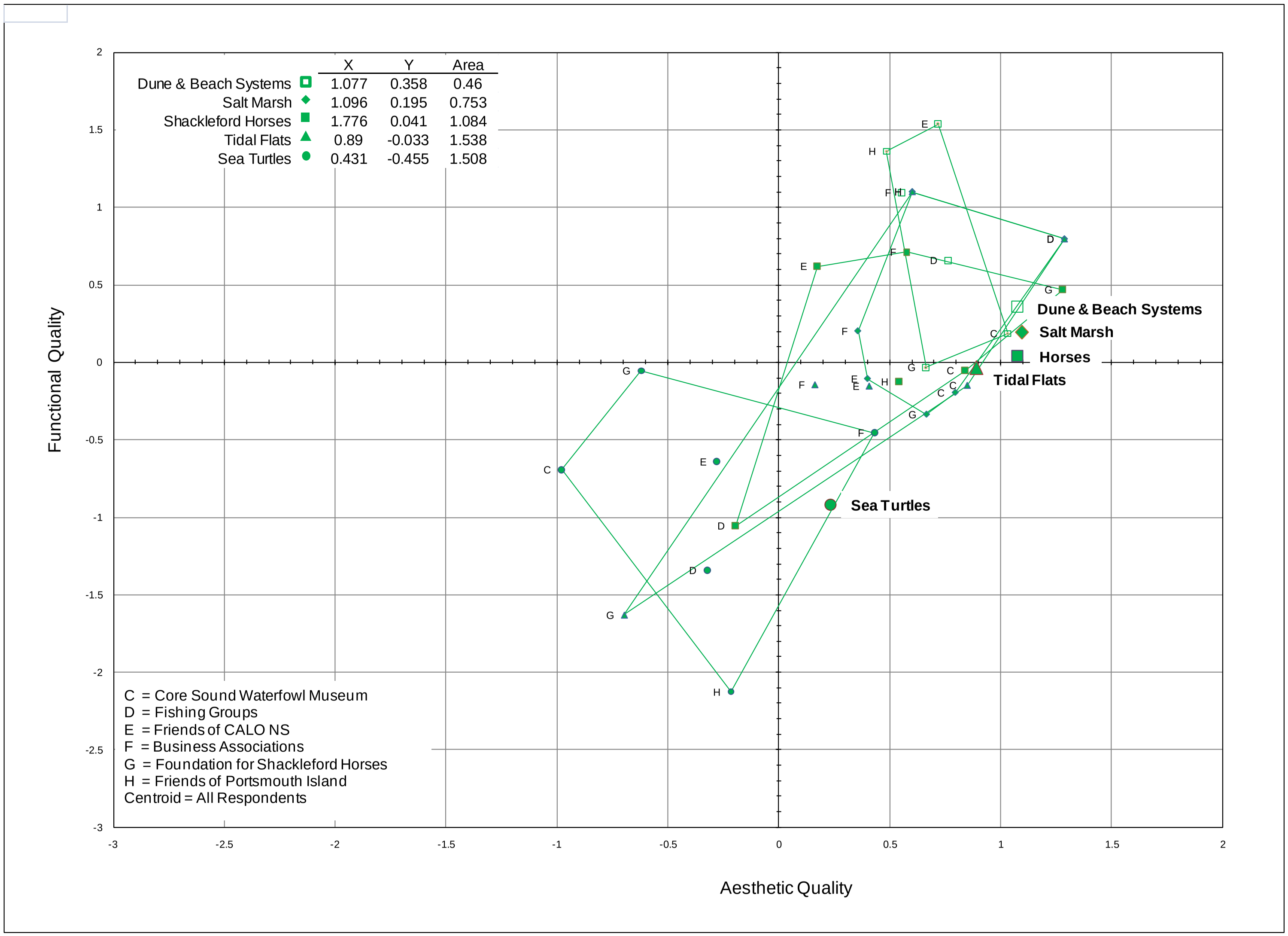


Figure 7. Value ranges for shared natural resources

Lighthouse, which is largely independent of other cultural resources and indeed overlaps only with the 1873 Keeper's Quarters, the resource tied most directly to the lighthouse in function, proximity and cultural importance. Because of this dense clustering of value ranges, these areas do not appear to follow the theory that as these centroids become more negative, while the value ranges become less concentrated and more diffuse.

In summary, as was described above with respect to sharing of resources, with observing these valued cultural resources, the usable insight here is that these are valued as sets of resources that make up cultural landscapes. Thus, when considering decisions that potentially impact these resources, the broader cultural landscape should be considered of primary importance over a focus on individual cultural resources.

Comparing shared resources between specific groups

Lastly, as a third approach to assessing values with respect to groups, direct comparisons of resource values for paired groups are made. In the following comparisons, value ranges for all resources and are represented in a value space that depicts the value range of each group for all resources as well as the locations of specific resources. A table associated with each pairing provides Euclidean distances between shared resources as well as uniquely valued resources for each group. These tables are also presented, among shared resources, in order of those that exhibit high, moderate and low degrees of value "consensus" as a first-level of understanding relationships between group values for specific resources.

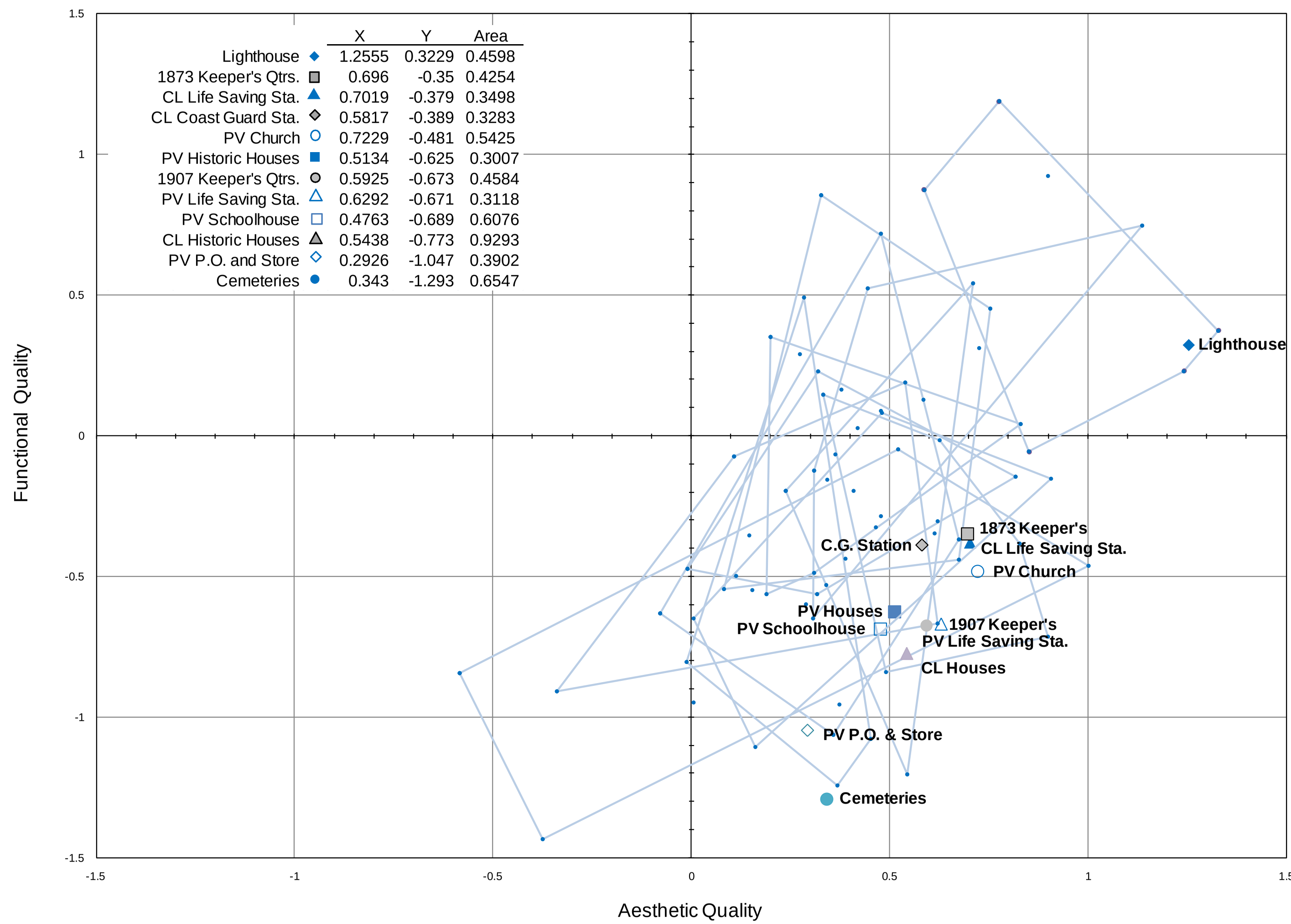
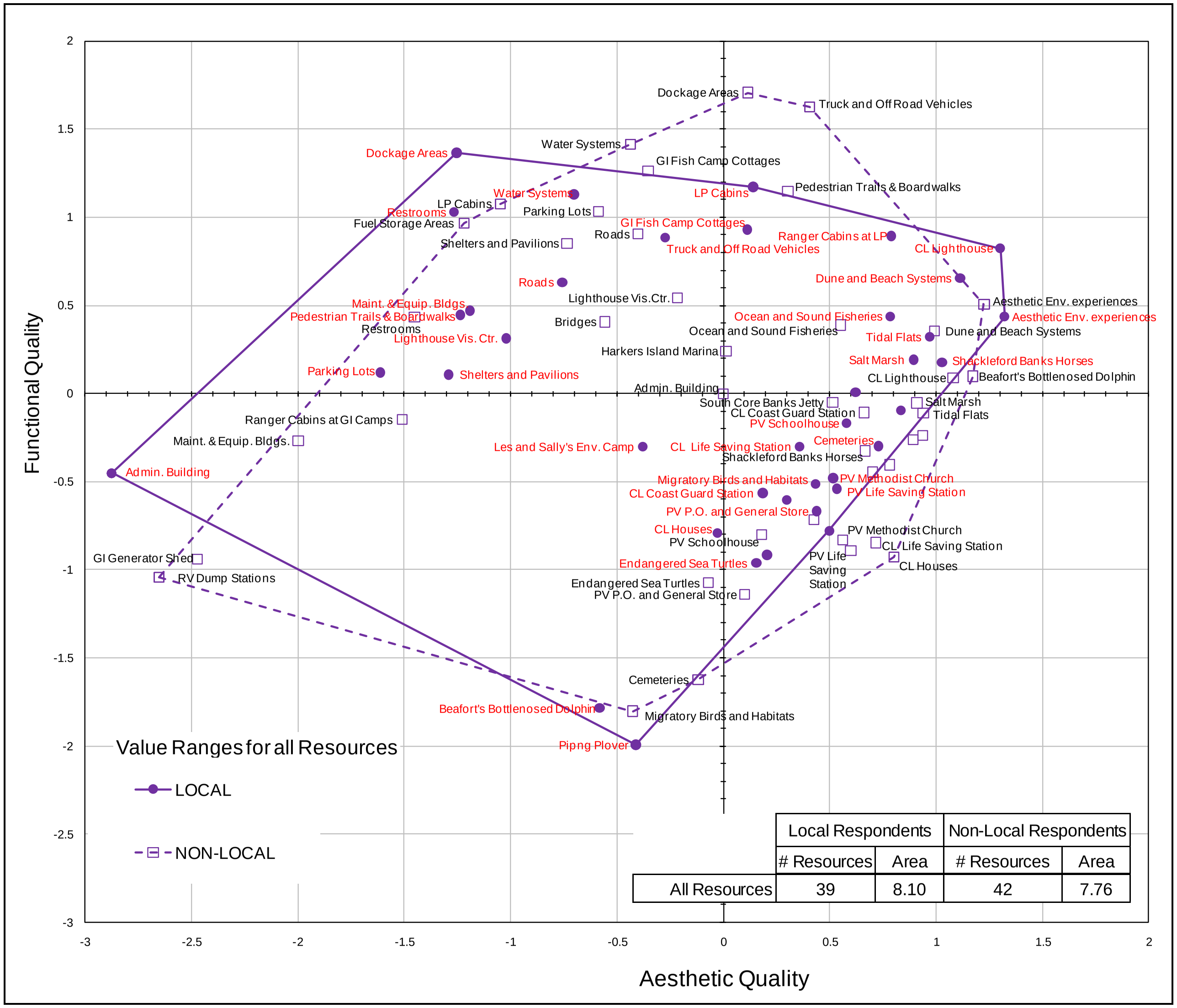


Figure 8. Value ranges for shared cultural resources



	Local Respondents		Non-Local Respondents	
	# Resources	Area	# Resources	Area
All Resources	39	8.10	42	7.76

Figure 9. Value ranges for local and non-local respondents comparison

Table 11. Local and non-local respondent values comparison

	Shared Resources	Local Respondents X	Local Respondents Y	Non-Local Respondents X	Non-Local Respondents Y	Distance Apart	
	Aesthetic Env. experiences	1.32	0.44	1.23	0.51	0.12	High Value Consensus
X	PV Houses	0.30	-0.60	0.43	-0.72	0.17	
X	Maritime Forests	0.83	-0.10	0.94	-0.24	0.17	
	Ocean and Sound Fisheries	0.78	0.44	0.55	0.39	0.24	
	Salt Marsh	0.90	0.19	0.91	-0.05	0.25	
	Endangered Sea Turtles	0.16	-0.96	-0.07	-1.07	0.25	
	Dune and Beach Systems	1.11	0.65	0.99	0.35	0.32	
	PV Methodist Church	0.52	-0.48	0.56	-0.83	0.35	
	PV Life Saving Station	0.54	-0.54	0.60	-0.89	0.36	
	Water Systems	-0.70	1.13	-0.44	1.42	0.39	
	Tidal Flats	0.97	0.32	0.94	-0.11	0.43	
	Roads	-0.76	0.63	-0.40	0.90	0.45	
X	CL 1873 Keeper's Qtrs.	0.62	0.01	0.70	-0.45	0.46	
	GI Fish Camp Cottages	0.11	0.93	-0.35	1.26	0.57	Moderate Value Consensus
	PV P.O. and General Store	0.44	-0.67	0.10	-1.14	0.58	
	Shackleford Banks Horses	1.03	0.18	0.67	-0.33	0.62	
	Restrooms	-1.27	1.03	-1.45	0.43	0.62	
X	Other Nesting Shorebirds	0.50	-0.78	0.89	-0.26	0.65	
	CL Life Saving Station	0.36	-0.30	0.72	-0.85	0.65	
	CL Coast Guard Station	0.19	-0.57	0.66	-0.11	0.66	
	PV Schoolhouse	0.58	-0.17	0.18	-0.80	0.75	
	CL Lighthouse	1.30	0.82	1.08	0.09	0.77	
X	CL 1907 Keeper's Qtrs.	0.21	-0.92	0.78	-0.41	0.77	
	Lighthouse Vis. Ctr.	-1.02	0.31	-0.22	0.54	0.84	
	CL Houses	-0.03	-0.79	0.80	-0.93	0.84	
	Shelters and Pavilions	-1.29	0.11	-0.74	0.85	0.93	
	Truck & Off Road Vehicles	-0.27	0.89	0.41	1.63	1.01	Low Value Consensus
	Maint and Equip. Bldgs.	-1.19	0.47	-2.00	-0.27	1.09	
	LP Cabins	0.14	1.17	-1.05	1.08	1.19	
	Parking Lots	-1.61	0.12	-0.59	1.03	1.37	
	Dockage Areas	-1.25	1.37	0.11	1.71	1.41	
	Migratory Birds and Habitats	0.44	-0.51	-0.43	-1.80	1.55	
	Historic Cemeteries	0.73	-0.30	-0.12	-1.62	1.57	
	Pedestrian Trails & Boardwalks	-1.23	0.45	0.30	1.15	1.69	
	Ranger Cabins at LP	0.79	0.89	-1.51	-0.15	2.52	
	Beafort's Bottlenosed Dolphin	-0.58	-1.79	1.17	0.10	2.57	
	Admin. Building	-2.88	-0.45	0.00	0.00	2.91	

