

Planning for Climate Change in US National Parks: Assessing the Quality of National  
Park Management Plans

by

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## ABSTRACT

Global climate change, rising average temperatures, rising water levels, irregularities in climate and river regimes, and increasing anthropogenic disturbances pose a significant risk to the ecosystems of protected areas. Given that past conditions are different from future conditions, managing protected areas faces serious challenges. New management approaches and strategies are needed to overcome these challenges. Planners and academicians have established methodologies for assessing the quality of climate change adaptation and resilience plans. However, a similar plan quality evaluation that considers climate change adaptation for National Park General Management Plans has not been conducted. This study adapted that methodology for national park management plans and applied it to analyze National Park General Management Plans across nine United States climate regions. Furthermore, this thesis aims to address this gap by asking and answering the following question: How do existing management plans for national parks meet the principles identified for effective planning for climate change? In this study, national park management plans are evaluated according to 112 criteria across seven principles, allowing for direct comparison and conclusions on strengths and weaknesses. The study revealed the strengths and weaknesses of the plans. Plans generally have similar weak points and strong points. While some aspects, such as public participation and coordination, perform relatively well, there are critical shortcomings in articulating a vision for climate adaptation, addressing uncertainty, and developing detailed strategies and monitoring mechanisms. The study will contribute to a better understanding of how protected areas can prepare for climate change impacts.

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## CHAPTER 1

### INTRODUCTION AND RESEARCH QUESTION

#### 1- Introduction

Climate change is today's global challenge, with serious and far-reaching impacts on ecosystems, biodiversity, and communities (IPCC, 2018). As a result of climate change, there are significant changes in natural systems, including loss of biodiversity, changes in ecosystems, and changes in the timing and duration of seasons, resulting in changes in the distribution and number of species (IPCC, 2014). A variety of adverse conditions, such as sea level rise, erratic rainfall regimes, and increased wildfires, pose serious threats to protected areas (Holtz et al., 2014). Due to these threats, climate change has several negative impacts on ecosystems and biodiversity, including changing habitats and ecological interactions of species in national parks and increasing the risk of extinction (Steffen et al., 2018). In the face of the uncertainty caused by the extensive and complex impacts of climate change, decisions must be made and action taken to protect natural and cultural resources despite this uncertainty (Miller et al., 2022). Effective planning and management in protected areas is essential to ensure their resilience, adaptability, and sustainability in the context of an evolving climate (NPS, 2021). Adaptation is defined as an adjustment to natural or human systems in response to actual or anticipated climatic stimuli or their impacts that mitigate damage or exploit beneficial opportunities, while mitigation is defined as any anthropogenic intervention to reduce sources or increase sinks of greenhouse gases (Ayers & Huq, 2009).



In the United States, with national parks of diverse characteristics and climatic conditions, meeting the challenges of climate change requires complex and sophisticated planning (Miller et al., 2022). General management plans, which set long-term goals and protect resources, can be used as an effective tool in this struggle with their comprehensive structure (NPS, 2023). To adapt these plans to changing conditions, this research will contribute to the development of the capacity to identify the strengths and weaknesses of existing plans. For this purpose, plan quality analysis is a good evaluation method to document the content of the plan and to identify the strengths and weaknesses of the plan (Woodruff et al., 2022). This study used Meerow and Woodruff's (2020) seven principles for plan quality analysis: 7 principles containing 112 evaluation criteria: (1) goals that describe desired conditions in the future; (2) a fact base that identifies contextual issues that provide the empirical basis for strategies; (3) strategies that guide decision making to ensure plan objectives are met; (4) public participation in the plan creation process; (5) interorganizational coordination; (6) details of implementation and monitoring; and (7) how plans address uncertainty. Woodruff and Stults (2016) for plan quality analysis methodology were used for the plan quality analysis methodology. Through this evaluation, direct comparisons can be made, and general conclusions about strengths and weaknesses can be drawn.

This master's thesis aims to investigate the quality and effectiveness of National Park Management Plans in the United States in the context of climate change adaptation. The increasing need to adapt to changing environmental conditions has become a very important focus in climate change adaptation, planning studies, and research (Pelling et al., D., 2015). Evaluation and development of compliance policies for management plans can

make important contributions to the successful adaptation of management plans to future conditions. For this reason, this study will make important contributions to both the planning literature and academicians and practitioners. In this context, the master thesis consists of 5 chapters. The first chapter contains the introduction section and the research question. The second chapter explains the literature review and research question to understand the background knowledge on the subject. The third chapter includes the methodology and evaluation criteria for plan quality analysis. The fourth chapter describes the research results. The last chapter consists of discussion and conclusion sections.

## 2- Research Question

The research question—how do existing management plans for national parks meet the principles identified for effective planning for climate change? —aims to explore and assess how current management strategies implemented in national parks meet the principles of plan quality analysis to address climate change adaptation. The research aims to assess whether the current management plans of national parks effectively incorporate strategies and actions in line with the principles set out for adapting to the impacts of climate change. This research question underlines the need to analyze the degree of integration of climate change considerations into park management frameworks and to determine whether these plans adequately address the ecological, environmental, and socio-economic consequences of a changing climate.

## CHAPTER 2

### LITERATURE REVIEW

The Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC, 2023), published in 2023, highlights important points about the escalating consequences of global climate change. This report emphasizes the revelation that the global average surface temperature reached 1.1°C above 1850–1900 in 2011–2020, with projections pointing to further increases in the future (IPCC, 2023). This increase, largely because of anthropogenic activities, has been shown to have profound consequences for the Earth's natural systems and protected areas (IPCC, 2014). Climate change has many negative impacts, but one of the most worrying impacts on protected areas is its transformative effect on natural systems because of biodiversity loss, ecosystem changes, and changes in the timing and duration of seasons (IPCC, 2014). As a result of global climate change, habitats are changing with increasing temperatures, and ecological conditions are becoming less favorable for various species, disrupting the delicate balance that sustains biodiversity and causing shifts in the distribution and abundance of species (IPCC, 2018).

National parks are ecologically vital, preserving biodiversity and preserving fragile ecosystems (Alemu, 2016). They also have deep social importance as they provide recreational opportunities, preserve cultural heritage, and support tourism and local economies (Hena et al., 2021). For this reason, it is essential for national parks to survive in order to protect the ecological balance, cultural heritage, and the well-being of both nature and society and to transfer this heritage to future generations. The negative impacts of global climate change are also seen in national parks, which contain many sensitive ecosystems (NPS, 2021). National parks in the United States are significantly exposed to

the impacts of climate change, and this exposure has led to vulnerability in national parks (Gonzalez et al., 2018). Due to these threats, climate change has several negative impacts on ecosystems and biodiversity, such as changing habitats, altering ecological interactions, and increasing the risk of extinction (Steffen et al., 2018). Sea level rise as a result of climate change and rising temperatures poses a serious threat, especially for coastal and low-lying protected areas, and these sensitive areas face the risk of habitat loss (Holtz et al., 2014). Measurements in national parks already show that temperatures are rising, sea levels are rising, tree mortality is increasing, and animal habitats are changing (Gonzalez, 2011). Furthermore, erratic precipitation regimes associated with climate change are disrupting the ecological balance in these areas and bringing a range of problems, including drought, an increase in wildfires because of rising temperatures, and an increase in the challenges faced by protected areas (Holtz et al., 2014). Changes in fire regimes increase tree loss, and changes in shorelines and biodiversity lead to species losses (Gonzalez, 2017). Research has shown that the area burned by climate change-induced fires in Yellowstone National Park could increase three to tenfold from 1990 to 2100, well above natural levels (Gonzalez et al., 2018). It could also cause the loss of up to 90% of tree species in Joshua Tree National Park in the same time frame (Gonzalez et al., 2018). These fires reduce ecological resilience, making ecological recovery and regeneration more difficult. Given all these threats, it is important to adapt to changing conditions for environmental and ecological impacts on national parks.

The development of general management plans for national parks is an important tool for establishing long-term goals and resource protection measures. These plans include management objectives that are crucial for achieving park goals and addressing a wide

range of challenges, including resource protection, visitor use, developmental initiatives, and boundary maintenance (NPS, 2023). However, changing conditions associated with climate change are creating the need for transformation in the management of protected areas. As climatic conditions change, changes in the ecosystems of national parks are inevitable. This requires a paradigm shift in resource management approaches, as highlighted by Colwell et al. (2012).

Because of the urgency of the situation, the need to adapt NPS strategies to manage the constant state of change caused by climate fluctuations is inevitable (NPS, 2021). The key lies in embracing flexibility and resilience in management practices, allowing for agile responses to dynamic changes in park ecosystems. Baron et al. (2009) reinforce the need to adapt in the face of climate-induced changes. Traditional management approaches are inadequate in the face of a rapidly changing climate, and protected areas need to move beyond historical practices and establish innovative management strategies that actively engage with the nuances of climate change impacts (Baron et al., 2009). In this context, the need to recalibrate overall management plans becomes even more tangible. Therefore, the National Park Service (NPS) has published a climate change response strategy that outlines the scientific research and vulnerability assessments necessary to support climate change adaptation, mitigation, and communication (NPS, 2010).