Unique Resources-Local Respondents	X	Y
Les and Sally's Env. Camp	-0.38	-0.30
Pipng Plover	-0.41	-1.99

Unique Resources-Non-Local Respondents	X	Y
GI Generator Shed	-2.47	-0.94
Fuel Storage Areas	-1.22	0.97
RV Dump Stations	-2.65	-1.04
Bridges	-0.56	0.41
Harkers Island Marina	0.01	0.24
South Core Banks Jetty	0.51	-0.05

X= These closely located resources not labeled on Figure 9 for clarity

Local and non-local respondents

The value spaces for local and non-local respondents as illustrated in Figure 9. and Table 11 show many similarities in both the overall area of the value range and in the patterns of resource types. In fact, of the 37 shared resources, 13 (35%) lie within the high value consensus range which to very similar resource value locations for the two groups. This would be expected since these two groups are derived from the data and combined represent all respondents. There are, however, some important differences that show differences in park resource uses that can be helpful in decision processes. First, within shared resources, non-local respondents tend to report greater values for infrastructure resources such as pedestrian trails and boardwalks, dockage and parking lots. Local respondents, on the other hand, exhibit more positive values for important natural and cultural resources such as salt marshes, tidal flats, dune and beach systems, the PV schoolhouse, and Post Office-general store, and the lighthouse. Uniquely valued resources also reflect these trends as non-local respondents include six infrastructure resources centered around transient boating and camping support facilities such as fuel storage areas, RV dump stations and the Harkers Island Marina, while local respondents include one cultural and one natural resource, the Piping Plover. These trends both follow the theoretical reasoning that due to logistical needs, non-local visitors will see a greater value in infrastructure resources that support longer-distance visitors, while local visitors will not have as much need for these infrastructure support resources and will hold stronger cultural ties to the place-based cultural resources found at Cape Lookout.

These findings point to differing approaches that can be taken with regard to decisions that will impact core natural and cultural resources versus those that will impact visitor support infrastructural resources. In the case of the latter, public input from local citizens will in most cases be appropriate as many of these natural and cultural resources have high levels of value consensus and local respondents tend to value these more highly than non-locals. When, however, decisions affecting visitor support resources such as RV facilities, parking lots and dockage, it would be greatly beneficial to ensure that non-local input is gathered as these visitors are most highly dependent upon these resources.

Friends of Portsmouth Island and the Foundation for Shackleford Horses

Figure 10 and Table 12 provide the value spaces and corresponding data for the Friends of Portsmouth Island (Friends of PI) and the Foundation for Shackleford Horses (Horse Found.). The Friends of Portsmouth Island focuses on the preservation of the cultural heritage related to the structures, written and oral history of Portsmouth Village. The Foundation for Shackleford Horses focuses on the long-term protection of the horse herd and the natural resource systems that support them. While value ranges for the two groups are again nearly identical in area (6.71 for Friends of PI and 6.88 for Horse Found.), several differences between specific resources are observable.

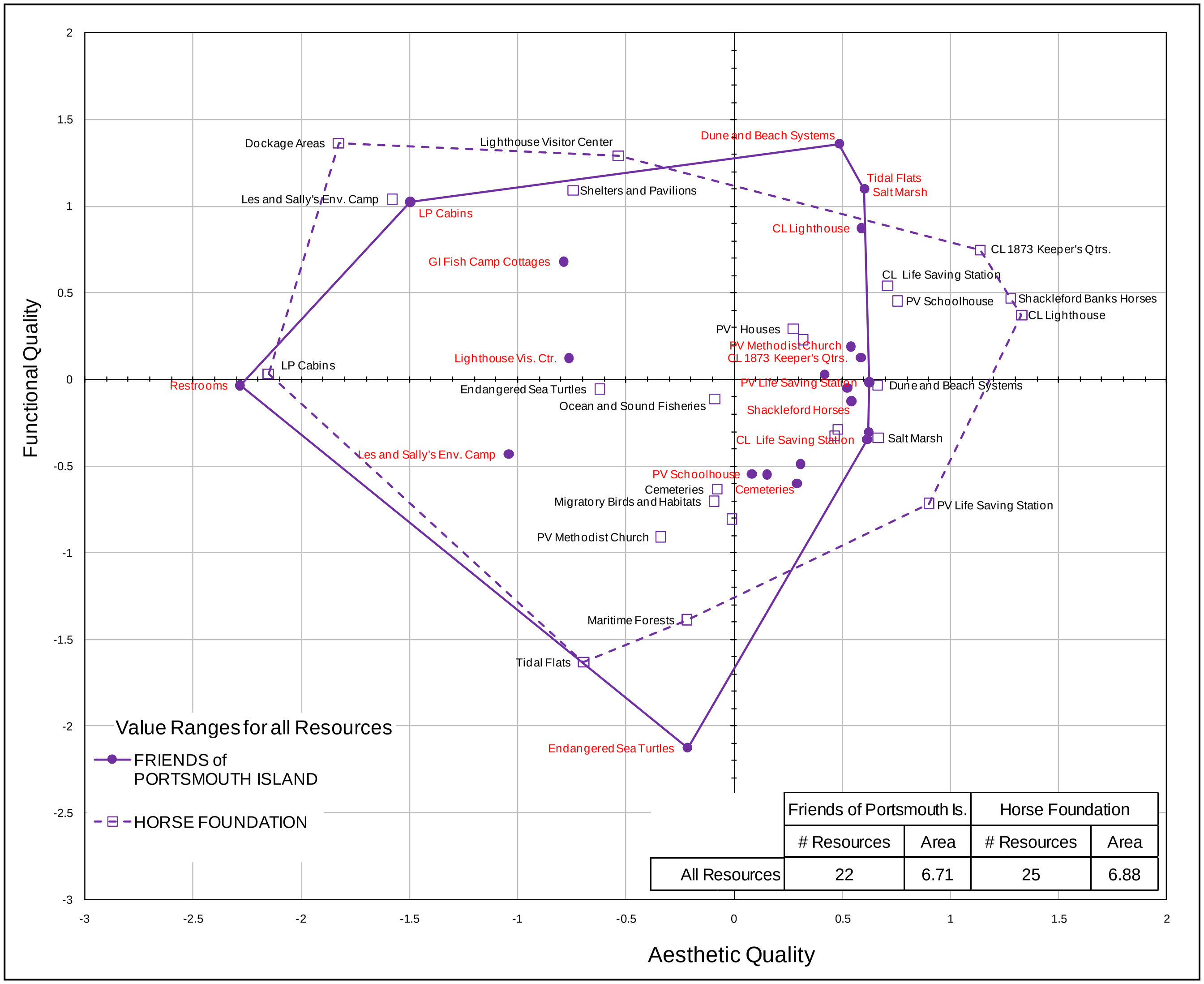


Figure 10. Value ranges for Friends of Portsmouth Island and Horse Foundation comparison

Table 12. Friends of Portsmouth Island and Foundation for Shackleford Horses values comparison

	Shared Resources	Friends of Portsmouth Island		Foundation for Shackleford Horses		Distance Apart	
		X	Y	X	Y		
X	CL 1907 Keeper's Qtrs.	0.62	-0.30	0.47	-0.32	0.16	High Value Consensus
X	CL Coast Guard Station	0.42	0.03	0.32	0.23	0.22	
X	CL Area Historic Houses	0.52	-0.05	0.48	-0.29	0.24	
X	PV P.O. and General Store	0.15	-0.55	-0.01	-0.80	0.30	
	Historic Cemeteries	0.29	-0.60	-0.08	-0.63	0.37	
	PV Life Saving Station	0.63	-0.02	0.90	-0.72	0.75	Moderate Value Consensus
X	PV Historic Houses	0.31	-0.49	0.27	0.29	0.78	
	CL 1873 Keeper's Qtrs.	0.59	0.13	1.14	0.75	0.83	
	CL Life Saving Station	0.61	-0.35	0.71	0.54	0.89	
	CL Lighthouse	0.59	0.87	1.33	0.37	0.89	
	Shackleford Banks Horses	0.54	-0.13	1.28	0.47	0.95	
	LP Cabins	-1.50	1.03	-2.15	0.03	1.19	Low Value Consensus
	Lighthouse Visitor Center	-0.76	0.12	-0.54	1.29	1.19	
	PV Schoolhouse	0.08	-0.54	0.75	0.45	1.20	
	PV Methodist Church	0.54	0.19	-0.34	-0.91	1.40	
	Dune and Beach Systems	0.49	1.36	0.66	-0.03	1.40	
	Salt Marsh	0.60	1.10	0.67	-0.34	1.44	
	Endangered Sea Turtles	-0.21	-2.12	-0.62	-0.05	2.11	
	Tidal Flats	0.60	1.10	-0.70	-1.63	3.02	
	Unique Resources-Friends of PI	X	Y				
	Restrooms	-2.28	-0.03				
	Les and Sally's Env. Camp	-1.04	-0.43				
	GI Fish Camp Cottages	-0.79	0.68				
	Unique Resources-Horse Foundation			X	Y		
	Les and Sally's Env. Camp			-1.58	1.04		
	Shelters and Pavilions			-0.74	1.09		
	Maritime Forests			-0.22	-1.39		
	Ocean and Sound Fisheries			-0.09	-0.11		
	Migratory Birds and Habitats			-0.09	-0.70		
	Dockage Areas			-1.83	1.36		

X= These closely located resources not shown on Figure 10 for clarity

The Friends of PI value some natural resources including dune and beach systems and salt marshes, which are seen as much more functional (factor two) by the

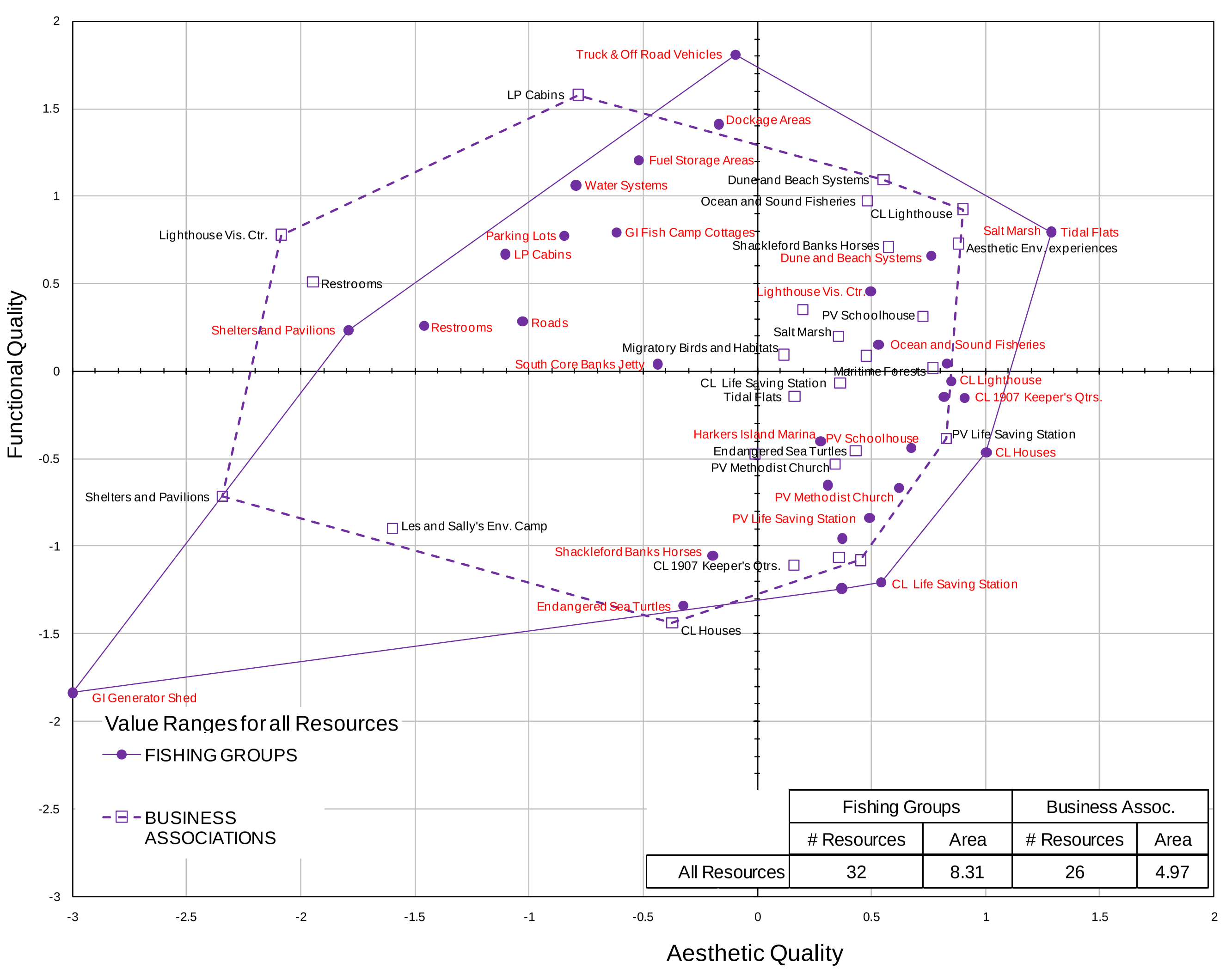
this group when compared to the Horse Found. The Tidal Flats, which exhibits the greatest difference in value (3.02) are highly valued for their function and aesthetic quality by the Friends of PI as compared to negative value locations on both factors for the Horse Found. As well, some cultural resources including the PV Methodist Church, higher on both factors, and the CL Lighthouse which the Friends of PI place a greater emphasis on its functional quality.

The Horse Found. exhibits greater values on several resources that are either related directly to the Shackleford horse herd or are closer geographically to Shackleford Banks. First, and most obviously, the Horses are more highly valued on both dimensions, as is the 1873 Keeper's Quarters, while the Lighthouse Visitor Center exhibits a greater functional quality for this group. With a group focus on natural resources, it is also understandable that they place a much greater value on Endangered Sea Turtles and also uniquely value Maritime Forests on which the horse herd is dependent, Ocean and Sound Fisheries and Migratory Birds and Habitats.

These two examples again point to value differences that can be understood and utilized in decision-making processes even though many values are shared. As an example, values for the salt marsh are nearly identical on the X-axis, representing aesthetic quality. The Y-axis, representing functional quality, however, is distinctly different between the two groups. The ability to understand the specific type of value held for a resource allows for informed decision processes to take place. Understanding that members of the Friends of PI are more likely to be interested in the productive ecosystem services (i.e. its functional qualities such as protective dunes) than in simply its aesthetic value, can guide decision makers as they involve these groups, establish problem and objective statements, and seek alternative solutions.

Fishing groups and business associations

Figure 11 and Table 13 provide the value spaces and corresponding data for fishing groups and business associations. Fishing groups have been aggregated from four individual fishing organizations that have a similar focus but are separated geographically as in the Davis Island Fishing Foundation, Cape Lookout Mobile Sport Fishermen and the United Mobile Sportfishermen, or by their for-profit status as in the Carteret County Commercial Fishermen's Association. Business Associations is likewise an aggregation of two similar organizations. In this case, both the Carteret County Chamber of Commerce and the Down East Business Association have similar missions, but differing geographic ranges.



	Fishing Groups		Business Assoc.	
	# Resources	Area	# Resources	Area
All Resources	32	8.31	26	4.97

Figure 11. Value ranges for fishing groups and business associations comparison

Table 13. Fishing groups and business associations values comparison

	Shared Resources	Fishing Groups X	Fishing Groups Y	Business Associations X	Business Associations Y	Distance Apart	
X	Cemeteries	0.37	-0.95	0.36	-1.07	0.11	High Value Consensus
X	PV P.O. and General Store	0.37	-1.24	0.45	-1.08	0.18	
	PV Methodist Church	0.62	-0.67	0.34	-0.53	0.31	
	Dune and Beach Systems	0.76	0.66	0.55	1.09	0.48	
	Restrooms	-1.46	0.26	-1.95	0.51	0.55	Moderate Value Consensus
	PV Life Saving Station	0.49	-0.84	0.83	-0.38	0.57	
X	PV Houses	0.83	0.04	0.20	0.35	0.70	
	PV Schoolhouse	0.68	-0.44	0.72	0.31	0.75	
X	CL 1873 Keeper's Qtrs.	0.31	-0.65	0.48	0.09	0.76	
	Ocean and Sound Fisheries	0.53	0.15	0.48	0.97	0.82	
X	CL Coast Guard Station	0.82	-0.14	-0.01	-0.47	0.89	
	LP Cabins	-1.10	0.67	-0.78	1.58	0.97	
	CL Lighthouse	0.85	-0.06	0.90	0.93	0.98	
	Shelters and Pavilions	-1.79	0.24	-2.34	-0.72	1.10	Low Value Consensus
	Salt Marsh	1.29	0.79	0.36	0.20	1.10	
	CL Life Saving Station	0.54	-1.20	0.36	-0.07	1.15	
	Endangered Sea Turtles	-0.32	-1.34	0.43	-0.45	1.16	
	CL 1907 Keeper's Qtrs.	0.91	-0.15	0.16	-1.11	1.21	
	Tidal Flats	1.29	0.79	0.16	-0.14	1.47	
	CL Houses	1.00	-0.46	-0.37	-1.44	1.69	
	Shackleford Banks Horses	-0.20	-1.05	0.58	0.71	1.93	
	Lighthouse Vis. Ctr.	0.50	0.46	-2.09	0.78	2.60	

Unique Resources-Fishing Groups	X	Y
Roads	-1.03	0.29
Parking Lots	-0.84	0.77
Fuel Storage Areas	-0.52	1.21
Water Systems	-0.79	1.06
Dockage Areas	-0.17	1.41
Harkers Island Marina	0.28	-0.40
South Core Banks Jetty	-0.44	0.04
Truck and Off Road Vehicle Fleet	-0.10	1.81
GI Fish Camp Cottages	-0.62	0.79
GI Generator Shed	-3.00	-1.84

Unique Resources-Business Associations	X	Y
Les and Sally's Env. Camp	-1.60	-0.90
Maritime Forests	0.77	0.02
Migratory Birds and Habitats	0.12	0.09
Aesthetic Env. experiences	0.88	0.73

X= These closely located resources not labeled on Figure 11 for clarity

The overall value ranges for each of the groups does differ quite substantially in this case (8.31 and 4.97 for Fishing Groups and Business Associations respectively), however, most of this difference can be explained by the outlying value of the GI generator shed given by Fishing Groups. This particular resource is vital to the operation of the Great Island Fish Camp Cottages, so there is expressed value in the utility of this resource, even if negative on both factors, by fishing groups. In general, Business Associations tend to respond with higher values on factor two, functional quality as is exemplified by resources such as the LP cabins, CL lighthouse, Shackleford Horses and, interestingly, ocean and sound fisheries. As well, their unique values for resources such as migratory birds, maritime forests and aesthetic environmental experiences points to their focus on visitation and the positive effects that these resources have on drawing visitors and economic activity to the area. Fishing Groups, on the other hand, value the salt marsh and tidal flats more positively and uniquely value roads, parking lots, fuel storage areas, dockage, the South Core Banks Jetty and the GI fish camp cottages, all of which are understandable value positions given their missions and focus.

These two examples again point to the ability of decision makers to better understand the points of view that drive each group's value for specific resources, even if those resources are shared between both groups.

Summary discussion of group values

In the preceding findings and discussions, resources held in some value and shared across all examined groups were discussed, providing a starting point for discussions about decisions and policies that may affect these resources. First, by understanding these overlaps, decision makers can begin to understand the scope of public participation efforts that are appropriate and which specific resources may involve more or less contention in discussions of changes to the access of these resources or potential impacts to them. Next examinations of resource types and their value fields were conducted. Specifically, the relationship between either the degree of sharing among groups or the location of the "all respondents" centroid location and the size and location of the value field were sought. While clearly identifiable trends were difficult to establish in all cases, natural resource value ranges did tend to become more concentrated as both the degree of sharing and centroid location became more positive. These two trends indicate a greater stability in values for natural resources among groups as sharing increases or the centroid value becomes more positive. However, the small sample size of groups, small samples within groups, and the absence of infrastructure resources due to a lack of sharing among groups present challenges to clear interpretations across all resource types. Finally, pairings of groups, their value spaces and specific resources were compared. These three examples present the clearest interpretations of differences between groups. In these comparisons, it is possible to see not only which resources are valued similarly or differently between groups, but also to understand which value space dimension more dominantly drives these differences. Understanding, for instance, that non-local visitors place high functional quality values on connecting and supporting infrastructure, or that the Friends of Portsmouth Island hold many resources beyond Portsmouth Island as valued highly, can provide insights into the points-of-view of these two important groups their input is solicited and received.

CHAPTER VII

FINDINGS OF RESOURCE BASE EFFECTS ON VALUES

In this final chapter of findings, two sets of observations will be presented, both relating changes in value spaces as a result of scenarios depicting changes in resources. First, three scenarios depicting impacts to differing resource types and resultant changes in value spaces will be presented. Then, two scenarios depicting geographically differing impact scenarios and resultant changes in value spaces will be presented.

The second research construct put forth in Chapter III discusses changes in value spaces as a result of changes to the resources in a place. As noted earlier, changes of either loss or gain can theoretically result in value space changes, however, these data do not allow for value spaces to be constructed around resource gains. To observe differences in value spaces in pre-loss and post-loss situations, several scenarios were created that reflect moderate to disastrous impacts to park resources. Each of the results of the first three scenarios will be presented followed by a combined discussion of trends seen in each scenario. Then the final two scenarios will be presented and observations discussed in a similar manner.

Moderate impact scenarios

Scenario one – cultural resource loss

Scenario one deals with a major loss of cultural resources on Portsmouth Island due to a storm event such as a direct hurricane impact to the northern portion of Cape Lookout that spares southern park resources. After an impact such as this, it can reasonably be expected that, due to near sea-level elevations of most structures, their current condition and construction, that most or all built historic resources could be lost completely. In this case, these include the Portsmouth Village Schoolhouse, Methodist Church, Post Office and General Store, Life Saving Station and the 16 named historic houses. Table 14 presents factor results for value spaces in the pre-loss and post-loss situations for all 153 survey respondents.

Table 14. Factor results for resource loss scenario one - cultural resources

	Mean Ratings			
	Pre-Loss		Post-Loss	
	Aesthetic Quality Factor 1	Functional Quality Factor 2	Aesthetic Quality Factor 1	Functional Quality Factor 2
Eigenvalue	3.230	0.887	3.225	0.861
Character	0.901	0.001	0.901	-0.001
Scenic Beauty	0.980	-0.074	0.981	-0.057
Visitation	0.864	0.284	0.862	0.289
Operations	-0.208	0.728	-0.821	0.511
Replaceable	-0.818	0.521	-0.179	0.717
Variance Explained	0.807	0.222	0.812	0.217
Shaded cells contain loadings >.05, which reflects loadings that dominate the factor.				

Comparing the two factor results, both pre and post-loss scenarios present nearly identical factor results that are driven by scenic beauty, character and visitation on factor one, and by operations and replaceable on factor two.

Factor scores, assigned to their XY values used to create value spaces for pre- and post-loss are presented in Table 15. Also included are Euclidean distance values for each resource representing the movement, in standardized units, of each resource as a result of the change in resources. Shaded resources represent those lost in this scenario. There is limited movement in this scenario, with a maximum distance of less than 1/5 of a standardized unit.

Finally, value spaces created for pre and post-loss scenarios are presented in one illustration. Figure 12 includes the number of resources and value range areas as well as labeled specific locations of resources in pre-loss (filled markers) and post-loss (open markers) that are connected graphically to better illustrate changes in value space locations.

Table 15. Resource value locations and movements for resource loss scenario one. - cultural resources

Resource	Pre-Incident X	Pre-Incident Y	Post-Incident X	Post-Incident Y	Value Movement Post-Incident
GI Generator Shed	-2.716	-0.967	-2.53801	-0.96968	0.18
RV Dump Stations	-2.032	-0.742	-1.88535	-0.73509	0.15
Truck and Off Road Vehicle Fleet	0.141	1.695	0.178732	1.557352	0.14
Fuel Storage Areas	-2.090	-0.009	-1.95094	-0.01297	0.14
Aesthetic Env. experiences	1.382	0.662	1.384911	0.523362	0.14
Administration Building	-2.042	-0.081	-1.90919	-0.10297	0.13
CL Lighthouse	1.255	0.323	1.262608	0.188552	0.13
Dockage Areas	-0.069	1.762	-0.02677	1.63468	0.13
Ranger Cabins at GI Camps	-1.717	0.076	-1.58468	0.057625	0.13
GI Fish Camp Cottages	0.044	1.302	0.08798	1.181264	0.13
Dune and Beach Systems	1.077	0.358	1.09043	0.230935	0.13
Maintenance and Equipment Bldgs.	-1.712	-0.047	-1.59249	-0.08144	0.12
LP Cabins	-0.303	1.234	-0.24672	1.123946	0.12
Ocean and Sound Fisheries	0.719	0.112	0.747397	-0.00679	0.12
Harkers Island Marina	0.370	1.071	0.406138	0.954467	0.12
Shackleford Banks Horses	1.076	0.041	1.096865	-0.07628	0.12
Parking Lots	-0.720	0.798	-0.6415	0.709081	0.12
Salt Marsh	1.096	0.195	1.114204	0.078101	0.12
Water Systems	-0.612	1.118	-0.53979	1.024627	0.12
Bridges	-0.198	1.193	-0.14335	1.089521	0.12
Restrooms	-1.222	0.667	-1.12533	0.602782	0.12
Les and Sally's Env. Camp	-0.745	-1.057	-0.65009	-1.12267	0.12
Pedestrian Trails and Boardwalks	-0.073	1.434	-0.01965	1.332963	0.11
Roads	-0.518	1.007	-0.44726	0.918157	0.11
South Core Banks Jetty	0.571	0.057	0.613771	-0.04732	0.11
Ranger Cabins at LP	0.348	0.974	0.382051	0.867325	0.11
Pipng Plover-Endangered Bird	-0.332	-2.546	-0.22572	-2.56591	0.11
Tidal Flats	0.890	-0.034	0.917435	-0.13718	0.11
Shelters and Pavilions	-0.803	0.681	-0.71707	0.618749	0.11
Maritime Forests	0.897	-0.308	0.927734	-0.40781	0.10
Lighthouse Visitor Center	-0.208	0.702	-0.148	0.61688	0.10
CL Coast Guard Station	0.582	-0.389	0.625553	-0.48296	0.10
CL 1873 Keeper's Qtrs.	0.696	-0.350	0.733516	-0.44672	0.10
CL Life Saving Station	0.702	-0.379	0.744081	-0.47061	0.10
Other Nesting Shorebirds	0.839	-0.490	0.878216	-0.58072	0.10
CL 1907 Keeper's Qtrs.	0.592	-0.673	0.639157	-0.76065	0.10
Sea-Beach Amaranth-EP	0.101	-1.072	0.171114	-1.14183	0.10
Migratory Birds and Habitats	0.633	-0.624	0.678166	-0.70782	0.10
Historic Cemeteries	0.343	-1.293	0.402664	-1.36656	0.09
Endangered Sea Turtles	0.235	-0.920	0.301686	-0.98458	0.09
CL Area Historic Houses	0.544	-0.773	0.596085	-0.84983	0.09
Beafort's Bottlenosed Dolphin	0.344	-1.194	0.411411	-1.25201	0.09
PV Schoolhouse	0.476	-0.689	Resources Lost in Scenario		
PV Methodist Church	0.723	-0.481			
PV P.O. and General Store	0.293	-1.047			
PV Life Saving Station	0.629	-0.671			
PV Historic Houses	0.513	-0.625			