The increasing need to adapt to changing environmental conditions has become an important focus in climate change adaptation and planning research (Pelling et al., 2015). Studies by Jantarasami, Lawler, and Thomas (2010) and Casey and Becker (2019) emphasize the inadequacy of policies and regulations in the development of climate change adaptation strategies in national parks and the lack of funding to support adaptation

strategies. Inadequate climate impact information, inadequate financial and staff resources, and concerns about stakeholder opposition are emerging as significant inadequacies in policy development for developing effective climate change adaptation strategies in national parks (Jantarasami et al., 2010). Moreover, existing policies and regulations need to be expanded to include the development of climate change adaptation strategies and the need for funding to support the implementation of such strategies (Jantarasami et al., 2010; Casey & Becker, 2019). Another need is for a comprehensive assessment of climate change and related vulnerabilities in national park plans to enable predictive climate adaptation planning for protected areas (Michalak et al., 2016). Thus, a comprehensive assessment of climate change and associated vulnerabilities is crucial for climate change adaptation in national park planning (Michalak et al., 2016). Developing effective adaptation policies and planning approaches to avoid worst-case scenarios for national parks in an uncertain climate change environment is another important consideration (Miller et al., 2022). The uncertainty of climate change reveals a challenging and complex process in national park planning and strategy development (Miller et al., 2022). Identifying how plans already address climate change in protected area planning is an important step in adapting planning approaches to address the impacts of climate change (Jantarasami et al., 2010; Casey & Becker, 2019; Michalak et al., 2016; Miller et al., 2022).

Plan evaluation is a methodology for documenting plan content and identifying strengths and weaknesses. Plan evaluation is used to analyze different climate change adaptation plans, resilience plans, and other plans (Woodruff et al., 2022). Plan quality evaluation is a valuable method for systematically assessing the effectiveness of plans, covering various domains like natural hazards and sustainable development (Berke & Godschalk, 2009).

Evaluation of existing plans is also an important step in the development of policies that will ensure the adaptation of National Park Management Plans to climate change.

Meerow and Woodruff (2020), Woodruff and Stults (2016), and Woodruff et al. (2022), for plan quality analysis, analyzed seven principles and criteria related to these principles in their research. These seven principles are (1) goals that describe future desired conditions; (2) a fact base that identifies the relevant issues to the context, providing the empirical foundation for strategies; (3) strategies that guide decision-making to ensure plan goals are achieved; (4) public participation in plan creation; (5) inter-organizational coordination; (6) details regarding implementation and monitoring; and (7) how plans address uncertainty (Meerow & Woodruff, 2020; Woodruff & Stults, 2016; Woodruff et al., 2022). Criteria linked to these principles are specific both to the characteristics that assess overall plan quality and to the climate context. For example, the criteria of the fact-based principle include both an assessment of the overall strategies of the plan and an assessment of strategies in the climate context. The definition of each criterion linked to these seven principles is discussed in more detail in the methodology section.

Plan evaluation in the context of climate change is supported by Meerow and Woodruff (2020) with seven key principles that are of critical importance. First, it is essential to set clear, measurable targets to guide climate change planning, encompassing the preparation for climate change impacts (Meerow & Woodruff, 2020). Second, a sound knowledge base provides an empirical basis for climate planning. Comprehensive data collection on current conditions, future projections, and modeled impacts is necessary. This includes detailed GHG inventories for mitigation plans and vulnerability assessments across various sectors and populations for adaptation plans (Meerow & Woodruff, 2020). Third, effective climate

change planning requires multifaceted strategies that encompass changes in various domains, such as planning processes, policies, infrastructure, and individual behaviors. Prioritizing strategies, estimating implementation costs, and tradeoffs among economy, environment, and equity are crucial, especially in regions where adaptation is a higher priority than mitigation (Meerow & Woodruff, 2020). Fourth, inclusive public participation in the formulation of climate plans is vital. Ensuring procedural equity and fair participation in decision-making processes is crucial to counter the dominance of elites and technocrats. Inclusive, participatory approaches allow all local communities to actively shape climate plans and emphasize transparent documentation of participation processes and outcomes (Meerow & Woodruff, 2020). Fifth, inter-organizational coordination is crucial in addressing the complex challenges of climate change planning. Negotiating conflicting priorities and tradeoffs among economy, environment, and equity requires integrating climate considerations into various planning efforts, identifying inconsistencies, and seeking collaborative, win-win strategies (Meerow & Woodruff, 2020). Sixth, details on implementation and monitoring are critical to bridge the gap between planning and action. This includes overcoming challenges related to funding and financing for implementation (Meerow & Woodruff, 2020). Seventh, addressing uncertainty is a fundamental challenge in climate planning. Uncertainties related to scientific gaps, future emissions, and political responses can be addressed by identifying sources of uncertainty, considering different scenarios, adopting adaptive management approaches, and prioritizing low-regret strategies (Meerow & Woodruff, 2020).

In previous research, in the assessment for climate change and resilience plans, the presence/absence of criteria associated with the plan's principles was evaluated and scored



1 point if the criteria were met and 0 if not (Meerow & Woodruff, 2020; Woodruff & Stults, 2016; Woodruff et al., 2022). After scoring, the index scores were calculated according to the percentage of the principle criteria included in the plan, and the average of the principle scores and the total plan quality was calculated (Meerow & Woodruff, 2020; Woodruff & Stults, 2016; Woodruff et al., 2022). Meerow and Woodruff (2020), Woodruff and Stults (2016), and Woodruff et al. (2022) for plan quality analysis method emerge as an objective and up-to-date method to make a quantitative evaluation among plans. The determined principles and criteria are compatible with adaptation planning broadly and address new issues brought about by climate change, such as uncertainty (Meerow et al., 2022). The uncertainty principle assesses the recognition of various unpredictable future uncertainties related to climate processes, the identification of these uncertainties in plans, the consideration of different scenarios, and the implementation of adaptive, flexible measures that address new challenges brought by climate change (Meerow et al., 2022). Therefore, it is considered appropriate to use a similar methodology in the quality analysis of National Park Management Plans.

## CHAPTER 3

### METHODOLOGY

#### 1- Methodology

The study will examine how national park general management plans across the USA address climate change. Evaluating plans helps us understand the effectiveness of plans and planning processes and provides valuable learning findings (Berke & Godschalk, 2009). For this, firstly, a plan quality assessment will be conducted. Plan quality evaluation adapted from Woodruff, Meerow, Stults, and Wilkins (2022). These method principles are 1) goals, 2) public participation in plan creation, 3) fact-based, 4) inter-organizational coordination, 5) uncertainty, 6) policies, and 7) details regarding implementation and monitoring. For plan quality assessment, the methods used by Woodruff, Meerow, Stults, and Wilkins (2022) adapted to the national park management plan.

In order to assess the quality of National Park Management Plans, some arrangements have been made for the adaptation of the criteria determined by Woodruff, Meerow, Stults, and Wilkins (2022) for Climate Change Adaptation Plans to National Park Management Plans. In the adapted study, a score of 1 was assigned when the criteria were met, whereas a score of 0 was assigned when the requirements were not met. Subsequently, the mean of the scores pertaining to each principle was calculated in order to generate principle scores, while the overall scores were derived by calculating the average of the principle scores. The method of evaluation used the same methodology as the research system. Due to the original study's focus on cities, certain criteria were found to be unsuitable for application in national park management plans. Consequently, an adaptation was undertaken to adapt

and eliminate these criteria accordingly. The criteria for the seven main principles and the changes made are set out below.

1.1- Articulation of Purpose, Goals, And Objectives Principle

The articulation of purpose, goals, and objectives principle evaluates the plans using six criteria: "Plan purpose," "Vision statement," "Define resilience, adaptation, or preparedness," "Goals," "Objectives," and "Objectives detailed" (see Table 1). Firstly, this principle emphasizes that a plan must clearly state its purpose, ensuring stakeholders understand its fundamental objectives. Secondly, as Berke et al. (2006) recommended, including a vision statement is essential. Additionally, the principle stresses the importance of defining terms like resilience, adaptation, or preparedness. Moreover, the plan's goals should be expressed using adjectives and nouns, reflecting public values and articulating future desired conditions, as advised by Berke and Godschalk (2009). Furthermore, the plan should include specific and measurable objectives, serving as tangible steps toward goal achievement, by Berke et al. (2006). Finally, the plan should include quantifiable detailed objectives with goals. In articulating purpose, goals, and objectives principles, all the criteria established by Woodruff, Meerow, Stults, and Wilkins (2022) were deemed appropriate. However, the example of heat-related mortality given in the definition for the objective, the detailed criterion, has been replaced with a more general alternative energy objective since national parks are generally uninhabited areas (see Table 1).

Table 1 Articulation of Purpose, Goals, and Objectives Principle Criteria

<b>ARTICULATION OF PURPOSE, GOALS, AND OBJECTIVES</b>	
<b>Criterion</b>	<b>Description</b>
Plan purpose	States the purpose of the plan.
Vision statement	Includes a vision statement, which establishes an overall image of a desired future (Berke et al. 2006).

Define resilience, adaptation, or preparedness	Defines resilience, adaptation or preparedness.
Goals	Includes goals, which are outcomes that the community aspires towards. Goals are usually expressed in adjectives and nouns (not verbs) and are not quantified (Berke et al. 2006). Goals reflect public values and express future desired conditions (Berke and Godschalk 2009).
Objectives	Includes objectives, which are tangible, measurable outcomes leading to the achievement of a goal (Berke et al. 2006).
Objectives detailed	Includes quantifiable objectives for each goal (e.g., increase the use of alternative energy sources to 70% by 2030; there should be targets for each goal).

*Note: The Criteria Adopted from Woodruff, Meerow, Stults, and Wilkins (2022)*

## 1.2- Public Participation Principle

The public participation principle evaluates the plans using eight criteria: "Planning process," "Plan preparation involvement," "Plan preparation involvement detailed," "Representative stakeholders," "Participation techniques," and "Participation techniques detailed," "Public meetings," "Planning or steering committee" (see Table 2). The criterion within the public participation principle assesses the planning process's transparency and inclusivity. It requires a concise account of the planning process, including stakeholder involvement, representation of disadvantaged groups, and effective participation techniques. Additionally, it emphasizes open meetings and the presence of steering or advisory committees, highlighting the ongoing commitment to public engagement during plan maintenance and evaluation. All criteria of the uncertainty principle were taken unchanged from Woodruff, Meerow, Stults, and Wilkins (2022) (see Table 2).

Table 2 Public Participation Principle Criteria

<b>PUBLIC PARTICIPATION</b>	
<b>Criterion</b>	<b>Description</b>
Planning process	Describes the process undertaken to create the plan.

Plan preparation involvement	Describes the stakeholders involved in plan preparation.
Plan preparation involvement detailed	Includes detailed description of organizations and individuals involved in plan preparation. Description must include number of stakeholders and the general categories of stakeholders (e.g. residents, companies, non-profits, governmental agencies).
Representative stakeholders	Mentions how stakeholders who were involved represent all the groups affected by proposed policies or how the planning process sought to engage disadvantaged populations. Disadvantaged populations are those that may not traditionally be included in the planning process and may be adversely affected by climate change, such as the poor, elderly, or those for whom English is a second language.
Participation techniques	Mentions participation techniques used to create the plan, such as meetings, surveys, charettes, public comments on drafts, etc.
Participation techniques detailed	Describes participation techniques with details about each method including number of participants, main topics covered, and activities used to elicit input.
Public meetings	States that meetings were used to engage stakeholders and that these meetings were open to the public.
Planning or steering committee	States that a steering committee or advisory committee was used to guide plan creation.
Public participation maintenance	Discusses how public engagement will continue in plan maintenance/evaluation.

Note: The Criteria Adopted from Woodruff, Meerow, Stults, and Wilkins (2022)

### 1.3- Coordination Principle

The coordination principle evaluates plans through seven critical criteria, including "Local university," "Federal agencies," "State agencies," "Nonprofits," "Businesses," "Neighboring jurisdictions," and "Elected official engagement" (see Table 3). The criteria provide a comprehensive and collaborative approach to developing effective adaptation strategies. Internal support and detailed internal support criteria were excluded from the evaluation because they are criteria that include institutional support from within the local government, and national parks do not affiliate with a local government. All criteria of the uncertainty principle were taken unchanged from Woodruff, Meerow, Stults, and Wilkins (2022) (see Table 3).

Table 3 Coordination Principle Criteria

<b>COORDINATION</b>	
<b>Criterion</b>	<b>Description</b>
Local university	States that local universities were engaged in the planning process.
Federal agencies	States that federal agencies were engaged in the planning process.
State agencies	States that state agencies were engaged in the planning process.
Nonprofits	States that nonprofits were engaged in the planning process.
Businesses	States that businesses were engaged in the planning process.
Neighboring jurisdictions	States that neighboring jurisdictions were given the opportunity to participate in the planning process. Neighboring jurisdictions include regional planning organizations and counties as well as other cities, towns, or villages.
Elected official engagement	Mentions involvement of elected official(s) in the planning process.

Note: The Criteria Adopted from Woodruff, Meerow, Stults, and Wilkins (2022)

#### 1.4- Fact-Based Principle

The fact-based principle establishes a solid foundation for planning processes by emphasizing data collection and analysis using 38 criteria (see Table 4). It recommends delineating data types collected, providing planners with a robust informational base. Furthermore, it advocates for including insights from national, regional, and international studies, broadening the perspectives considered in planning. Additionally, local, indigenous, or traditional knowledge is acknowledged for its invaluable contributions. The principle also necessitates understanding existing impacts, conditions, and actions, along with historical climate trends, facilitating informed projections. To foster adaptability, it highlights non-climatic drivers' consideration, rigorous vulnerability, adaptive capacity, and risk assessments, ultimately prioritizing vulnerabilities and risks. By adhering to these criteria, the Fact Base Principle ensures that planning processes remain grounded,

adaptable, and aligned with sustainability and resilience principles (CA APG, 2012; PROVIA, 2013; Kates et al., 2012).

Most of the fact-based principle criteria were applicable, as established by Woodruff, Meerow, Stults, and Wilkins (2022). However, since national parks are not urban areas, the criteria for human vulnerabilities and urban services were deleted. For this reason, water supply, water supply detailed, vulnerable populations, vulnerable populations detailed, human/public health, and human/public health detailed criteria were removed from the evaluation list. In addition, in the evaluation of the criteria, the evaluation criteria related to the community were changed to those related to the park (see Table 4).

Table 4 Fact-Based Principle Criteria

<b>FACT-BASED</b>	
<b>Criterion</b>	<b>Description</b>
Data collection	Provides information about the type of data collected and analyzed in order to make the plan.
National studies	States that national studies were used to inform the plan. Studies may include climate, demographics, economic projections, etc.
Regional studies	States that regional studies were used to inform the plan. Studies may include climate, demographics, economic projections, etc.
International studies	States that international studies were used to inform the plan. Studies may include climate, demographics, economic projections, etc.
Local knowledge	States that local, indigenous, or traditional knowledge was used to inform the plan.
Existing impacts	Identifies ways that climate change or changing weather conditions are already affecting the community.
Existing conditions	Discusses existing social, economic, environmental, or built infrastructure conditions that could lead to enhanced vulnerability in the future.
Existing actions	Identifies actions and plans that are in progress or planned that have adaptation value. Actions do not need to be specifically designed to address climate change.
Historic changes weather/climate	Discusses how climate or weather trends in the area have changed to date.

Primary economic base(s)	Identifies the major economic sectors associated with the park.
Primary cultural base(s)	Identifies the main cultural assets of the park.
Primary natural system(s)	Identifies the major natural systems that are part of the park.
Presidentially declared disaster	Indicates that the community has experienced a presidentially declared disaster.
Previous hazardous events	Includes information on previous occurrences of hazardous events.
Repetitive loss properties	Discusses areas or specific properties that have been repetitively damaged by hazardous events.
Projected changes	Identifies climate change exposure, which is the climate change effects a community expects to feel, e.g., warmer temperature, increased precipitation, rising sea level (CA APG 2012).
Prioritized exposure	Prioritizes climate change effects or hazards.
Non-climatic drivers	Mentions other factors that may impact future vulnerability or resilience. Non-climatic factors include a shifting economy, growing or depleting population, or changing land use patterns.
Non-climatic drivers detailed	Explicitly discusses projections for non-climatic factors over time and how this could affect vulnerability or resilience. Non-climatic factors include a shifting economy, growing or depleting population, or changing land use patterns.
Vulnerability assessment	Clearly indicates that a vulnerability assessment was undertaken as part of the planning process. A vulnerability assessment includes an analysis of exposure, sensitivity, and adaptive capacity.
Adaptive capacity	Clearly indicates that an assessment of adaptive capacity was undertaken. Adaptive capacity is the community's current and future ability to address projected impacts (CA APG 2012).
Adaptive capacity detailed	Provides a detailed description of adaptive capacity, including a clear description of what factors were considered in assessing adaptive capacity.
Risk assessment	Clearly indicates that a risk assessment was undertaken as part of the planning process. A risk assessment includes an assessment of the likelihood and consequence of an event.
Water quality	Discusses impacts of changing climate conditions on the park's water quality.
Water quality detailed	Provides a detailed description of the vulnerability of water quality to changing climate conditions. Must include a map of areas at risk of low water quality or a detailed text description



	of at-risk areas that includes the location of specific vulnerable areas.
Natural systems	Discusses impacts of changing climate conditions on natural systems.
Natural systems detailed	Provides a detailed description of the vulnerability of natural systems to changing climate conditions. Vulnerable natural systems must be mapped, or a detailed text description including the specific location of vulnerable natural systems must be provided.
Cultural assets	Identifies cultural assets that will be impacted by changing climate conditions. Includes things such as archeologically significant sites, recreational opportunities, events such as sports tournaments, museums, public art, and other culturally relevant places.
Cultural assets detailed	Provides a detailed description of cultural assets that are vulnerable to changing climate conditions. The location of vulnerable cultural assets must be mapped, or a detailed description of the cultural assets and their location must be provided.
Built environments / infrastructure	Identifies infrastructure that will be impacted by changing climate conditions.
Built environments / infrastructure detailed	Provides a detailed description of infrastructure vulnerable to changing climate conditions. Vulnerable locations are mapped, or a detailed description of the vulnerable built environments and their location is provided.
Public services	Identifies sensitive public services, including emergency services, that will be impacted by climate change.
Public services detailed	Provides a detailed description of public services vulnerable to changing climate conditions. Vulnerable public services must be mapped, or a detailed description, including a list of vulnerable services, must be included.
Economic systems	Identifies economic impacts of changing climate conditions. This may be a general discussion of impacts to entire economic sectors such as agriculture, forestry, tourism, OR a more specific discussion of impacts such as reduced patronage during extreme heat, or business closure and damage during extreme events.
Economic systems detailed	Provides a detailed description of the economies vulnerable to changing climate conditions. Vulnerable economies must be mapped, or a detailed description, including a list of the vulnerable economic sectors, must be provided.
Prioritization of vulnerabilities or risks	Includes the results of a prioritization of identified vulnerabilities.