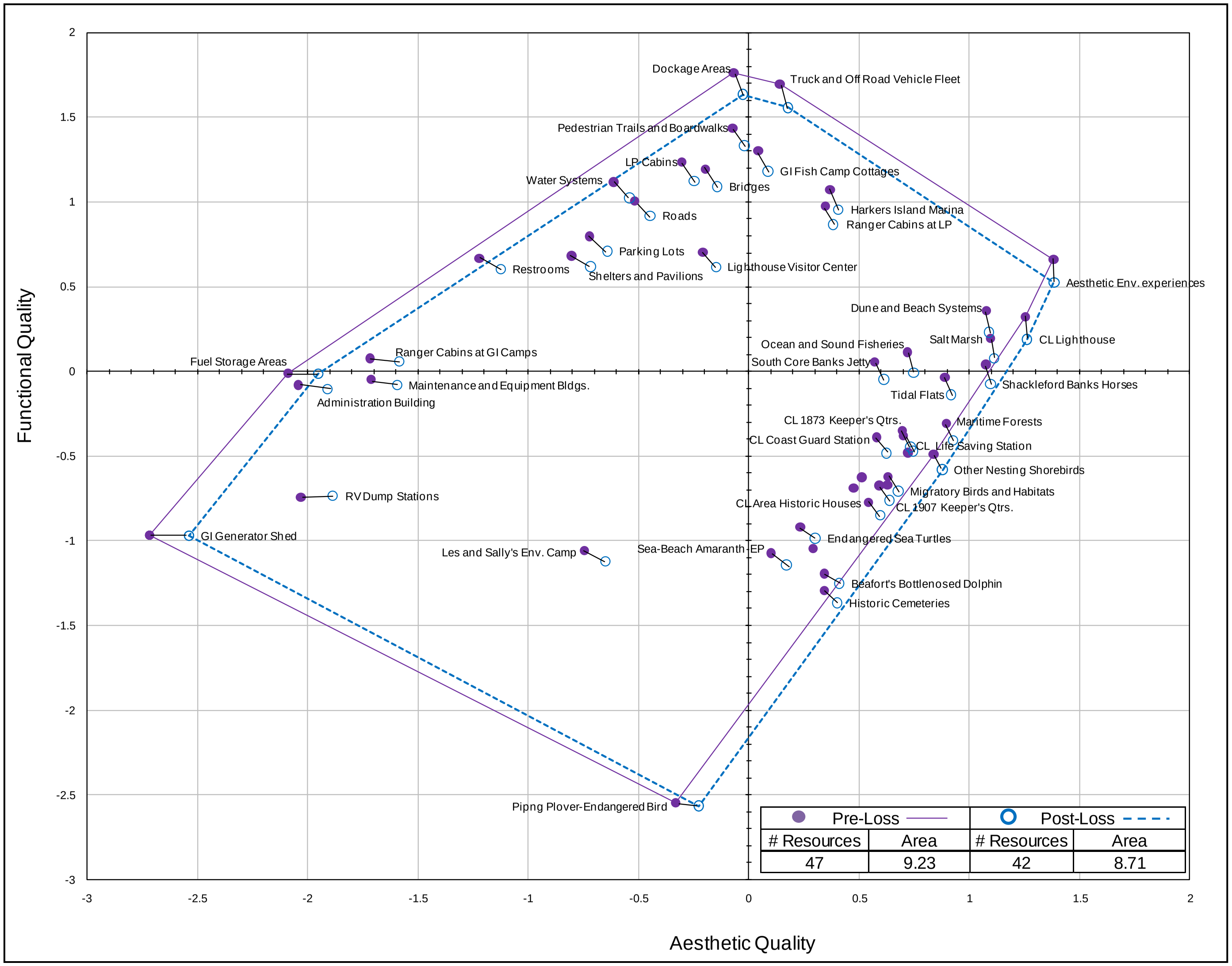


Figure 12. Value space representations for resource loss scenario one. - cultural resources

Scenario two – natural resource loss

Scenario two deals with a major loss of natural resources as a result of human actions such as a major spill or other drastic change to the ocean and sound waters (e.g. oil spill or creation of a dead zone, etc.) surrounding Cape Lookout. In a scenario such as this, sensitive flora and fauna such as salt marshes, endangered species, ocean and sound fisheries and shorebirds would be severely impacted and subject to long-term losses. Table 16 presents factor results for value spaces in the pre-loss and post-loss situations for all 153 survey respondents.

Table 16. Factor results for resource loss scenario two - natural resources

	Mean Ratings			
	Pre-Loss		Post-Loss	
	Aesthetic Quality Factor 1	Functional Quality Factor 2	Aesthetic Quality Factor 1	Functional Quality Factor 2
Eigenvalue	3.230	0.887	3.349	0.703
Character	0.901	0.001	0.899	0.013
Scenic Beauty	0.980	-0.074	0.983	-0.041
Visitation	0.864	0.284	0.872	0.285
Operations	-0.208	0.728	-0.853	0.452
Replaceable	-0.818	0.521	-0.296	0.644
Variance Explained	0.807	0.222	0.850	0.178
Shaded cells contain loadings >.05, which reflects loadings that dominate the factor.				

Comparing the two factor results, again the pre- and post-loss scenarios present very similar factor results that are driven by scenic beauty, character and visitation on factor one, and share being driven by replaceable on factor two. For the post-loss scenario, the next highest factor loading is for operations, as in the pre-loss scenario, however, with a loading of .452, the threshold of 0.5 was not met.

Factor scores, assigned to their XY values used to create value spaces for pre and post-loss are presented in Table 17. Also included are Euclidean distance values for each resource representing the movement, in standardized units, of each resource as a result of the change in resources. Shaded resources represent those lost in this scenario. The maximum shift in resources move approximately one-half of one standardized unit.

Finally, value spaces created for pre and post-loss scenarios are presented in one illustration. Figure 13 includes the number of resources and value range areas as well as labeled specific locations of resources in pre-loss (filled markers) and post-loss (open markers) that are connected graphically to better illustrate changes in value space locations.

Table 17. Resource value locations and movements for resource loss scenario two - natural resources

Resource	Pre-Incident X	Pre-Incident Y	Post-Incident X	Post-Incident Y	Value Movement Post-Incident
GI Generator Shed	-2.716	-0.967	-2.487	-1.398	0.49
Les and Sally's Env. Camp	-0.745	-1.057	-0.622	-1.343	0.31
Ranger Cabins at GI Camps	-1.717	0.076	-1.560	-0.178	0.30
RV Dump Stations	-2.032	-0.742	-1.821	-0.880	0.25
Historic Cemeteries	0.343	-1.293	0.435	-1.513	0.24
PV P.O. and General Store	0.293	-1.047	0.391	-1.247	0.22
Administration Building	-2.042	-0.081	-1.888	-0.238	0.22
South Core Banks Jetty	0.571	0.057	0.622	-0.156	0.22
PV Life Saving Station	0.629	-0.671	0.702	-0.876	0.22
Fuel Storage Areas	-2.090	-0.009	-1.917	-0.139	0.22
CL Area Historic Houses	0.544	-0.773	0.625	-0.969	0.21
CL 1907 Keeper's Qtrs.	0.592	-0.673	0.660	-0.866	0.20
Maintenance and Equipment Bldgs.	-1.712	-0.047	-1.574	-0.196	0.20
PV Schoolhouse	0.476	-0.689	0.547	-0.874	0.20
CL Coast Guard Station	0.582	-0.389	0.638	-0.576	0.20
CL Life Saving Station	0.702	-0.379	0.763	-0.564	0.19
PV Historic Houses	0.513	-0.625	0.585	-0.805	0.19
Parking Lots	-0.720	0.798	-0.635	0.642	0.18
PV Methodist Church	0.723	-0.481	0.788	-0.630	0.16
Maritime Forests	0.897	-0.308	0.935	-0.463	0.16
CL 1873 Keeper's Qtrs.	0.696	-0.350	0.745	-0.501	0.16
Restrooms	-1.222	0.667	-1.104	0.580	0.15
Shackleford Banks Horses	1.076	0.041	1.105	-0.096	0.14
Truck and Off Road Vehicle Fleet	0.141	1.695	0.155	1.557	0.14
Water Systems	-0.612	1.118	-0.534	1.012	0.13
Shelters and Pavilions	-0.803	0.681	-0.689	0.617	0.13
Roads	-0.518	1.007	-0.443	0.901	0.13
Tidal Flats	0.890	-0.034	0.919	-0.153	0.12
CL Lighthouse	1.255	0.323	1.249	0.203	0.12
Dune and Beach Systems	1.077	0.358	1.078	0.246	0.11
Harkers Island Marina	0.370	1.071	0.397	0.967	0.11
Aesthetic Env. experiences	1.382	0.662	1.375	0.559	0.10
LP Cabins	-0.303	1.234	-0.247	1.163	0.09
Lighthouse Visitor Center	-0.208	0.702	-0.141	0.642	0.09
GI Fish Camp Cottages	0.044	1.302	0.084	1.222	0.09
Bridges	-0.198	1.193	-0.149	1.119	0.09
Pedestrian Trails and Boardwalks	-0.073	1.434	-0.011	1.377	0.08
Dockage Areas	-0.069	1.762	-0.051	1.686	0.08
Ranger Cabins at LP	0.348	0.974	0.372	0.954	0.03
Endangered Sea Turtles	0.235	-0.920	Resources Lost in Scenario		
Sea-Beach Amaranth-EP	0.101	-1.072			
Pipng Plover-Endangered Bird	-0.332	-2.546			
Other Nesting Shorebirds	0.839	-0.490			
Beafort's Bottlenosed Dolphin	0.344	-1.194			
Salt Marsh	1.096	0.195			
Ocean and Sound Fisheries	0.719	0.112			
Migratory Birds and Habitats	0.633	-0.624			

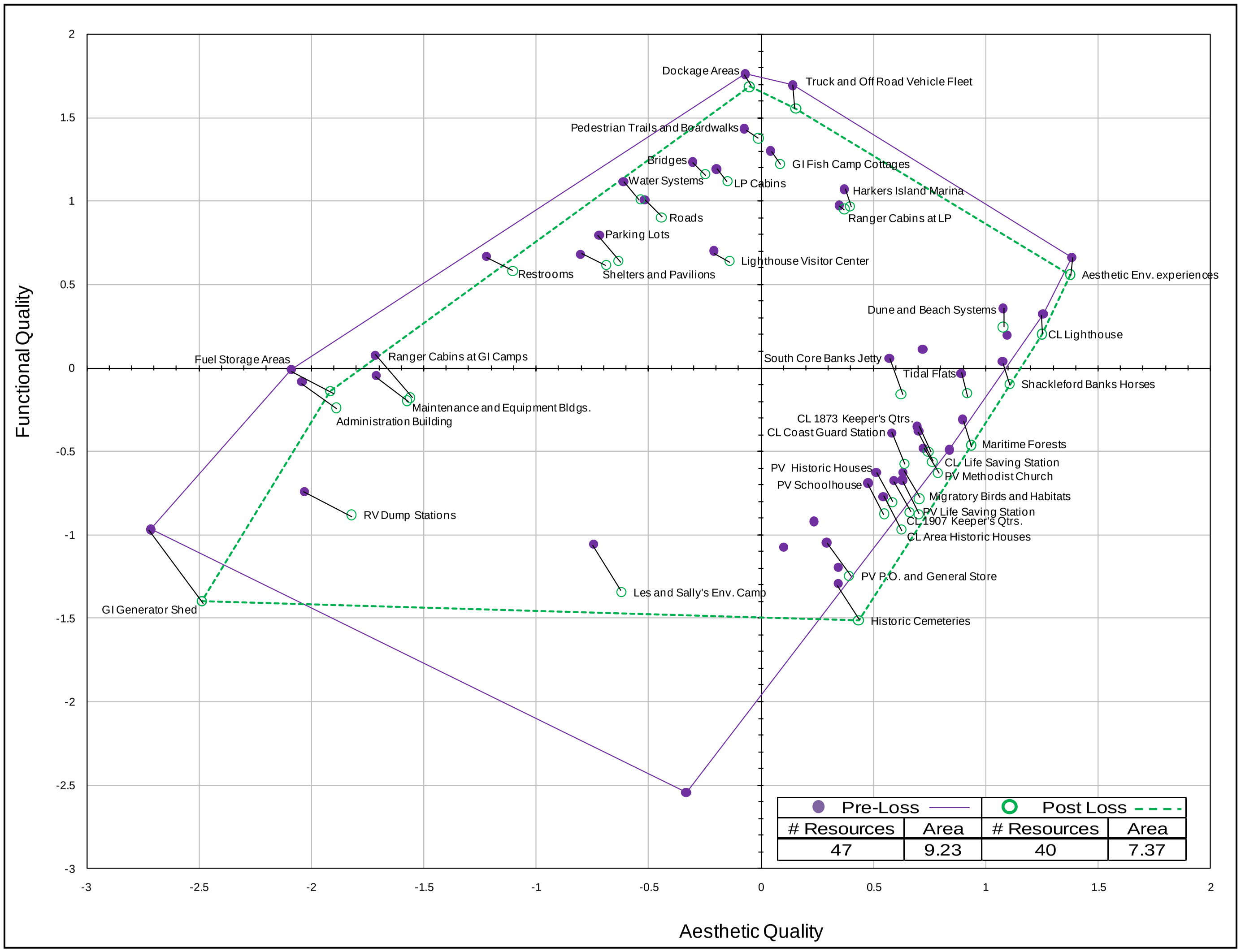


Figure 13. Value space representations for resource loss scenario two - natural resources

Scenario three – infrastructure resource loss

Scenario three deals with a loss of rental cabins and other infrastructure resources for overnight park use as a result of recreational use policy changes. A change such as this would not represent a physical loss of resources, but rather a loss of resource availability. This scenario includes the loss of two cabin camp areas representing over 40 structures as well as support infrastructure that includes RV facilities and parking lots. Table 18 presents factor results for value spaces in the pre-loss and post-loss situations for all 153 survey respondents.

Table 18. Factor results for resource loss scenario three - infrastructure resources

	Mean Ratings			
	Pre-Loss		Post-Loss	
	Aesthetic Quality Factor 1	Functional Quality Factor 2	Aesthetic Quality Factor 1	Functional Quality Factor 2
Eigenvalue	3.230	0.887	3.293	0.866
Character	0.901	0.001	0.936	0.007
Scenic Beauty	0.980	-0.074	0.971	-0.104
Visitation	0.864	0.284	0.861	0.260
Operations	-0.208	0.728	-0.799	0.539
Replaceable	-0.818	0.521	-0.310	0.705
Variance Explained	0.807	0.222	0.818	0.215
Shaded cells contain loadings >.05, which reflects loadings that dominate the factor.				

As in the previous two scenarios, similar factors and loadings are found. In this case, factor two is still driven by operations and replaceable, however in the post-loss scenario, these two factor loadings reverse in magnitude.

Factor scores, assigned to their XY values used to create value spaces for pre- and post-loss are presented in Table 19. Also included are Euclidean distance values for each resource representing the movement, in standardized units, of each resource as a result of the change in resources. Shaded resources represent those lost in this scenario. The largest shifts generate just over one-half of one standardized unit differences.

Table 19. Resource value locations and movements for resource loss scenario three - infrastructure resources

Resource	Pre-Incident X	Pre-Incident Y	Post-Incident X	Post-Incident Y	Value Movement Post-Incident
Fuel Storage Areas	-2.090	-0.009	-2.579	-0.295	0.57
Ranger Cabins at GI Camps	-1.717	0.076	-2.120	-0.132	0.45
Administration Building	-2.042	-0.081	-2.422	-0.163	0.39
Maintenance and Equipment Bldgs.	-1.712	-0.047	-2.045	-0.089	0.33
Shelters and Pavilions	-0.803	0.681	-1.102	0.533	0.33
Les and Sally's Env. Camp	-0.745	-1.057	-0.818	-0.746	0.32
Restrooms	-1.222	0.667	-1.481	0.660	0.26
Truck and Off Road Vehicle Fleet	0.141	1.695	0.135	1.920	0.23
Lighthouse Visitor Center	-0.208	0.702	-0.420	0.640	0.22
Ocean and Sound Fisheries	0.719	0.112	0.717	0.321	0.21
Pedestrian Trails and Boardwalks	-0.073	1.434	-0.262	1.356	0.20
Pipng Plover-Endangered Bird	-0.332	-2.546	-0.529	-2.506	0.20
Roads	-0.518	1.007	-0.709	1.007	0.19
Beafort's Bottlenosed Dolphin	0.344	-1.194	0.168	-1.244	0.18
CL Lighthouse	1.255	0.323	1.282	0.504	0.18
Water Systems	-0.612	1.118	-0.780	1.171	0.18
Ranger Cabins at LP	0.348	0.974	0.184	0.924	0.17
PV P.O. and General Store	0.293	-1.047	0.127	-1.062	0.17
Historic Cemeteries	0.343	-1.293	0.258	-1.152	0.16
Sea-Beach Amaranth-EP	0.101	-1.072	-0.001	-0.945	0.16
Endangered Sea Turtles	0.235	-0.920	0.076	-0.925	0.16
Bridges	-0.198	1.193	-0.353	1.217	0.16
Dockage Areas	-0.069	1.762	-0.147	1.895	0.15
Dune and Beach Systems	1.077	0.358	1.066	0.496	0.14
PV Schoolhouse	0.476	-0.689	0.389	-0.589	0.13
South Core Banks Jetty	0.571	0.057	0.523	0.181	0.13
CL Area Historic Houses	0.544	-0.773	0.413	-0.770	0.13
Aesthetic Env. experiences	1.382	0.662	1.398	0.786	0.12
PV Historic Houses	0.513	-0.625	0.422	-0.543	0.12
Migratory Birds and Habitats	0.633	-0.624	0.511	-0.614	0.12
CL Coast Guard Station	0.582	-0.389	0.503	-0.299	0.12
CL 1907 Keeper's Qtrs.	0.592	-0.673	0.506	-0.592	0.12
PV Methodist Church	0.723	-0.481	0.607	-0.478	0.12
Shackleford Banks Horses	1.076	0.041	1.054	0.152	0.11
PV Life Saving Station	0.629	-0.671	0.527	-0.631	0.11
CL 1873 Keeper's Qtrs.	0.696	-0.350	0.611	-0.283	0.11
Harkers Island Marina	0.370	1.071	0.276	1.124	0.11
CL Life Saving Station	0.702	-0.379	0.605	-0.346	0.10
Tidal Flats	0.890	-0.034	0.795	-0.019	0.10
Other Nesting Shorebirds	0.839	-0.490	0.745	-0.470	0.10
Maritime Forests	0.897	-0.308	0.819	-0.258	0.09
Salt Marsh	1.096	0.195	1.049	0.260	0.08
GI Fish Camp Cottages	0.044	1.302	Resources Lost in Scenario		
LP Cabins	-0.303	1.234			
GI Generator Shed	-2.716	-0.967			
Parking Lots	-0.720	0.798			
RV Dump Stations	-2.032	-0.742			

Finally, value spaces created for pre and post-loss scenarios are presented in one illustration. Figure 14 includes the number of resources and value range areas as well as labeled specific locations of resources in pre-loss (filled markers) and post-loss (open markers) that are connected graphically to better illustrate changes in value space locations.

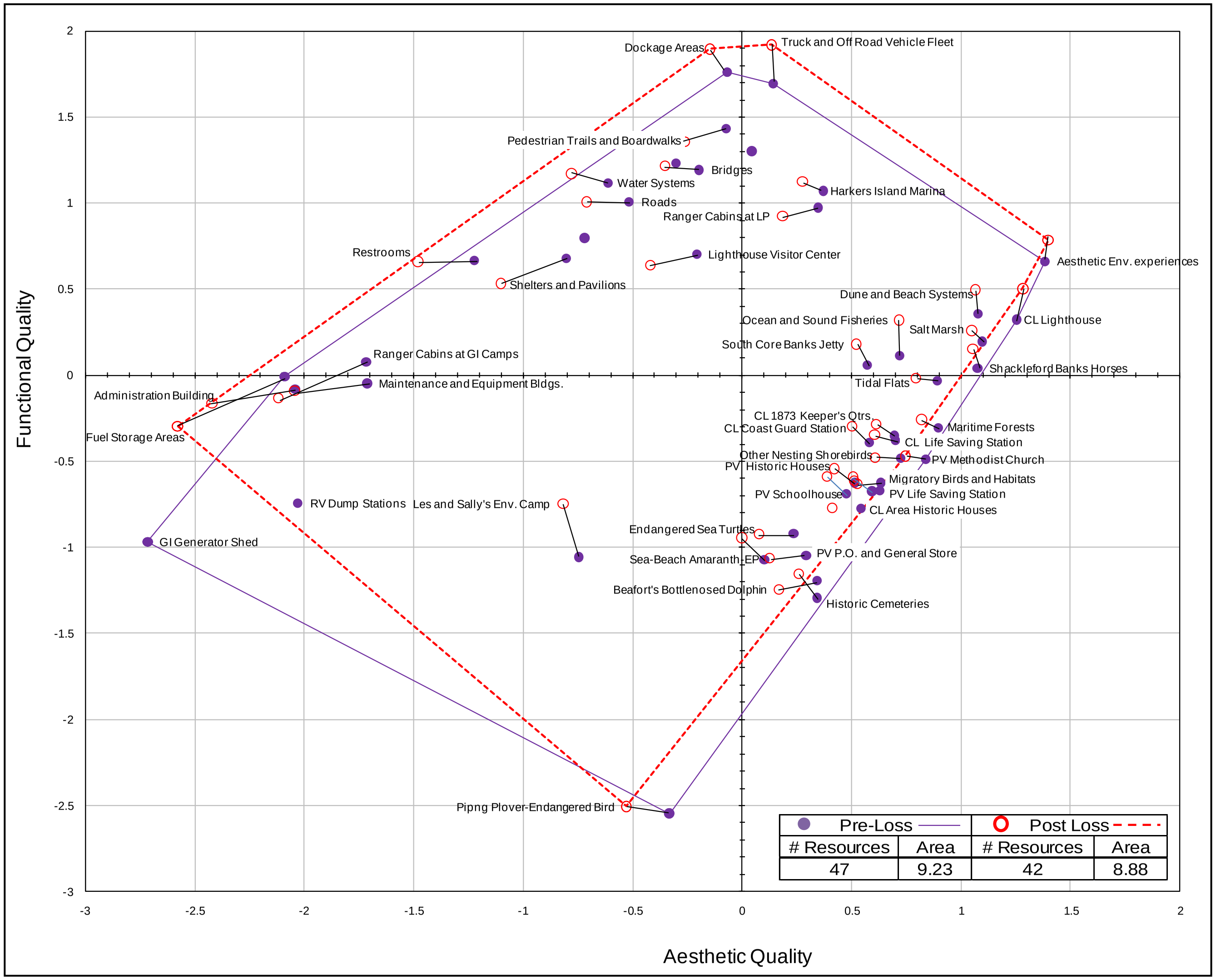


Figure 14. Value space representations for resource loss scenario three. - infrastructure resources

Discussion of moderate impact scenarios

In all three scenarios, despite seemingly major losses of resources, the overriding observation is that value spaces remain largely stable after losses. Subtle shifts occur between the location of the value range for all resources and in changes to scenarios one and two, representing cultural and natural resources respectively. Value range areas also decrease only slightly with reductions of 4% for scenario one and 6% for scenario two. Scenario three presents nearly a 25% difference in value range area, however, this is driven by the loss of a single resource, the piping plover, which reflected very low level of replaceability.

The direction of pre to post-loss movements can also provide insight as to whether resources losses move value locations in the direction of one factor or a combination of both factors. In scenarios one and two movements are driven by a combination of both factors and values shift more positively toward aesthetic quality and away from functional quality. Movements in these two scenarios are also very slight, with, all resource movements in scenario one moving less than 0.20 standard units and 70% of movements in scenario two under that threshold. In fact, only one resource (GI Generator Shed) in scenario two approaches a 0.5 standard unit shift. In scenario three, resource values do not shift consistently with respect to one or both factors. It appears that the great overlap and concentrations in value locations for cultural and natural resources produce similar small shifts, while more diffuse patterns of resource value locations, as is the case with infrastructure resources, produce less predictable shifts. Scenario three also presents only two resources (Fuel Storage Areas and Ranger Cabins at GI Camps) that are at or near movements of 0.5 standard units while 76% of the resources move 0.20 standard units or less.

Disastrous impact scenarios

The last two scenarios depict disastrous losses to northern and southern areas of the park. In these two scenarios, cultural and infrastructural resources are equally impacted, though natural resources remain intact. The reasoning for this is theoretical as well as data driven. First, in the case of Cape Lookout, disaster-producing storms can impact one area of the park while causing lesser damage to other areas due to great length of these islands. Second, most natural resources either regenerate quickly (e.g. salt marsh re-establishment after washover events) or are not bound by location (e.g. fish and migratory birds). Third, related to data limitations, respondents were asked to rate natural resources such as dune and beach systems, endangered sea turtles, etc. for the entire park, so losses in a specific area of the park are not observed in these data.

Scenario four - disastrous impact to northern resources

Results for scenario four include similar eigenvalues and loadings for pre and post-loss factor analysis indicating that observed differences can be attributed to the loss of resources and not differing underlying factors or loadings. These results are listed in Table 20.

Table 20. Factor results for resource loss scenario four - disastrous impact to northern resources

	Mean Ratings			
	Pre-Loss		Post-Loss	
	Aesthetic Quality Factor 1	Functional Quality Factor 2	Aesthetic Quality Factor 1	Functional Quality Factor 2
Eigenvalue	3.230	0.887	3.127	1.134
Character	0.901	0.001	0.915	-0.036
Scenic Beauty	0.980	-0.074	0.957	-0.190
Visitation	0.864	0.284	0.943	0.167
Operations	-0.208	0.728	-0.684	0.667
Replaceable	-0.818	0.521	-0.130	0.789
Variance Explained	0.807	0.222	0.757	0.274
Shaded cells contain loadings >.05, which reflects loadings that dominate the factor.				

Table 21 lists factor scores, assigned to their XY values used to create value spaces for pre and post-loss scenarios. Also included are Euclidean distance values for each resource representing the movement, in standardized units, of each resource as a result of the change in resources. Shaded resources represent those lost in this scenario.

Table 21. Resource value locations and movements for resource loss scenario four - disastrous impact to northern resources

Resource	Pre-Incident X	Pre-Incident Y	Post-Incident X	Post-Incident Y	Value Movement Post-Incident
Administration Building	-2.042	-0.081	-2.874	0.712	1.15
Maintenance and Equipment Bldgs.	-1.712	-0.047	-2.424	0.746	1.07
Les and Sally's Env. Camp	-0.745	-1.057	-1.147	-0.308	0.85
Pipng Plover-Endangered Bird	-0.332	-2.546	-1.055	-2.329	0.75
Parking Lots	-0.720	0.798	-1.031	1.458	0.73
Lighthouse Visitor Center	-0.208	0.702	-0.494	1.247	0.61
Sea-Beach Amaranth-EP	0.101	-1.072	-0.471	-1.042	0.57
Historic Cemeteries	0.343	-1.293	-0.004	-0.947	0.49
Endangered Sea Turtles	0.235	-0.920	-0.219	-0.759	0.48
Beafort's Bottlenosed Dolphin	0.344	-1.194	-0.103	-1.039	0.47
CL Area Historic Houses	0.544	-0.773	0.116	-0.741	0.43
Other Nesting Shorebirds	0.839	-0.490	0.449	-0.618	0.41
Truck and Off Road Vehicle Fleet	0.141	1.695	0.067	2.091	0.40
CL 1907 Keeper's Qtrs.	0.592	-0.673	0.253	-0.543	0.36
CL Life Saving Station	0.702	-0.379	0.342	-0.394	0.36
Migratory Birds and Habitats	0.633	-0.624	0.312	-0.463	0.36
Ocean and Sound Fisheries	0.719	0.112	0.619	0.454	0.36
CL Coast Guard Station	0.582	-0.389	0.244	-0.295	0.35
South Core Banks Jetty	0.571	0.057	0.247	0.055	0.32
CL 1873 Keeper's Qtrs.	0.696	-0.350	0.419	-0.190	0.32
Maritime Forests	0.897	-0.308	0.584	-0.325	0.31
Harkers Island Marina	0.370	1.071	0.166	1.302	0.31
Salt Marsh	1.096	0.195	0.824	0.056	0.31
Tidal Flats	0.890	-0.034	0.604	-0.013	0.29
Shackleford Banks Horses	1.076	0.041	0.992	0.213	0.19
Dune and Beach Systems	1.077	0.358	0.972	0.488	0.17
CL Lighthouse	1.255	0.323	1.220	0.455	0.14
Aesthetic Env. experiences	1.382	0.662	1.391	0.731	0.07
Shelters and Pavilions	-0.803	0.681	Resources Lost in Scenario		
Restrooms	-1.222	0.667			
GI Fish Camp Cottages	0.044	1.302			
LP Cabins	-0.303	1.234			
Ranger Cabins at LP	0.348	0.974			
Ranger Cabins at GI Camps	-1.717	0.076			
PV Schoolhouse	0.476	-0.689			
PV Methodist Church	0.723	-0.481			
PV P.O. and General Store	0.293	-1.047			
PV Life Saving Station	0.629	-0.671			
PV Historic Houses	0.513	-0.625			
GI Generator Shed	-2.716	-0.967			
Roads	-0.518	1.007			
Fuel Storage Areas	-2.090	-0.009			
RV Dump Stations	-2.032	-0.742			
Bridges	-0.198	1.193			
Pedestrian Trails and Boardwalks	-0.073	1.434			
Water Systems	-0.612	1.118			
Dockage Areas	-0.069	1.762			

Finally, Figure 15 illustrates two value spaces created for pre and post-loss scenarios. Also included are the numbers of resources and value range areas as well as labeled specific locations of resources in pre-loss (filled markers) and post-loss (open markers) that are connected graphically to better illustrate changes in value space locations.