Prioritization of vulnerabilities or risks detailed	Prioritizes risks and clearly describes how risks were ranked.
Underlying Causes / Transformation	Mentions the need to address fundamental drivers of human vulnerability or "transformational" adaptation/change. "Fundamental drivers of vulnerability" refers to underlying causes of social vulnerability reinforced by existing institutions and social systems; "transformational" adaptation or change reassesses the way a system operates and may take the form of new rights claims and changes in political systems (PROVIA 2013). Transformational change affects how individuals and society make decisions and allocate resources to cope with climate change; it may alternatively include changes in institutional arrangements, priorities, and norms (Kates et al. 2012)

Note: The Criteria Adopted from Woodruff, Meerow, Stults, and Wilkins (2022)

### 1.5- Uncertainty Principle

The Uncertainty Principle serves as a robust foundation for addressing the complexities of uncertainty in planning processes. Comprising thirteen criteria, it advocates for transparently acknowledging uncertainties in climate change projections and vulnerability assessments, facilitating well-informed decision-making (see Table 5). This principle encourages the consideration of multiple scenarios with a detailed exposition of scenario development, emphasizing the role of underlying assumptions and their diverse impacts. Additionally, it strongly emphasizes adaptive management, promoting continuous learning and integrating new data and scientific insights into decision-making. The principle's inclusivity in terms of time frames, its support for flexible adaptation strategies, and its recognition of robust and no- or low-regrets strategies make it a comprehensive framework for navigating uncertainty while fostering sustainability and resilience (Woodruff et al., 2022; CCS, 2011). All criteria of the uncertainty principle were taken unchanged from Woodruff, Meerow, Stults, and Wilkins (2022) (see Table 5).

Table 5 Uncertainty Principle Criteria

<b>UNCERTAINTY</b>	
<b>Criterion</b>	<b>Description</b>
Acknowledgement of uncertainties	The plan acknowledges uncertainties involved in projection of climate change or estimation of vulnerabilities.
Acknowledgement of uncertainty detailed	Describes sources of uncertainty.
Multiple scenarios	Mentions that different climate scenarios were considered.
Multiple scenarios detailed	Provides a detailed description of scenarios. Description must include how scenarios were developed and how scenarios differ in terms of assumptions and impacts.
Adaptive management	Mentions adaptive management. Adaptive management is the process of incorporating new information from monitoring and science into decision-making with an emphasis on learning.
Adaptive management detailed	Emphasizes adaptive management and learning throughout the plan and establishes a process for incorporating new information from monitoring and science into decision-making.
Multiple time frames	Includes both short-term (next 5 years) and long-term (5+ years) strategies.
Flexible strategies	Explicitly recognizes the need for flexible adaptation strategies.
Flexible strategies detailed	Includes flexible strategies and explicitly identifies strategies as being flexible.
Robust strategies	Discusses robust strategies as an option to address uncertainty. Robust strategies are those that produce positive outcomes across a range of different scenarios or future conditions.
Robust strategies detailed	Includes robust strategies. Robust strategies produce positive outcomes across a range of different scenarios or future conditions. Must identify the strategies as robust.
No- or low-regrets strategies	Discusses no- or low-regrets strategies as an option to address uncertainty. No-regrets strategies are those that can be justified under current climate conditions but also make even more sense with climate change (CCS 2011); these may also be called win-win strategies. Low-regret strategies are low-cost strategies with relatively large benefits, although those benefits are realized mainly under projected future climate change. Must explicitly discuss no- or low- regrets strategies.

No- or low-regrets strategies detailed	Includes no- or low- regret strategies. No-regrets strategies are those that can be justified under current climate conditions but also make even more sense with climate change (CCS 2011); these may also be called win-win strategies. Low-regret strategies are low-cost strategies with relatively large benefits, although those benefits are realized mainly under projected future climate change. Must explicitly identify strategies as no- or low- regrets.
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Note: The Criteria Adopted from Woodruff, Meerow, Stults, and Wilkins (2022)

### 1.6- Strategy Identification Principle

The strategy identification principle includes 23 criteria, providing a robust framework for adaptation and resilience (see Table 6). It starts by prioritizing adaptation strategies, ensuring a focused response to climate challenges. Furthermore, it provides detailed insight into how these strategies are ranked, adding transparency to the decision-making process.

The criterion underscores the importance of specific adaptation strategies directly linked to identified impacts, ensuring a targeted approach to address critical concerns. It also recognizes the need for capacity-building strategies, equipping individuals, institutions, and communities with the necessary skills and tools to adapt effectively.

The strategy identification principle also advocates for collaboration through advocacy strategies, fostering alignment with regional and state agencies on adaptation measures. Including general adaptation strategies allows for adaptability, while information and awareness strategies engage the public. Research and monitoring strategies facilitate data-driven decisions, and planning-related strategies incorporate climate science into governmental and institutional planning. Strategies aiming to change practices and behaviors enhance resilience, while policy and legislative strategies focus on systemic preparedness. Infrastructure resilience, green infrastructure, land use, and conservation strategies underscore a holistic approach, while financial aspects address financing and

insurance strategies. Technology strategies support compliance efforts and emphasize the need for detailed cost assessments. All criteria of the strategy identification principle were taken unchanged from Woodruff, Meerow, Stults, and Wilkins (2022) (see Table 6).

Table 6 Strategy Identification Principle Criteria

<b>STRATEGY IDENTIFICATION</b>	
<b>Criterion</b>	<b>Description</b>
Prioritized actions	Prioritizes adaptation strategies.
Prioritized strategies detailed	Prioritizes adaptation strategies and describes how strategies were ranked.
Specific adaptation strategies	Includes strategies that are linked to specific impacts.
Capacity building	Includes capacity-building strategies. Capacity building is developing human resources, institutions, and communities, equipping them with the capability to adapt.
Advocacy	Includes advocacy strategies. Advocacy includes encouraging regional and state agencies to have adaptation-appropriate strategies.
General strategies	Includes generic adaptation strategies, which are strategies not specific enough to be classified in another category.
Information and awareness	Includes information and awareness strategies, which focus on increasing public knowledge.
Research and monitoring	Includes research or monitoring strategies, which focus on gathering information and creating reports, maps, or models. Monitoring includes observation or repeated measurements over time.
Planning	Includes planning-related strategies, including strategies that incorporate understanding of climate science, impacts, vulnerability and risk into government and institutional planning processes, efforts, or existing initiatives.
Practice and behavior	Includes strategies to change practice and behavior. Practice and behavior strategies revise or expand practices and on-the-ground behavior that affect resilience.
Policy and legislation	Includes policy and legislative strategies aimed at preparing for climate change.
Physical infrastructure	Includes physical infrastructure strategies to prepare for climate change.
Building codes and engineering design standards	Includes strategies to improve physical infrastructure's response to changing climate through improved standards or engineering.

Green infrastructure	Includes green infrastructure strategies aimed at providing protection from climate hazards.
Land use	Includes land use strategies focused on preparing for climate change.
Conservation	Includes conservation strategies to preserve biodiversity and protect open space under a changing climate.
Financing	Includes financing or insurance strategies to prepare for future climate changes.
Technology	Includes technology strategies.
Cost	Estimates the cost of implementing specific adaptation actions.
Cost detailed	Identifies the cost of implementing each adaptation strategy.
Cost of inaction	States that taking action to adapt to climate change costs less than not acting.
Cost of inaction detailed	Provides specific dollar figures on the cost of inaction versus adaptation-related action.
Co-benefits	Identifies co-benefits associated with taking adaptation action.

Note: The Criteria Adopted from Woodruff, Meerow, Stults, and Wilkins (2022)

#### 1.7- Implementation and Monitoring Principle

The principle of implementation and monitoring encompasses 16 comprehensive criteria, forming a robust framework to ensure the effective execution and continuous oversight of the plan (see Table 7). It commences by providing a clear timetable for the phased implementation of actions, thus promoting a systematic and well-paced response to climate challenges. Responsibility is a central theme encompassing overarching policy responsibilities and specific duties for executing individual strategies. Funding considerations highlight the need for financial resources and detail potential funding sources linked to each strategy. Furthermore, it mandates regular reporting of implementation progress, enhancing transparency and accountability. The criterion allocates monitoring responsibilities to track progress effectively. The need for plan updates is acknowledged, while potential barriers to effective climate adaptation are acknowledged and addressed (Rauken et al., 2014). All criteria of the implementation and

monitoring principle were taken unchanged from Woodruff, Meerow, Stults, and Wilkins (2022) (see Table 7).

Table 7 Implementation and Monitoring Principle Criteria

<b>IMPLEMENTATION AND MONITORING</b>	
<b>Criterion</b>	<b>Description</b>
Timetable for implementation	Provides a timetable for when each action will be implemented.
Implementation responsibilities	Assigns responsibility for policies broadly to organizations or agencies.
Implementation responsibilities detailed	Assigns responsibility for the implementation of each strategy.
Funding (need for)	Describes the need for funding sources to implement the plan.
Potential funding sources detailed	Clearly describes potential funding sources and associates them with particular strategies.
Reporting requirements	Includes requirements for the regular reporting of implementation progress.
Monitoring responsibility	Mentions assignment of responsibility for monitoring.
Evaluation method	Establishes a process to evaluate the plan.
Evaluation method detailed	Describes when analyses of progress toward objectives will take place and how results will be used.
Evaluation metrics	Mentions how to measure progress towards implementing strategies.
Evaluation metrics detailed	Mentions how to measure progress towards implementing each strategy identified in the plan.
Mainstreaming	Discusses mainstreaming climate change adaptation. Mainstreaming refers to the integration of climate adaptation into other sector policies or plans (Rauken et al. 2014).
Mainstreaming detailed	Identifies specific plans and programs as opportunities for mainstreaming. Mainstreaming refers to the integration of climate adaptation into other sector policies or plans (Rauken et al. 2014).
Plan updates	Mentions need for updates.
Plan updates detailed	Includes timetable for updating plan.
Barriers	Mentions barriers to climate adaptation.

Note: The Criteria Adopted from Woodruff, Meerow, Stults, and Wilkins (2022)

## 2- Data Collection

The dataset under analysis consists of National Park Management Plans created by the National Park Service. The plans were accessed via the official website of the National Park Service. The entire sample was selected from plans published in the management plan section of the National Park Service website. One plan was chosen for each region, representing distinct climate zones within the sampled area. The climate zones established by the Fourth National Climate Assessment were taken into consideration in the analysis of climate zones. Given the constraints of my time and financial resources, I deliberately decided to select a plan encompassing many climatic zones. Despite its limitations, this study has the potential to yield significant findings due to the inclusion of several climatic regions within the sample.

Two criteria were taken into account when selecting the plans. These two criteria were that the plans should be general management plans and that they should be up-to-date plans published in the last 20 years. First, a national park was randomly selected for each region. The first criterion for the selected national park was the existence of a general management plan for the park. Some of the management plans prepared for National Parks include different types of plans prepared for a specific purpose (fire management) and a specific protected species (deer, birds). These plans are narrow in scope as they are related to a specific purpose or a specific species. Therefore, general management plans, which are more comprehensive for national parks, were selected. The second selection criterion was then applied. The second criterion was that the plans should be as up-to-date as possible, as adaptation to climate change has become more important in the last few decades. If the selected national park had a general management plan, the publication date of the plan was



checked. For the publication date of the plan, the last approximately 10 years were taken into consideration, and it was checked whether the plan was published after 2010. If the plan was published after 2010, it was accepted. If it was published before 2010, another plan was randomly selected, and the same criteria were applied, and the selection was made. Plans that met these two selection criteria were available for nine climate zones. Only for the Caribbean region, no suitable plan was found. Therefore, the evaluation was done for one plan for each of the nine climate zones. The selected plans are listed below.

Plan Samples:

Alaska Region: Gates of the Arctic National Park and Preserve General Management Plan Amendment / Wilderness Stewardship Plan / Environmental Assessment, 2014

Hawaii and Pacific Island Region: Hawaii Volcanoes National Park Draft General Management Plan / Wilderness Study / Environmental Impact Statement, 2015

Northwest Region: Ross Lake National Recreation Area Final General Management Plan and Environmental Impact Statement, 2011

Southwest Region: Golden Gate National Recreation Area Muir Woods National Monument Final General Management Plan/ Environmental Impact Statement, 2014

Northern Great Plains Region: Badlands National Park - South Unit, Final General Management Plan and Environmental Impact Statement, 2012

Southern Great Plains Region: Big Thicket National Preserve Final General Management Plan / Environmental Impact Statement, 2014

Midwest Region: Apostle Islands National Lakeshore General Management Plan / Wilderness Management Plan/Environmental Impact Statement, 2010

Southeast Region: Everglades General Management Plan / East Everglades Wilderness Study / Environmental Impact Statement, 2015

Northeast Region: Fire Island Draft General Management Plan / Environmental Impact Statement, 2015

### 3- Limitations

This study has several limitations that must be considered when interpreting the findings. Firstly, simplifying the scoring system, which assigns 1 or 0 points to each criterion, presents a significant limitation. This binary approach indicates the presence or absence of criteria, omitting nuances in content quality assessment. Consequently, the depth and effectiveness of the evaluated plans may not be fully captured, limiting the comprehensive assessment of their capabilities.

Secondly, the study's selection of only nine different plans for evaluation due to budget and time constraints poses another limitation. Although efforts were made to ensure diversity by including plans from various climate regions, this restricted sample may not encompass the full spectrum of approaches and strategies in all national park management plans.

Furthermore, this research's criteria and evaluation principles were initially designed for assessing city planning documents related to climate change adaptation and resilience. While adapted for the context of protected areas, these criteria may not perfectly align with national parks characteristics and goals. This adaptation introduces a potential limitation, as specific criteria may not fully capture the intricacies of protected area planning and management.

Despite these limitations, it is crucial to underscore that this research contributes to the literature on protected area planning and adaptation to climate change. While the findings should be interpreted with an awareness of these constraints, they still offer valuable insights to researchers in these fields. Moreover, these limitations highlight areas for future research to refine evaluation methods and broaden the scope of analysis, ultimately advancing our understanding of how protected areas can effectively address the challenges posed by climate change.

#### 4- Analysis

The same scoring system as the adopted study was used for the analysis method. The use of the same scoring system facilitated the comparison of the results with similar previous studies. First, the presence/absence of each plan evaluation criterion was evaluated, and 1 point was given if the criteria were met, and 0 points were given if the criteria were not met. Then, for each principle, principle scores were determined by averaging the criteria so that the principle score was between 0 and 1. This will make it easier to make comparisons between the principles. Finally, the overall plan score was created by averaging the principle scores for each plan. Averaging provides both ease of comparison between principles and ease of comparison between principles and overall plan quality. It also allows for easy comparison with previous studies and meaningful interpretations between the values compared.

With the analysis, each criterion, principle, and general plan scores were compared with each other. In this comparison, it was determined which plan met the criteria compared to other plans. This comparison revealed the criteria that weaker plans need to meet in order

to improve. It also revealed the strengths of the plans by revealing which criteria were met. With this analysis, I will compare which plans are better or worse in general according to certain criteria and principles and, at the same time, highlight the criteria and principles that are stronger compared to others. Then, I will compare this with previous studies in the discussion chapter and try to explain the findings.

## CHAPTER 4

### RESULTS

The assessment of National Park Management Plans in nine climate zones of the United States resulted in an overall score for National Park General Management Plans and an assessment for each principle. Gates of the Arctic, Hawaii Volcanoes, Ross Lake, Golden Gate, Badlands, Big Thicket, Apostle Islands, Everglades, and Fire Island were selected as sample plans. The most recent general management plans available for each park on the official website of the National Park Service have a publication date range of 40 years, from 1983 to 2023. The date range of the sample selected for this study consists of plans published between 2010 and 2015. The selection was based on the fact that the plans were published in 2010 and later, which was influential in the formation of this date range. The sample plans were analyzed over a period of approximately three months. This time frame was used to analyze and evaluate the plans, taking into account time constraints.

National Park general management plans usually consist of 5 sections. The first is the introduction, which includes the purpose of the plan and the general objectives of the plan. The second is the alternatives section, which consists of three parts: no action alternative, the preferred alternative, and other alternatives. In the alternatives section, the no-action alternative is the alternative that continues the current management policies in all plans. The preferred alternative specifies the management strategies desired by the plan. Other alternatives are single in some plans and multiple in others, and these alternatives are often not preferred due to budgetary or other management challenges. Third, plans include an affected environment section. This section includes findings about the existing environmental conditions of the park and resources that could be affected by decisions in