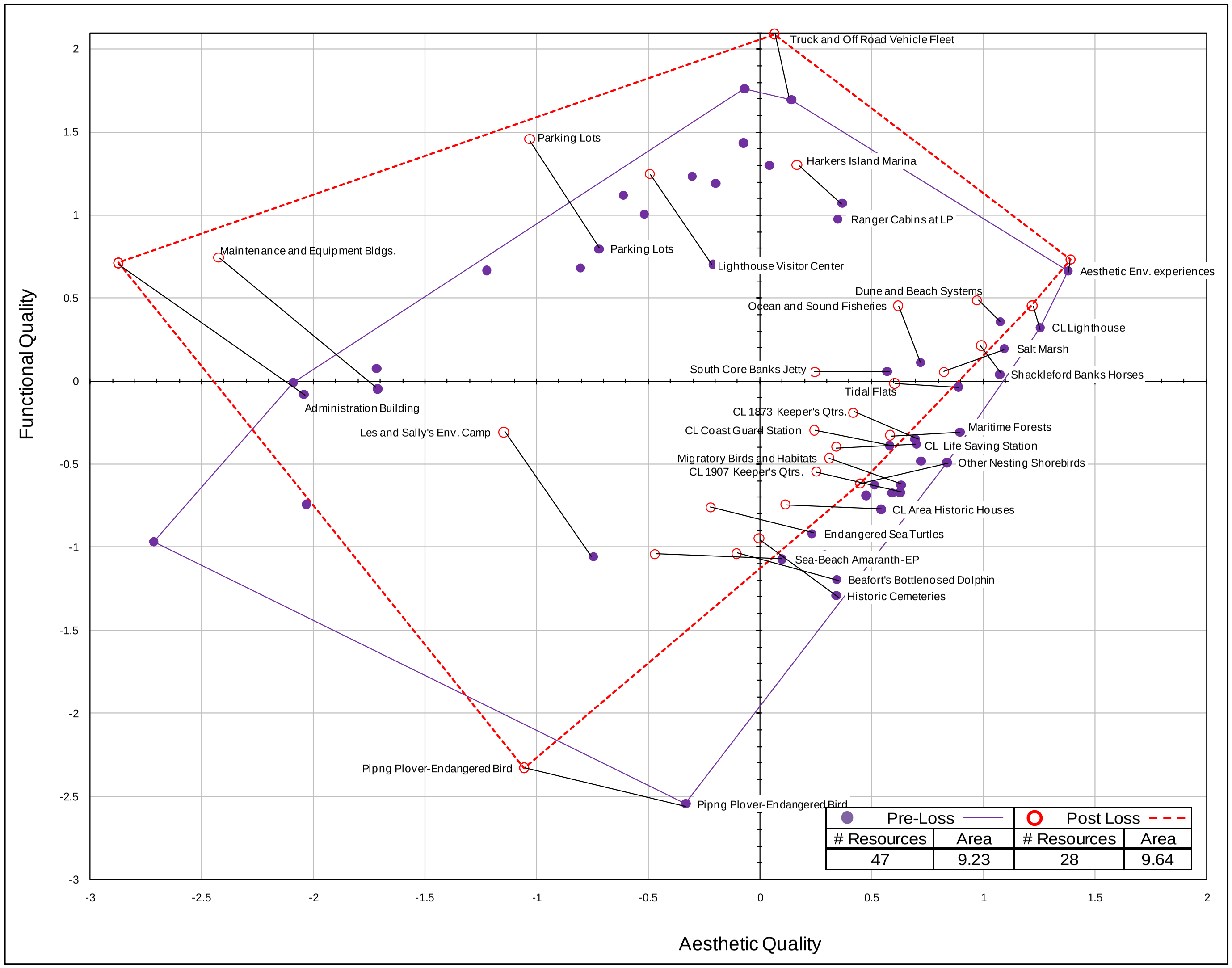


Figure 15. Value space representations for resource loss scenario four - disastrous impact to northern resources

Scenario five - disastrous impact to southern resources

Results in Table 22 for scenario five include similar eigenvalues and loadings for pre and post-loss factor analysis indicating that observed differences can be attributed to the loss of resources and not differing underlying factors or loadings.

Table 22. Factor results for resource loss scenario five – disastrous southern impact

	Mean Ratings			
	Pre-Loss		Post-Loss	
	Aesthetic Quality Factor 1	Functional Quality Factor 2	Aesthetic Quality Factor 1	Functional Quality Factor 2
Eigenvalue	3.230	0.887	3.183	1.058
Character	0.901	0.001	0.883	0.070
Scenic Beauty	0.980	-0.074	0.988	0.007
Visitation	0.864	0.284	0.842	0.298
Operations	-0.208	0.728	0.020	0.851
Replaceable	-0.818	0.521	-0.846	0.509
Variance Explained	0.807	0.222	0.764	0.254
Shaded cells contain loadings >.05, which reflects loadings that dominate the factor.				

Table 23 lists factor scores, assigned to their XY values used to create value spaces for pre and post-loss scenarios. Also included are Euclidean distance values for each resource representing the movement, in standardized units, of each resource as a result of the change in resources. Shaded resources represent those lost in this scenario.

Finally, Figure 16 illustrates two value spaces created for pre and post-loss scenarios. Also included are the numbers of resources and value range areas as well as labeled specific locations of resources in pre-loss (filled markers) and post-loss (open markers) that are connected graphically to better illustrate changes in value space locations.

Table 23. Resource value locations and movements for resource loss scenario five - disastrous southern impact

Resource	Pre-Incident		Post-Incident		Value Movement Post-Incident
	X	Y	X	Y	
Ranger Cabins at GI Camps	-1.717	0.076	-1.900	0.739	0.69
GI Generator Shed	-2.716	-0.967	-2.988	-0.619	0.44
Bridges	-0.198	1.193	-0.503	1.499	0.43
Water Systems	-0.612	1.118	-0.949	1.387	0.43
LP Cabins	-0.303	1.234	-0.665	1.400	0.40
GI Fish Camp Cottages	0.044	1.302	-0.302	1.497	0.40
Ranger Cabins at LP	0.348	0.974	0.103	1.272	0.39
Salt Marsh	1.096	0.195	0.937	0.504	0.35
South Core Banks Jetty	0.571	0.057	0.374	0.340	0.34
RV Dump Stations	-2.032	-0.742	-2.247	-0.493	0.33
Aesthetic Env. experiences	1.382	0.662	1.166	0.882	0.31
Tidal Flats	0.890	-0.034	0.738	0.229	0.30
Other Nesting Shorebirds	0.839	-0.490	0.714	-0.218	0.30
Dune and Beach Systems	1.077	0.358	0.875	0.569	0.29
Maritime Forests	0.897	-0.308	0.756	-0.066	0.28
Ocean and Sound Fisheries	0.719	0.112	0.492	0.247	0.26
Sea-Beach Amaranth-EP	0.101	-1.072	-0.034	-0.846	0.26
PV Life Saving Station	0.629	-0.671	0.497	-0.443	0.26
Shackleford Banks Horses	1.076	0.041	0.883	0.200	0.25
PV Methodist Church	0.723	-0.481	0.578	-0.290	0.24
Endangered Sea Turtles	0.235	-0.920	0.099	-0.725	0.24
PV P.O. and General Store	0.293	-1.047	0.178	-0.849	0.23
Migratory Birds and Habitats	0.633	-0.624	0.493	-0.446	0.23
PV Historic Houses	0.513	-0.625	0.351	-0.480	0.22
PV Schoolhouse	0.476	-0.689	0.315	-0.551	0.21
Beafort's Bottlenosed Dolphin	0.344	-1.194	0.233	-1.031	0.20
Historic Cemeteries	0.343	-1.293	0.203	-1.237	0.15
Pipng Plover-Endangered Bird	-0.332	-2.546	-0.396	-2.471	0.10
Lighthouse Visitor Center	-0.208	0.702	Resources Lost in Scenario		
Administration Building	-2.042	-0.081			
Maintenance and Equipment Bldgs.	-1.712	-0.047			
Shelters and Pavilions	-0.803	0.681			
Restrooms	-1.222	0.667			
Les and Sally's Env. Camp	-0.745	-1.057			
CL Lighthouse	1.255	0.323			
CL Life Saving Station	0.702	-0.379			
CL 1873 Keeper's Qtrs.	0.696	-0.350			
CL 1907 Keeper's Qtrs.	0.592	-0.673			
CL Coast Guard Station	0.582	-0.389			
CL Area Historic Houses	0.544	-0.773			
Roads	-0.518	1.007			
Parking Lots	-0.720	0.798			
Fuel Storage Areas	-2.090	-0.009			
Pedestrian Trails and Boardwalks	-0.073	1.434			
Dockage Areas	-0.069	1.762			
Harkers Island Marina	0.370	1.071			
Truck and Off Road Vehicle Fleet	0.141	1.695			

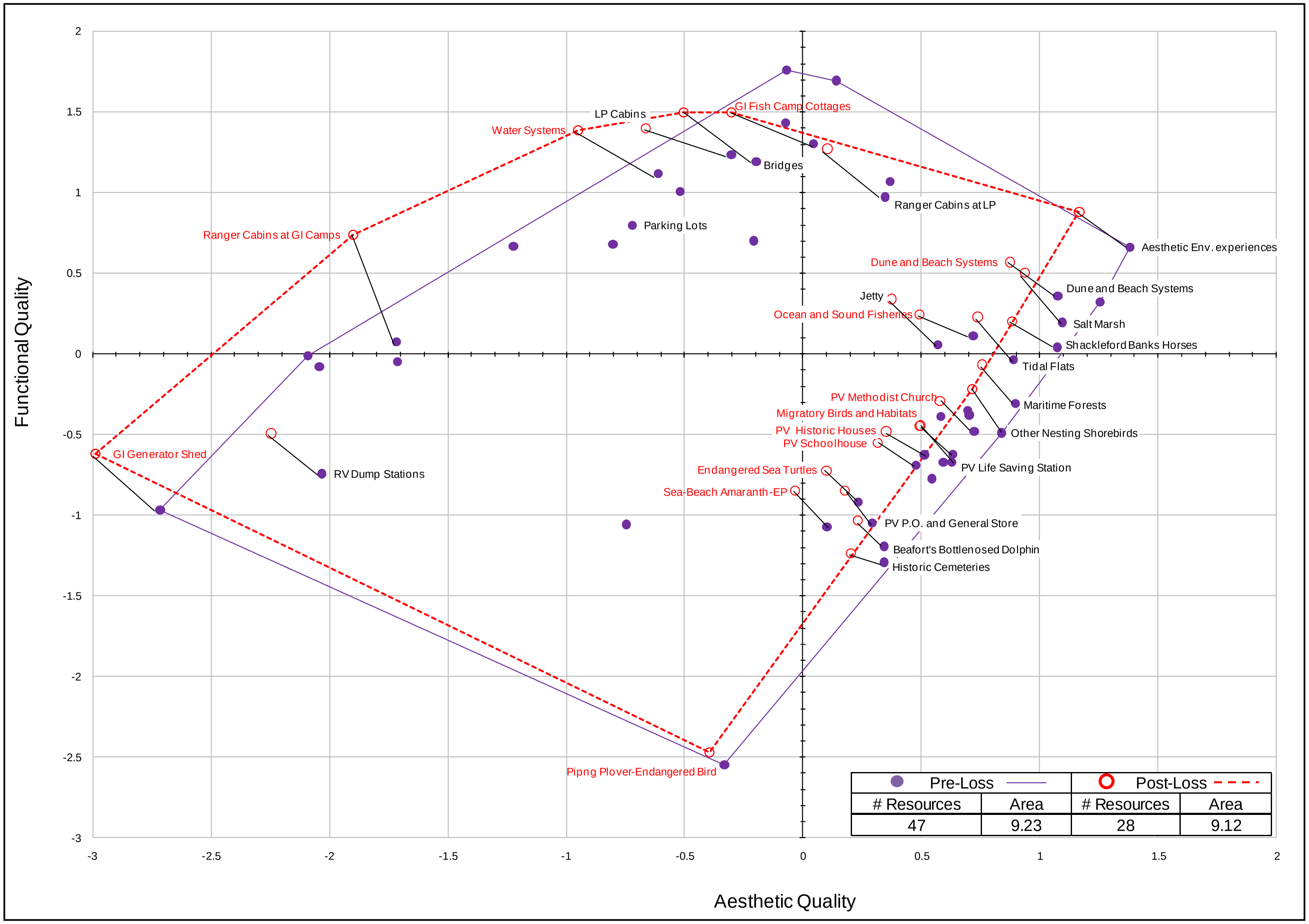


Figure 16. Value space representations for resource loss scenario five. - disastrous southern impact

Discussion of disastrous impact scenarios

In these two scenarios that depict disastrous losses of cultural and infrastructure resources that would arguably represent a fundamental change to the perception and use of Cape Lookout, greater changes in value spaces can be observed compared to previous scenarios. In both cases, value range location and area shifts are subtle, but changes in individual resource locations become more pronounced as individual resources carry great load in the overall value space. As was observed in earlier scenarios, outlying resources, those furthest from concentrations of resources, and often related to infrastructure, exhibit the greatest movement. Note that in scenario four, the Administration Building moves to a greater functional role with less emphasis on aesthetic quality. Other infrastructure resources in this scenario also exhibit similar movements, several changing by nearly a full standard unit as illustrated in Table 18. Two trends stand out as most interesting when looking at the changes observed in both scenarios. First, that the core resources, those highly-ranked by respondents, maintained their relative relationships to one another despite noticeable shifts. For these, rather than individual resources moving in the value space independently both in direction and distance, they shifted as a group. Where resource inventories, maintenance efforts, etc. may treat these core resources as distinctly different, their representations in a value space, built upon the preferences of respondents with ties to Cape Lookout, show that they are highly interconnected. In other words, the whole is greater than the sum of its parts, providing greater value to visitors as cohesive units rather than individual elements.