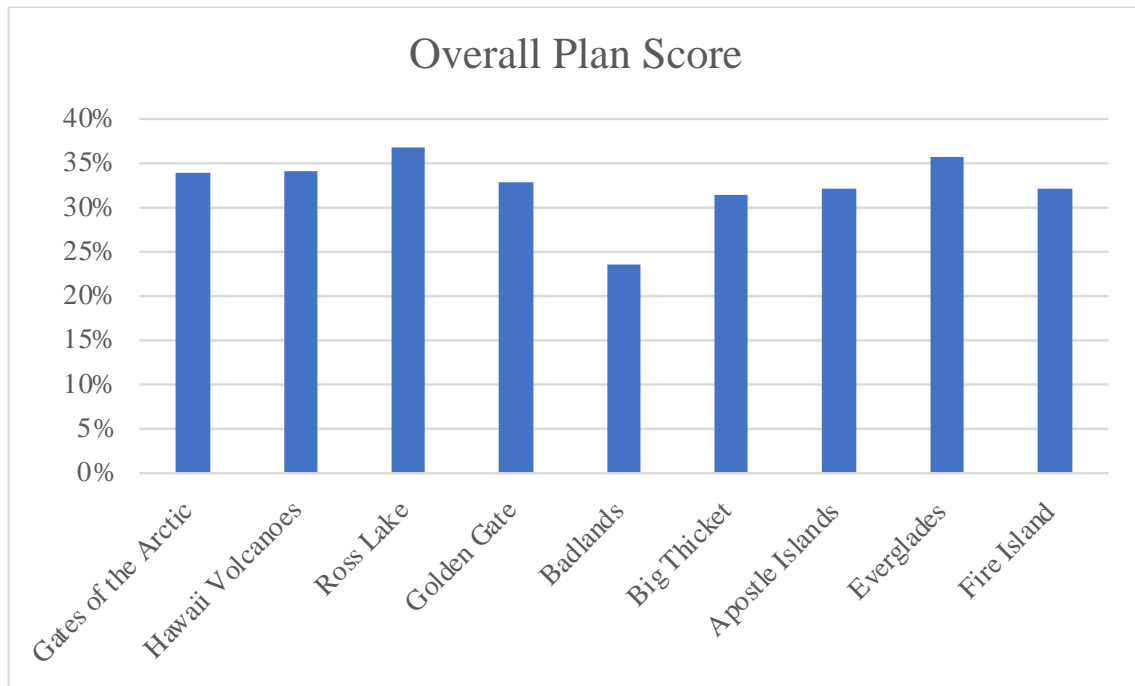
the management alternatives. The fourth section is the environmental consequences section. This section includes findings and discussions on environmental impacts, feasible alternatives for these impacts, and unavoidable adverse environmental impacts. Finally, there is a section on consultation and coordination. This section deals with public participation and inter-institutional coordination. The analyzed plans were prepared using a similar formula.

In the findings section, highlights and assessments of the overall scores of the sample plans will be presented. For each principle and specific criterion, salient findings and evaluation results will be explained. I will explain the findings obtained, highlighting the weak and strong aspects of the plans.

#### 1- Overall Scores of the Plans Evaluation of Plans According to the Principles

In evaluating National Park Management Plans in nine climate zones, all plans scored below 40% in the overall score. Ross Lake Plan received the highest score, with 37%. The Everglades Plan followed this plan with 36%, the Gates of the Arctic Plan and Hawaii Volcanoes Plan with 34%, the Golden Gate Plan with 33%, the Apostle Islands Plan and Fire Island Plan with 32%, and the Big Thicket Plan with 31%. The lowest score was received by the Badlands Plan, with 24%. It is observed that 8 of the nine plans examined received a score between 30% and 40%. While there was little difference between the eight plans in the overall plan evaluation, the Badlands plan received lower scores than the others (see Chart 1).

Chart 1 Overall Plan Score



The principle with the highest score is public participation, with an average score of 68%. It is followed by the principle of coordination with an average score of 52%; the principle of articulation of purpose, goals, and objectives with an average score of 50%; the principle of fact base with an average score of 25%; the principle of strategy identification with an average score of 24%; and the principle of implementation and monitoring with an average score of 6%. The principle of uncertainty received the lowest average score, with an average score of 2%. In the Uncertainty principle, 7 out of 9 plans scored 0, and in the implementation and monitoring principle, all plans scored 6%. In addition, in the principle of articulation of purpose, goals, and objectives, all plans scored equal at 50% (see Figure 1).

In the overall assessment of nine plans, uncertainty and implementation, and monitoring principles stand out among the principles where the plans perform poorly. In addition, it is

observed that the plans perform quite strongly in public participation and coordination principles compared to other principles. More detailed results according to the plan principles and their criteria will be evaluated separately for each principle in the next section of the study.

Figure 1 Overall Plan Score

PRINCIPLE	GATES OF THE ARCTIC PLAN, AK	HAWAII VOLCANO PLAN, HI	ROSS LAKE PLAN, WA	GOLDEN GATE PLAN, CA	BADLANDS PLAN, SD	BIG THICKET PLAN, TX	APOSTLE ISLANDS, WI	EVERGLADES PLAN, FL	FIRE ISLAND PLAN, NY
ARTICULATION OF PURPOSE, GOALS, AND OBJECTIVES (6)	50%	50%	50%	50%	50%	50%	50%	50%	50%
PUBLIC PARTICIPATION (9)	67%	67%	67%	78%	67%	67%	67%	67%	67%
COORDINATION (7)	57%	57%	71%	43%	29%	57%	57%	57%	43%
FACT BASE (38)	32%	37%	29%	26%	13%	18%	18%	24%	29%
UNCERTAINTY (13)	0%	0%	8%	0%	0%	0%	0%	8%	0%
STRATEGY IDENTIFICATION	26%	22%	26%	26%	0%	22%	26%	39%	30%
IMPLEMENTATION AND MONITORING	6%	6%	6%	6%	6%	6%	6%	6%	6%
OVERALL PLAN SCORE	34%	34%	37%	33%	24%	31%	32%	36%	32%

## 2- Evaluation of Plans According to the Principles

### 2.1- The Principle of Articulation of Purpose, Goals, and Objectives

When we evaluated the plans according to the principle of articulation of purpose, goals, and objectives and the criteria of this principle, all nine plans showed similar overall scores. All plans include a statement of the plan's purpose, goals, and objectives. Apostle Islands Plan describes the purpose of the plan as "to ensure that a national park system unit (park unit) has a clearly defined direction for resource preservation and visitor use. It defines it as "best achieve the National Park Service's mandate to preserve resources unimpaired for the enjoyment of future generations" (2010, p. 5). Badlands Plan mentions the plan's goals as "The principles and strategies guide actions taken by park managers on such topics as natural and cultural resource, park facilities, and visitor use management" (2012, p. 19).



Fire Island Plan mentions its objectives: "The objectives of sustainability are to design structures to minimize adverse impacts on natural and cultural values; to reflect their environmental setting; to maintain and encourage biodiversity." (2015, p. 34). However, none of the plans had a vision statement and objectives details indicating the plan's vision. What is most striking in the assessment of this principle is that in all nine plans, there is no information about defining resilience and adaptation or the preparation process (see Figure 2).

Figure 2 The Principle of Articulation of Purpose, Goals, and Objectives Score

ARTICULATION OF PURPOSE, GOALS, AND OBJECTIVES	GATES OF THE ARCTIC PLAN, AK	HAWAII VOLCANO PLAN, HI	ROSS LAKE PLAN, WA	GOLDEN GATE PLAN, CA	BADLANDS PLAN, SD	BIG THICKET PLAN, TX	APOSTLE ISLANDS, WI	EVERGLADES PLAN, FL	FIRE ISLAND PLAN, NY
Plan purpose	1	1	1	1	1	1	1	1	1
Vision statement	0	0	0	0	0	0	0	0	0
Define resilience, adaptation, or preparedness	0	0	0	0	0	0	0	0	0
Goals	1	1	1	1	1	1	1	1	1
Objectives	1	1	1	1	1	1	1	1	1
Objectives detailed	0	0	0	0	0	0	0	0	0
OVERALL PLAN SCORE	50%	50%	50%	50%	50%	50%	50%	50%	50%

## 2.2- The Principle of Public Participation

The principle of public participation is observed with the highest performance in all plans analyzed. All plans provided information about the planning process. Ross Lake Plan describes the planning process as, "The process of creating a GMP ensures that park managers, stakeholders, and the public share a clearly defined understanding of the resource conditions, opportunities for visitor experiences, and general kinds of management, access, and development that will best achieve a park's purpose and conserve its resources unimpaired for the enjoyment of future generations" (2011, p. 10). In addition, all plans provide detailed information on participation techniques, participants, and number

of participants. Plans have good participation performance because federal law requires participation in the plan-making process.

Participant details given by Big Thicket Plan, as "The first newsletter (June 2009) received 384 comments in 32 correspondences and the second newsletter (October 2010) received 214 comments in 42 correspondences. In July 2009, four open houses were held so the public could learn more about the general management planning process" (2014, p. 291). However, it is observed that the plans are insufficient on the criteria of represented stakeholders and public participation maintenance and do not provide any information on these criteria. Although the plans generally performed well for this principle, the use of the steering committee in the participation process was only used in the Golden Gate Plan among the nine plans, and this is one of the remarkable results for this principle (see Figure 3).

Figure 3 The Principle of Public Participation Score

PUBLIC PARTICIPATION	GATES OF THE ARCTIC PLAN, AK	HAWAII VOLCANO PLAN, HI	ROSS LAKE PLAN, WA	GOLDEN GATE PLAN, CA	BADLANDS PLAN, SD	BIG THICKET PLAN, TX	APOSTLE ISLANDS, WI	EVERGLADES PLAN, FL	FIRE ISLAND PLAN, NY
Planning process	1	1	1	1	1	1	1	1	1
Plan preparation involvement	1	1	1	1	1	1	1	1	1
Plan preparation involvement detailed	1	1	1	1	1	1	1	1	1
Representative stakeholders	0	0	0	0	0	0	0	0	0
Participation techniques	1	1	1	1	1	1	1	1	1
Participation techniques detailed	1	1	1	1	1	1	1	1	1
Public meetings	1	1	1	1	1	1	1	1	1
Planning or steering committee	0	0	0	1	0	0	0	0	0
Public participation maintenance	0	0	0	0	0	0	0	0	0
OVERALL PLAN SCORE	67%	67%	67%	78%	67%	67%	67%	67%	67%

### 2.3- The Principle of Coordination

The coordination principle is observed as the principle with the highest average score after the public participation principle, with a 52% average. In the analysis, it is stated in all plans that institutions and other stakeholders are involved in the participation phase of the plan-making process. All nine plans included federal and state agencies in the planning process. 8 out of 9 plans included nonprofit organizations in the planning process. In comparison, 6 out of 9 plans included businesses in the process. Hawaii Volcanoes Plan defines the coordinated institutions as "The general public; NPS staff; and representatives from native Hawaiian groups; local communities; county, state, and federal agencies; and various organizations and businesses identified issues and concerns about park management during the scoping phase (early information gathering) for this general management plan" (2015, p. 18) Elected official engagement is included in the planning process as " 7 were from agencies and elected officials" only in the Ross Lake Plan (2011, vol2, p. 196). Local university and neighborhood jurisdictions were not included in the planning process in any of the plans. In addition, the Ross Lake Plan has the highest score for this principle, with 73%. The Badlands Plan's lowest score was 29% (see Figure 4).