A second trend observed in these two disastrous scenarios is that resource movements from pre to post-loss switched directions. While in lesser impact scenarios presented earlier, post-loss value locations largely moved positively on the aesthetic quality but negatively on functional quality, here the result was the opposite. Post-loss values consistently moved negatively on aesthetic quality and positively on functional quality. This appears to be driven by the great losses in infrastructure represented in these two scenarios, though this does not clearly point to management approaches that could be driven by this observation.

The overriding observation again is that value spaces remain largely stable even after disastrous impacts. Subtle shifts occur after loss of resources, however, despite the popularity of some individual resources (i.e. the Lighthouse, or Shackleford Banks Horses), the collections of resources together, with underlying and supporting infrastructure form fundamental character of the park.

CHAPTER VIII

CONCLUSIONS

Resource managers, planners and policy makers often face challenges when including values for non-market natural and cultural resources in decision processes. In the context of national parks, these individuals seek to balance the preservation and use of diverse sets of resource types, the needs of multiple user groups, and constant and ever-changing threats. All of these resources can be said to have multiple dimensions of value and many of these are non-market. Tools are available to assess individual dimensions of value, however most do so in monetary terms and in a reactive way. Rogers and Bardenhagen (2010) developed a method quantitatively measure these values accounting for multiple dimensions of value. This method is used to incorporate these values for natural, cultural and infrastructural resources into decision processes. This research is done in a manner that presents valued resources relative to one another, while enabling the ability to be used proactively.

This dissertation extended the work described above and utilized a *place-based resource-driven* valuation approach to measure the multi-dimensional value structures for resources, relative to one another, within a national park. Stakeholder group values were observed and trends in resource values were discussed. Additionally, potential scenarios of impacts to resources were presented to assess changes in values in the event of resource losses. Each of these assessments was enabled by the creation of value spaces for each group or scenario. Value spaces are multi-dimensional abstract representations of the values of resources relative to one another in a standardized Euclidian space. These are derived from stakeholder expressed preference data gathered for multiple value types and for a known set of resources. These value spaces provide insight to decision makers into the patterns of resource values, relationships between similar or opposing values for multiple stakeholder groups, and the ability to ascertain changes in how resources are valued should certain resource losses occur.

Based on the literature, values can be seen as a truly human concept, expressing importance and intrinsically tied to specific places, features or landscapes (Antrop, 2005; Bingham et al., 1995; Stephenson, 2008). During planning and decision processes, input is often sought to understand the individual values for certain resources and to place these held values in the context of directly observable, typically monetary, values for other resources (Friedmann, 1987; Seip and Wenstop, 2006) . Further, diverse sets of stakeholder groups, those that form around core sets of values, can provide decision makers additional insight as these groups have vested interests in the protection or use of specific resources, offer extended expertise, and can mobilize to work cooperatively with planners or administrators (or alternately, resist planning or implementation). Resource decision processes in the context of institutions often follow a process that moves from problem and objectives formation to alternatives creation and review, to selection of a preferred alternative and finally to implementation of the policy or action (Noble, 2006; Partidário and Clark, 2000; Seip and Wenstop, 2006). In these processes, typical resource valuation tools assess reactions to presented alternatives and express single dimensions of value, thus missing vital input that could be used in framing problems and objectives, and undervaluing the resources involved.

A theory was presented that some of the shortfalls of current valuation methods could be overcome by using place-based resource-driven value spaces in decision processes. Two primary constructs suggest: First, understanding the ways in which distinct stakeholder group value spaces differ can be especially helpful during problem articulation and alternatives creation or in conflict resolution efforts. Second, understanding changes in value spaces that result from scenario-based future resource losses can aid in long range planning efforts that seek to protect or adapt resources from likely future adverse impacts whether by natural occurrence or through human actions.

To create value spaces, ratings data for 47 specific resources or resource sets were obtained from a web-based preference survey distributed to individuals interested in or with some affiliation to Cape Lookout National Seashore. Mean ratings from eleven-point Thurstone scales along five value types were compiled and used in subsequent sets of factor analysis. Factor analysis is an appropriate method to depict values along multiple dimensions as it (a) assesses shared variances among resources in order to identify a smaller set of factors that are driven by the included resources, (b) creates orthogonal factor that are independent of one another, and (c) presents results in standardized form thus enabling direct comparisons. While the pilot nature of this study and the small sample sizes that are available from these data do not allow for traditional hypothesis testing, exploratory factor analysis can be appropriately used to uncover previously unobservable relationships and latent variables that depict trends in the data for qualitative discussion.

Stakeholder group differences

The first set of analyses explored whether differing groups presented observable differences in value spaces. Six self-reported stakeholder groups, two geographically distinct groups derived from the data, and the full sample of all respondents were identified and value spaces created for each. Valued resources shared across groups, value ranges for resource types across all groups, and direct comparisons of value space changes for paired groups were observed. Of immediate interest is the identification of a core set of 18 highly valued resources shared among all groups. Decision makers can use shared value information as they plan for public participation efforts in order to determine which groups should be encouraged to participate and which specific resources may involve more or less contention in discussions of changes to the access of these resources or potential impacts to them. Secondly, direct comparisons of value spaces for groups provided clear distinctions between group values for specific resources. Local versus non-local respondents showed minor changes in value spaces, which is understandable given that geography is the only distinction between these groups. However, when looking at two very different groups as in business associations versus fishing groups, distinct differences in shared values and unique values are observed. This reinforces the theory that interest groups matter in decision processes. The ability to observe differences between individual groups, allows resource managers, planners and decision makers the ability to tailor comparisons to the problem at hand and gain insights into the points-of-view of the two groups, areas of common ground and areas of potential contention, all prior to proposed alternatives or actions. Finally the stability of values for core resources, especially those that are interrelated such as historic structures within Portsmouth Village or key natural resources such as Tidal Flats, Dunes and Beaches, and the Salt Marsh is notable. These resources showed greater overlaps in value ranges and less volatile location changes across groups than resources outside of the core 18 resources.

Resource base differences

The second set of analyses explored whether differences in value spaces could be driven by resource change scenarios. Overall, it was observed that changes in the resource base do change value spaces, but that the patterns of how specific resources relate to one another remains remarkably stable. Using the value space for all respondents as a starting point, five individual resource loss scenarios were outlined and value spaces for each post-loss situation were created. Again these utilized value range depictions, this time for the areas that all resources in pre- and post-loss scenarios represented. As well, pre- to post-loss movements were measured by their change in Euclidean distance within the standardized space.

In the first three scenarios, despite losses of many highly valued resources, value spaces remained largely stable as value ranges and locations of individual resources exhibited only subtle shifts. Directional changes, indicating which of the two factors, aesthetic quality or functional quality most influential in the change were also described. Changes in natural and cultural resources were consistently driven by both factors, while less consistent directional movements were observed for infrastructure resources, likely due to their outlying and diffuse locations within the value space. In the final two scenarios depicting losses that would signal fundamental changes in the perception and use of the park, clear changes in resource values were observed. Of particular interest were pre- and post-loss resource value changes that in both cases mirrored one another despite quite different resource losses. In both scenarios, values changed noticeably, with several resources moving up to a full standardized unit. Even with this movement, the patterns of resource changes, especially for natural and cultural resources, remained remarkably stable and consistent.

This stability within value spaces can assure resource managers that the relative resource values that appear within the space can be used as a means of understanding value perceptions that are likely to be long-term and not subject to unpredictable or volatile shifts. Many of the resources observed are permanent features or are tied to long cultural histories. As well, the people who chose to participate have some connection to the park and its resources, so it is not surprising to see stable value relationships even in the midst of great resource losses.

Broader implications

This dissertation began with discussions of participation, conflict resolution and decision processes in the context of challenging decisions that demand insights into the values that individuals and groups hold for resources that are complex and typically not able to be monetized. Using a place-based resource-driven methodology, as employed here, a more holistic view of the underlying drivers of those values, can be achieved within one representative space. While this is a tool that fills a gap in our current ability to assess resource values, it is not intended to simply replace other methods, rather, it can be used in conjunction with other tools as a means of refining the information. As an example, would it not make sense to craft problem statements, objectives and alternatives with a prior understanding of the range of shared and unique values of constituents instead of hearing opposition to alternatives created without this understanding?

During these early phases of decision processes planners are often engaged in determining how public input will be solicited and used, especially in the realm of long-range planning efforts. Understanding the values held by multiple stakeholder groups can inform these efforts by identifying both the groups that are likely to be most interested in the proposed change or impact, thus they can be encouraged to participate. As well, identifying those that have overlapping values can provide insight when, for example, project steering committees are selected and members that can be seen in various roles are desired.

With many resource decision processes, especially those involving complex non-market resources as described here, conflicting viewpoints is the often result and not the exception. As illustrated in the findings described herein, shared resources are able to be identified and further the degrees to which there is relative value consensus among groups for specific resources can be observed. This allows decision makers and groups with opposing viewpoints to understand where they have some degree of consensus of values in order to begin discussions from common ground rather than polarized stances.

In complex decisions, such as those that deal with diverse sets of resources and stakeholder groups such as those present at Cape Lookout, some form of the basic linear process as described in Chapter II is often used. Admittedly, this portrayal is simplified and many processes have numerous other subtle actions and sequences involved, but the basic linear reactive structure remains. Where other valuation techniques are routinely utilized at the phase of assessing the utility, effectiveness or impacts of alternatives, the value space can be used proactively. This can identify resources of similar value to help to define the nature of the problem. This ability to use value spaces proactively can be employed in the context of planning for immediate impacts such as storms (whether or not losses are short or long-term) in which case recovery efforts can be guided by the values held by stakeholders. As well, slow-progressing impacts such as losses that would be associated with sea level rise can utilize value spaces to test scenarios and inform adaptation efforts.

Finally, the use of value spaces, as shown in observations of both groups and in resource loss scenarios, can also point to “bundles” of resources that are valued together in an interconnected way. The observations herein seem to point to many sets, not just individual resources alone, as driving the character, perceived beauty, visitation of the park. Operations and replaceability, in contrast, do seem to be driven by individual resources, though no single resource can be seen as superior to others. Insights such as these can allow decision makers the ability to approach problems from the standpoint of individual resources that can be known, counted and measured, but also with a better understanding of the value that the overall landscape provides when multiple resources remain cohesive relationships. A prime example of this is in how project or alternative boundaries are established. When planned impacts to resources are proposed, at some point project boundaries must be established. This is especially relevant in mandated NEPA and similar decision processes in which project boundaries are established early in the process. Boundaries that seek to avoid individual resources but do not account for other nearby and complementary resources run the risk of under-representing the scope of the project impact. Think of the highway that avoids impacting homes and parks, but severs their relationship nonetheless. Value spaces can pinpoint combinations of resources that form a unique whole and have greater value assets as landscapes than individual elements.

Limitations

The work presented here, is based on a pilot study stemming from work of Rogers and Bardenhagen (2010) and has shown promise as a new methodology to measure the values associated with natural and cultural resources in multiple dimensions. This effort, however, only represents the values for one national park. It is not possible to know from the findings described here whether or not expressed values can be generalized to other parks that differ either in location or in types of resources. As well, the small overall sample size and smaller sub-groups of respondents represented in stakeholder groups also limit the ability to use traditional hypothesis tests, but still produced adequate samples of resources to support the analyses used. While these samples were small and non-random, the use of self-selected user groups with established relationships to Cape Lookout strengthens the use of these data in that the individuals that make up these groups have some cultural, recreational, emotional or business tie to the park and its resources. The resource inventory used in this study was based on an existing list of resources provided by staff members at Cape Lookout. This presents the potential to neglect to include some resources that may be of value to those outside of park staff. However, respondents were allowed to include their own resources in the listing that they would ultimately rate, but none of these were found to be significant. Finally, choosing the dimensions or value types upon which respondents rate resources is critical to accurately capturing resource values. In this case, extensive discussions with park administration helped to vet the five value types used. A more systematic approach to identify value types including for example, focus groups, preliminary surveys or an associative group analysis-like process could strengthen the methodology by which value types are chosen.

Future research

Future research efforts will focus on extending this present work in three areas. First, additional data for similar parks will be sought to address the degree to which the results herein can be generalized. A goal will be to ascertain the extent to which common values can be observed across differing settings and whether patterns of resource values appear to be stable or variable, do groups hold unique or shared values, and can these be used only locally or generalized. Broader samples will be sought both in overall respondents and within stakeholder groups through more targeted outreach and potentially through additional survey administration techniques. A specific focus will also be placed on the methods by which resource inventories and value types are established as discussed above. This work would also benefit greatly from other studies using for example, contingent valuation or travel costs measures to observe the same resources. Comparisons with these additional data sets would help to confirm the results of place-based resource-driven studies.

Second, abstract value spaces, when coupled with additional data such as resource elevations, storm surge and future sea level rise scenarios present the possibility of creating graphic value impact zones for use within GIS. These overlays could be created for utilization in hazard recovery plans, long-term management, and climate change adaptation plans.

Finally, this study tested the new methodology to create value spaces for resources within a national park with known and recognizable resources and discrete boundaries. This presented an ideal situation to observe resource values as many complexities found in other locales were not present. However, it is reasonable to believe that this methodology could be extended for use in cities and communities that are seeking to understand their own resource base and potential impacts of resource decisions. There are likely numerous additional complexities to be overcome such as real and perceived boundaries, additional resource types, and value types to be rated. These will be challenges to be sure, but a long term goal of being able to consistently and reliably present a clear picture of a community's value structures, for use at the same decision processes table as common market resources, seems a worthy goal to me.