Figure 4 The Principle of Coordination Score

COORDINATION	GATES OF THE ARCTIC PLAN, AK	HAWAII VOLCANO PLAN, HI	ROSS LAKE PLAN, WA	GOLDEN GATE PLAN, CA	BADLANDS PLAN, SD	BIG THICKET PLAN, TX	APOSTLE ISLANDS, WI	EVERGLADES PLAN, FL	FIRE ISLAND PLAN, NY
Local university	0	0	0	0	0	0	0	0	0
Federal agencies	1	1	1	1	1	1	1	1	1
State agencies	1	1	1	1	1	1	1	1	1
Nonprofits	1	1	1	1	0	1	1	1	1
Businesses	1	1	1	0	0	1	1	1	0
Neighboring jurisdictions	0	0	0	0	0	0	0	0	0
Elected official engagement	0	0	1	0	0	0	0	0	0
<b>OVERALL PLAN SCORE</b>	57%	57%	71%	43%	29%	57%	57%	57%	43%

#### 2.4- The Principle of Fact-Based

In the evaluation for the fact-based principle, plans received an average score of 25%. In addition, this principle contains the most criteria with 38 criteria. Data collection, national studies, regional studies, and primary cultural- and natural-based criteria are used and discussed in all nine plans (see Figure 5). Apostle Islands Plan defines visitor use data: "Visitor use data is the information regarding how many people visit the park, when they visit, how often they visit, where they travel from, how long they stay in the park, etc." (2010, p. 200). Hawaii Volcanoes Plan uses Hawaii County's demographic data as an example of regional studies: "At the time of the 2010 Census, Hawai'i County reported a total of 82,324 housing units, a 31.4% increase from 2000" (2015, p. 276). Golden Gate Plan defines its primary cultural assets as "The park's planning area covered by this general management plan includes over 366 historic structures, 5 national historic landmark (NHL) districts, 13 "National Register of Historic Places properties, 7 national register-eligible properties, 9 documented cultural landscapes, 365 identified and over 500 predicted archeological sites, and the fourth-largest museum collection in the National Park Service" (2014, vol2, p. 73). However, there is no data use and discussion for existing impacts, existing actions, existing conditions, presidentially declared disaster, repetitive loss properties, prioritized exposure, non-climatic drivers, non-climatic drivers detailed, adaptive capacity, adaptive capacity detailed, risk assessment, water quality detailed, cultural assets detailed, built environments/infrastructure, built environments/infrastructure detailed, public services, public services detailed, economic systems, economic systems detailed, prioritization of vulnerabilities or risks, prioritization of vulnerabilities or risks detailed and underlying causes/transformation criteria. Local

knowledge as "Native Hawaiian traditional ecological knowledge would be used to enhance current scientific understanding to protect park resources and provide additional interpretive and educational opportunities for visitors" only in the Hawaii Volcanoes Plan is a remarkable result (2015, p. 117). Vulnerability assessment as "Specific options to protect Fire Island's resources include integrating long-term planning into Seashore operations, monitoring observed and projected climate trends, conducting climate-related vulnerability assessments for fundamental resources and values, monitoring climate-sensitive species, and implementing a range of adaptive management actions" only in Fire Island Plan is a remarkable result (2015, p. 39). Data on the change of weather and climate in the historical process are found in 3 out of 9 plans. In addition, projection data on climate change are included in 6 out of 9 plans. Fire Island Plan emphasizes that the effects of climate change projection will be affected by sea level rise as "Climate change is expected to result in many changes to the Atlantic coast, including the northeastern coast of the United States. Both historical trends and future projections suggest increases in temperature, precipitation levels, accelerated rates of sea-level rise, and intensity of weather events, such as storms, should be expected" (2015, p. 39). It is observed that the plans are generally good in identifying cultural and natural assets but need to improve in making detailed assessments of them. Vulnerability assessments are made on other ecological risks and human pressures, but no assessment is made on climate change. The Everglades Plan, for example, mentions human-induced vulnerability assessment as "The seagrass beds in Joe Bay are a focus of this assessment and where they exist (much of the bottom is rocky or has thin sediments), they are vulnerable to propeller scarring" (2015, vol2, p.209). In addition, they do not include discussions on increasing adaptive capacity.

Figure 5 The Principle of Fact Base Score

FACT-BASED	GATES OF THE ARCTIC PLAN, AK	HAWAII VOLCANO PLAN, HI	ROSS LAKE PLAN, WA	GOLDEN GATE PLAN, CA	BADLANDS PLAN, SD	BIG THICKET PLAN, TX	APOSTLE ISLANDS, WI	EVERGLADES PLAN, FL	FIRE ISLAND PLAN, NY
Data collection	1	1	1	1	1	1	1	1	1
National studies	1	1	1	1	1	1	1	1	1
Regional studies	1	1	1	1	1	1	1	1	1
International studies	1	1	1	1	0	0	0	0	1
Local knowledge	0	1	0	0	0	0	0	0	0
Existing impacts	0	0	0	0	0	0	0	0	0
Existing conditions	0	0	0	0	0	0	0	0	0
Existing actions	0	0	0	0	0	0	0	0	0
Historic changes weather/climate	1	1	1	0	0	0	0	0	0
Primary economic base(s)	1	1	1	1	0	1	1	1	1
Primary cultural base(s)	1	1	1	1	1	1	1	1	1
Primary natural system(s)	1	1	1	1	1	1	1	1	1
Presidentially declared disaster	0	0	0	0	0	0	0	0	0
Previous hazardous events	0	1	0	0	0	0	0	0	0
Repetitive loss properties	0	0	0	0	0	0	0	0	0
Projected changes	1	1	1	1	0	0	0	0	1
Prioritized exposure	0	0	0	0	0	0	0	0	0
Non-climatic drivers	0	0	0	0	0	0	0	0	0
Non-climatic drivers detailed	0	0	0	0	0	0	0	0	0
Vulnerability assessment	0	0	0	0	0	0	0	0	1
Adaptive capacity	0	0	0	0	0	0	0	0	0
Adaptive capacity detailed	0	0	0	0	0	0	0	0	0
Risk assessment	0	0	0	0	0	0	0	0	0
Water quality	1	1	0	0	0	0	0	1	0
Water quality detailed	0	0	0	0	0	0	0	0	0
Natural systems	1	1	1	1	0	1	1	1	1
Natural systems detailed	0	0	0	0	0	0	0	0	0
Cultural assets	1	1	1	1	0	0	0	1	1
Cultural assets detailed	0	0	0	0	0	0	0	0	0
Built environments / infrastructure	0	0	0	0	0	0	0	0	0
Built environments / infrastructure detailed	0	0	0	0	0	0	0	0	0
Public services	0	0	0	0	0	0	0	0	0
Public services detailed	0	0	0	0	0	0	0	0	0
Economic systems	0	0	0	0	0	0	0	0	0
Economic systems detailed	0	0	0	0	0	0	0	0	0
Prioritization of vulnerabilities or risks	0	0	0	0	0	0	0	0	0
Prioritization of vulnerabilities or risks detailed	0	0	0	0	0	0	0	0	0
Underlying Causes /	0	0	0	0	0	0	0	0	0
<b>OVERALL PLAN SCORE</b>	<b>32%</b>	<b>37%</b>	<b>29%</b>	<b>26%</b>	<b>13%</b>	<b>18%</b>	<b>18%</b>	<b>24%</b>	<b>29%</b>

## 2.5- The Principle of Uncertainty

In evaluating the plans, the uncertainty principle is observed as the weakest principle, with an average score of 2%. Only 2 of the nine plans, the Ross Lake Plan and Everglades Plan include a statement that considers the uncertainty of climate change. Ross Lake Plan defines climate change uncertainty as "The cumulative effect of human-forced climate change would be uncertain, but likely to be adverse" (2011, vol 2, p. 171). The other seven plans do not include a statement or discussion that meets any of the criteria of this assessment principle (see Figure 6). Although it is a positive development that the Ross Lake Plan and Everglades Plan include a statement recognizing the uncertainty of climate change, these two plans do not meet any of the other criteria. In addition, the fact that the plans do not address the uncertainty of climate change, in general, constitutes an important obstacle for these plans to develop functional strategies for adaptation to climate change.