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APPENDIX A

IRB REVIEW DOCUMENTATION

TEXAS A&M UNIVERSITY
DIVISION OF RESEARCH AND GRADUATE STUDIES - OFFICE OF RESEARCH COMPLIANCE

1186 TAMU
College Station, TX 77843-1186
1500 Research Parkway, Suite B-150

979.458.1467
FAX 979.862.3176
http://researchcompliance.tamu.edu

Institutional Biosafety Committee | Institutional Animal Care and Use Committee | Institutional Review Board

DATE: 10-Apr-2008

MEMORANDUM

TO: ROGERS, GEORGE O
778433137

FROM: Office of Research Compliance
Institutional Review Board

SUBJECT: Initial Review

Protocol Number: 2008-0196

Title: Cape Lookout Storm Recovery Plan

Review Category: Exempt from IRB Review

It has been determined that the referenced protocol application meets the criteria for exemption and no further review is required. However, any amendment or modification to the protocol must be reported to the IRB and reviewed before being implemented to ensure the protocol still meets the criteria for exemption.

This determination was based on the following Code of Federal Regulations:
(http://www.hhs.gov/ohrp/humansubjects/guidance/45cfr46.htm)

45 CFR 46.101(b)(2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior, unless: (a) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (b) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

Provisions:

This electronic document provides notification of the review results by the Institutional Review Board.

TEXAS A&M UNIVERSITY
DIVISION OF RESEARCH AND GRADUATE STUDIES - OFFICE OF RESEARCH COMPLIANCE
1186 TAMU, General Services Complex
College Station, TX 77843-1186
750 Agronomy Road, #3500
979.458.1467
FAX 979.862.3176
http://researchcompliance.tamu.edu

Institutional Biosafety Committee | Institutional Animal Care and Use Committee | Institutional Review Board

DATE: 03-Sep-2008

MEMORANDUM

TO: ROGERS, GEORGE O
778433137

FROM: Office of Research Compliance
Institutional Review Board

SUBJECT: Amendment

Protocol Number:	2008-0196
Title:	Cape Lookout Storm Recovery Plan
Review Category:	Exempt from IRB Review

It has been determined that the referenced protocol application meets the criteria for exemption and no further review is required. However, any amendment or modification to the protocol must be reported to the IRB and reviewed before being implemented to ensure the protocol still meets the criteria for exemption.

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Provisions: Increase number of participants to 1000. Subjects will now be recruited via e-mail contact with groups affiliated with Cape Lookout National Seashore.

This electronic document provides notification of the review results by the Institutional Review Board.

APPENDIX B

RESOURCE VALUATION SURVEY

TEXAS A&M UNIVERSITY

Ignore Validation
-more options-
Click Here to Start Over

Previewing Survey

Dear Friends and Visitors of Cape Lookout National Seashore,

Texas A&M University is currently working with the National Park Service to develop a Storm Recovery Plan for Cape Lookout National Seashore. This plan will work, together with the park's Storm Evacuation Plan, to ensure that the most appropriate measures are undertaken to protect human life, vital park resources and ongoing park operations in the event of a catastrophic storm.

Purpose of Survey

Setting priorities of resources at Cape Lookout will help to guide recommendations for recovery efforts. This survey collects your views as a part of the information to help establish priorities for hurricane and storm recovery in the park.

Directions

This survey asks you to think about the resources found within Cape Lookout. A park "resource" can be any element within the park such as docks, buildings, beaches, individual shorebirds etc. Please use the list provided to express your own opinion of which resources are the most important and are vital to making Cape Lookout the unique place that it is.

Anonymity

While your participation in this study is completely voluntary, your responses are critical in helping to create this plan. Your survey responses will be anonymous and no sensitive personal information will be asked of you. Further, your personal information will not be associated with any resulting data and will only be analyzed in groups.

If you have questions about the survey or the procedures, you may contact Eric Bardenhagen by email at bardenhagen@tamu.edu

Thank you for your time in taking this survey. Please start with the survey now by clicking on the "Continue" button below. It will take approximately 10-15 minutes to complete this survey.

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Please select up to ten of the resources at Cape Lookout that you consider to be the most important to the park

BUILDINGS and HISTORIC RESOURCES	NATURAL RESOURCES & INFRASTRUCTURE
Lighthouse Visitor Center	Endangered Sea Turtles
CALO Administration Building	Sea-Beach Amaranth-Endangered Plant
Maintenance and Equipment Buildings	Pipng Plover-Endangered Bird
Shelters and Pavilions	Other Nesting Shorebirds
Restrooms	Shackleford Banks Horses
Les and Sally's Environmental Camp	Beafort's Bottlenosed Dolphin
Camp Great Island Fish Camp Cottages (21)	Dune and Beach Systems
Long Point Cabins (20)	Salt Marsh
Ranger Cabins at Long Point (2)	Tidal Flats
Ranger Cabins at Great Island Camps (2)	Maritime Forests
Harker's Island Staff Housing (5)	Ocean and Sound Fisheries
Portsmouth Village Schoolhouse	Migratory Birds and Habitats
Portsmouth Village Methodist Church	Aesthetic environmental experiences such as views, the ocean air, etc.
Portsmouth Village Post Office and General Store	Radio shacks (2)
Portsmouth Village Life Saving Station	Great Island Generator Shed
Portsmouth Village Named Historic Houses (16)	Roads
Historic Cemeteries (6)	Parking Lots
Cape Lookout Lighthouse	Fuel Storage Areas (4)
Cape Lookout Life Saving Station	RV Dump Stations
Cape Lookout 1873 Keeper's Quarters (Current Bldg.)	Bridges
Cape Lookout 1907 Keeper's Quarters	Pedestrian Trails and Boardwalks
Cape Lookout Coast Guard Station	Water Systems (3)
Cape Lookout Area Named Historic Houses (14)	Dockage Areas (6)
	Harkers Island Marina
	South Core Banks Jetty
	Truck and Off Road Vehicle Fleet
	Other Resource (write in below)
	Other Resource (write in below)

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Please click and drag each resource to reflect the RANK ORDER that you feel reflects their importance to Cape Lookout.

RESOURCE	YOUR RANK OF IMPORTANCE
Lighthouse Visitor Center	1
Restrooms	2
Portsmouth Village Schoolhouse	3
Portsmouth Village Methodist Church	4
Cape Lookout Lighthouse	5
Cape Lookout 1873 Keeper's Quarters (Current Bldg.)	6
Endangered Sea Turtles	7
Other Nesting Shorebirds	8
Bridges	9
Harkers Island Marina	10

How important is each resource to the FUNDAMENTAL CHARACTER of the park?

	Not at all important (0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	Extremely Important (10)
Lighthouse Visitor Center	○	○	○	○	○	○	○	○	○	○	○
Restrooms	○	○	○	○	○	○	○	○	○	○	○
Portsmouth Village Schoolhouse	○	○	○	○	○	○	○	○	○	○	○
Portsmouth Village Methodist Church	○	○	○	○	○	○	○	○	○	○	○
Cape Lookout Lighthouse	○	○	○	○	○	○	○	○	○	○	○
Cape Lookout 1873 Keeper's Quarters (Current Bldg.)	○	○	○	○	○	○	○	○	○	○	○
Endangered Sea Turtles	○	○	○	○	○	○	○	○	○	○	○
Other Nesting Shorebirds	○	○	○	○	○	○	○	○	○	○	○
Bridges	○	○	○	○	○	○	○	○	○	○	○
Harkers Island Marina	○	○	○	○	○	○	○	○	○	○	○

How important is each resource to the park's SCENIC BEAUTY?

	Not at all important (0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	Extremely Important (10)
Lighthouse Visitor Center	○	○	○	○	○	○	○	○	○	○	○
Restrooms	○	○	○	○	○	○	○	○	○	○	○
Portsmouth Village Schoolhouse	○	○	○	○	○	○	○	○	○	○	○
Portsmouth Village Methodist Church	○	○	○	○	○	○	○	○	○	○	○
Cape Lookout Lighthouse	○	○	○	○	○	○	○	○	○	○	○
Cape Lookout 1873 Keeper's Quarters (Current Bldg.)	○	○	○	○	○	○	○	○	○	○	○
Endangered Sea Turtles	○	○	○	○	○	○	○	○	○	○	○
Other Nesting Shorebirds	○	○	○	○	○	○	○	○	○	○	○
Bridges	○	○	○	○	○	○	○	○	○	○	○
Harkers Island Marina	○	○	○	○	○	○	○	○	○	○	○

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How important is each resource in ATTRACTING VISITORS to the park?

	Not at all important (0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	Extremely Important (10)
Lighthouse Visitor Center											
Restrooms											
Portsmouth Village Schoolhouse											
Portsmouth Village Methodist Church											
Cape Lookout Lighthouse											
Cape Lookout 1873 Keeper's Quarters (Current Bldg.)											
Endangered Sea Turtles											
Other Nesting Shorebirds											
Bridges											
Harkers Island Marina											

In your view, how REPLACEABLE is each resource?

	Not Able to be Replaced (0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	Easily Replaced (10)
Lighthouse Visitor Center											
Restrooms											
Portsmouth Village Schoolhouse											
Portsmouth Village Methodist Church											
Cape Lookout Lighthouse											
Cape Lookout 1873 Keeper's Quarters (Current Bldg.)											
Endangered Sea Turtles											
Other Nesting Shorebirds											
Bridges											
Harkers Island Marina											

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How important is each resource to the park's ability to OPERATE?

	Not at all important (0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	Extremely Important (10)
Lighthouse Visitor Center	○	○	○	○	○	○	○	○	○	○	○
Restrooms	○	○	○	○	○	○	○	○	○	○	○
Portsmouth Village Schoolhouse	○	○	○	○	○	○	○	○	○	○	○
Portsmouth Village Methodist Church	○	○	○	○	○	○	○	○	○	○	○
Cape Lookout Lighthouse	○	○	○	○	○	○	○	○	○	○	○
Cape Lookout 1873 Keeper's Quarters (Current Bldg.)	○	○	○	○	○	○	○	○	○	○	○
Endangered Sea Turtles	○	○	○	○	○	○	○	○	○	○	○
Other Nesting Shorebirds	○	○	○	○	○	○	○	○	○	○	○
Bridges	○	○	○	○	○	○	○	○	○	○	○
Harkers Island Marina	○	○	○	○	○	○	○	○	○	○	○

After a damaging storm, decisions regarding the allocation of recovery funds will need to be made.

Assuming that each of the resources below are impacted by the storm to a similar degree, please slide the bars below to represent the PERCENTAGE of park recovery funds that you feel are most appropriate for each resource.

Resource	0 10 20 30 40 50 60 70 80 90 100	
Lighthouse Visitor Center		12 %
Restrooms		9 %
Portsmouth Village Schoolhouse		6 %
Portsmouth Village Methodist Church		12 %
Cape Lookout Lighthouse		31 %
Cape Lookout 1873 Keeper's Quarters (Current Bldg.)		19 %
Endangered Sea Turtles		1 %
Other Nesting Shorebirds		0 %
Bridges		3 %
Harkers Island Marina		5 %

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How important is Cape Lookout to Carteret County and the Southern Outer Banks in terms of?

	Not at all important (0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	Extremely important (10)
Character of the Area	○	○	○	○	○	○	○	○	○	○	○
Tourism	○	○	○	○	○	○	○	○	○	○	○
Recreation	○	○	○	○	○	○	○	○	○	○	○
Economy/Employment	○	○	○	○	○	○	○	○	○	○	○

In what year did you last visit Cape Lookout?

In a year, approximately how many days do you visit Cape Lookout?

Don't visit each year	1 Day	2-5 Days	6-10 Days	11-20 Days	More than 20 days
○	○	○	○	○	○

What area of the park do you visit most often? (Select One)

- ○ Shackleford Island
- ○ Long Point Camp - North Core Banks
- ○ Lighthouse Area / Cape Lookout Village
- ○ Portsmouth Village Area
- ○ Great Island Camp - South Core Banks
- ○ Harkers Island (Park Headquarters)

What other areas of the park have you ever visited? (Select all visited)

- ☐ Shackleford Island
- ☐ Long Point Camp - North Core Banks
- ☐ Lighthouse Area / Cape Lookout Village
- ☐ Portsmouth Village Area
- ☐ Great Island Camp - South Core Banks
- ☐ Harkers Island (Park Headquarters)

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What is your home ZIP code?

____

Approximately how much money do you spend on EACH TRIP to Cape Lookout?

Transportation to/from Cape Lookout	0
Lodging	0
Food	0
Equipment/Supplies	0
Ferry Fares	0
Other Costs	0
Total	0

Which of the following best describes you?

- ○ I am a park VISITOR
- ○ I am a PARK VOLUNTEER
- ○ I am part of the National Park Service STAFF

Are you a member of any of the following organizations?

☐ Friends of Cape Lookout National Seashore	☐ Davis Island Fishing Foundation
☐ Friends of Portsmouth Island	☐ Outer Banks Lighthouse Society
☐ Foundation For Shackleford Horses	☐ Boy Scouts of America
☐ Core Sound Waterfowl Museum	☐ Girl Scouts of America
☐ Cape Lookout Mobile Sportfishermen	☐ Carteret County Chamber of Commerce
☐ Beaufort Yacht and Sailing Club	☐ Down East Business Association
☐ Triangle Windsurfing and Boardsailing Club	☐ Other local recreational, historic or environmental organization- Please Specify
☐ Morehead City Boating Club	☐ Other local recreational, historic or environmental organization- Please Specify
☐ Cape Lookout Sail and Power Squadron	☐ Other local recreational, historic or environmental organization- Please Specify
☐ Crystal Coast Canoe and Kayak Club	☐ None of the above

Thank you for taking the time to complete this survey. Your responses will help the National Park Service in crafting a Storm Recovery Plan for Cape Lookout National Seashore.

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VITA

Eric Karsten Bardenhagen received his Bachelor of Arts degree in English from Valparaiso University in 1993. He entered the Master of Landscape Architecture program at Texas A&M University in September 1996 and received his MLA degree in May 1999. After seven years of private practice as a landscape architect in Madison, Wisconsin, he returned to Texas A&M University in 2006 to pursue a doctoral degree in urban and regional science which he completed in 2011. His research interests focus primarily on community preferences for natural and cultural resources that can be used as values in planning and decision making. He is also interested in campus planning, waterfront design, parks and recreation design and planning, and hazard planning and recovery in national parks. Mr. Bardenhagen is a registered landscape architect in Wisconsin

Dr. Bardenhagen is an Assistant Professor of landscape architecture at Texas A&M University and may be reached at:

Department of Landscape Architecture and Urban Planning
3137 TAMU
Langford Architecture Center
Texas A&M University
College Station, TX 77843