Figure 6 The Principle of Uncertainty Score

UNCERTAINTY	GATES OF THE ARCTIC PLAN, AK	HAWAII VOLCANO PLAN, HI	ROSS LAKE PLAN, WA	GOLDEN GATE PLAN, CA	BADLANDS PLAN, SD	BIG THICKET PLAN, TX	APOSTLE ISLANDS, WI	EVERGLADES PLAN, FL	FIRE ISLAND PLAN, NY
Acknowledgement of uncertainties	0	0	1	0	0	0	0	1	0
Acknowledgement of uncertainty detailed	0	0	0	0	0	0	0	0	0
Multiple scenarios	0	0	0	0	0	0	0	0	0
Multiple scenarios detailed	0	0	0	0	0	0	0	0	0
Adaptive management	0	0	0	0	0	0	0	0	0
Adaptive management detailed	0	0	0	0	0	0	0	0	0
Multiple time frames	0	0	0	0	0	0	0	0	0
Flexible strategies	0	0	0	0	0	0	0	0	0
Flexible strategies detailed	0	0	0	0	0	0	0	0	0
Robust strategies	0	0	0	0	0	0	0	0	0
Robust strategies detailed	0	0	0	0	0	0	0	0	0
No- or low-regrets strategies	0	0	0	0	0	0	0	0	0
No- or low-regrets strategies detailed	0	0	0	0	0	0	0	0	0
OVERALL PLAN SCORE	0%	0%	8%	0%	0%	0%	0%	8%	0%

## 2.6- The Principle of Strategy Identification

In the assessment for the strategy identification principle, with a score of 39%, the Everglades Plan received the highest score. In comparison, the Badlands Plan, with a score of 0%, did not meet any of the criteria (see Figure 7). All plans reviewed did not meet any of the criteria for prioritized actions, prioritized strategies detailed, specific adaptation strategies, advocacy, practice and behavior, policy and legislation, green infrastructure, land use, technology, cost, cost detailed, cost of inaction, cost of inaction detailed and co-benefits. Only the Everglades Plan has developed strategies for building codes, engineering standards, and financing criteria. This situation may be because buildings are less of a problem for national parks than for cities. Everglades Plan, the goal for building code development against the risk of sea level rise has been established as "Any new construction at the park would be required to appropriately consider the finished floor elevation of structures using the formula below, which takes into account variables such as predicted sea level change and the wave effect due to sea level change" (2015, vol1, p. 129). For the physical infrastructure criterion, it is observed that the Everglades Plan and Fire Plan meet the criteria. Strategies for general strategies on climate change, capacity building through staff training, public information, planning studies, and conservation are found in 8 out of 9 plans. Golden Gate Plan, as defined as "NPS staff would use and promote innovation, best practices, and partnerships to respond to the challenges of climate change and its effects on park resources," plans also include capacity-building efforts through staff training and collaborations (2014, vol1, p. 85 - 86). Strategies for supporting research and monitoring climate change are found in 7 out of 9 plans. For example, the Apostle Islands Plan has climate change monitoring objectives, such as "Park staff



proactively monitor, plan, and adapt to the effects of climate change by using the best information as it becomes available" (2010, p. 42). Unlike the other plans, the Badlands Plan does not include any strategies related to climate change. Although there are some general strategies for climate change in the plans, the lack of detailed strategies and targets for elaborating and implementing these strategies is an important barrier to climate change adaptation in the plans.

Figure 7 The Principle of Strategy Identification Score

STRATEGY IDENTIFICATION	GATES OF THE ARCTIC PLAN, AK	HAWAII VOLCANO PLAN, HI	ROSS LAKE PLAN, WA	GOLDEN GATE PLAN, CA	BADLANDS PLAN, SD	BIG THICKET PLAN, TX	APOSTLE ISLANDS, WI	EVERGLADES PLAN, FL	FIRE ISLAND PLAN, NY
Prioritized actions	0	0	0	0	0	0	0	0	0
Prioritized strategies detailed	0	0	0	0	0	0	0	0	0
Specific adaptation strategies	0	0	0	0	0	0	0	0	0
Capacity building	1	1	1	1	0	1	1	1	1
Advocacy	0	0	0	0	0	0	0	0	0
General strategies	1	1	1	1	0	1	1	1	1
Information and awareness	1	0	1	1	0	1	1	1	1
Research and monitoring	1	1	1	1	0	0	1	1	1
Planning	1	1	1	1	0	1	1	1	1
Practice and behavior	0	0	0	0	0	0	0	0	0
Policy and legislation	0	0	0	0	0	0	0	0	0
Physical infrastructure	0	0	0	0	0	0	0	1	1
Building codes and engineering design standards	0	0	0	0	0	0	0	1	0
Green infrastructure	0	0	0	0	0	0	0	0	0
Land use	0	0	0	0	0	0	0	0	0
Conservation	1	1	1	1	0	1	1	1	1
Financing	0	0	0	0	0	0	0	1	0
Technology	0	0	0	0	0	0	0	0	0
Cost	0	0	0	0	0	0	0	0	0
Cost detailed	0	0	0	0	0	0	0	0	0
Cost of inaction	0	0	0	0	0	0	0	0	0
Cost of inaction detailed	0	0	0	0	0	0	0	0	0
Co-benefits	0	0	0	0	0	0	0	0	0
<b>OVERALL PLAN SCORE</b>	26%	22%	26%	26%	0%	22%	26%	39%	30%

## 2.7- The Principle of Implementation and Monitoring

Among the seven principles assessed, the implementation and monitoring principle has the lowest score after the uncertainty principle, with a score of 6%. In this principle, all nine plans only meet the funding criterion (see Figure 8). For the funding criterion, the plans include assessments of the amount required to implement the plan. However, there needs to be an assessment of the need for detailed funding during the implementation phase of the strategies identified in the plan. In addition, there are no monitoring studies for the implementation of the objectives and strategies of the plan. The monitoring criteria set in the plans are based on data on the assets of the protected area, such as the number of visitors to national parks' biodiversity measurement. On the other hand, any monitoring and feedback activities for implementing the strategies are not specified.

Figure 8 The Principle of Implementation and Monitoring Score

IMPLEMENTATION AND MONITORING	GATES OF THE ARCTIC PLAN, AK	HAWAII VOLCANO PLAN, HI	ROSS LAKE PLAN, WA	GOLDEN GATE PLAN, CA	BADLANDS PLAN, SD	BIG THICKET PLAN, TX	APOSTLE ISLANDS, WI	EVERGLADES PLAN, FL	FIRE ISLAND PLAN, NY
Timetable for implementation	0	0	0	0	0	0	0	0	0
Implementation responsibilities	0	0	0	0	0	0	0	0	0
Implementation responsibilities detailed	0	0	0	0	0	0	0	0	0
Funding (need for)	1	1	1	1	1	1	1	1	1
Potential funding sources detailed	0	0	0	0	0	0	0	0	0
Reporting requirements	0	0	0	0	0	0	0	0	0
Monitoring responsibility	0	0	0	0	0	0	0	0	0
Evaluation method	0	0	0	0	0	0	0	0	0
Evaluation method detailed	0	0	0	0	0	0	0	0	0
Evaluation metrics	0	0	0	0	0	0	0	0	0
Evaluation metrics detailed	0	0	0	0	0	0	0	0	0
Mainstreaming	0	0	0	0	0	0	0	0	0
Mainstreaming detailed	0	0	0	0	0	0	0	0	0
Plan updates	0	0	0	0	0	0	0	0	0
Plan updates detailed	0	0	0	0	0	0	0	0	0
Barriers	0	0	0	0	0	0	0	0	0
OVERALL PLAN SCORE	6%	6%	6%	6%	6%	6%	6%	6%	6%

Common weaknesses include visioning, detailed strategy setting, uncertainty, and monitoring. The plans perform well on public participation and coordination principles but leave out some stakeholders. The fact-based principle shows poor scores, and this is because critical criteria such as vulnerability assessments are not addressed. The uncertainty principle is the weakest point, and the general uncertainty of climate change is not discussed in the plans. Plans often lack priority actions and detailed strategies. Finally, detailed financing needs for implementation and monitoring mechanisms and strategies are not included in the plans. The findings highlights will be discussed in more detail in the next chapter.

## CHAPTER 5

### DISCUSSION, RECOMMENDATION, AND CONCLUSION

#### 1- Discussion

This chapter aims to explain the strengths and weaknesses of National Park Management Plans in nine different climate zones in the United States according to certain criteria and principles and presents an evaluation. The overall score of National Park Management Plans varies between 24% and 37%. Using a similar methodology in the literature, Woodruff, Meerow, Stults, and Wilkins (2022) analyzed resilience and adaptation plans with scores ranging from 30% to 60%. The most important reason for the decline in the overall scores of the plans was Fact-based (25%), followed by Strategy Identification (24%), Implementation and Monitoring (6%), and the Uncertainty principle (2%). In the Woodruff, Meerow, Stults, and Wilkins (2022) study, Uncertainty (7%), Fact Based (28%), and Implementation and Monitoring (32%) caused the average score to decrease. This situation presents similarities and weaknesses in both studies. However, it is clearly seen that the principles that scored low in the study for resilience and adaptation plans scored higher than the general management plans. The general management plans scored well in Public Participation (68%), Coordination (52%), and Goals (50%). In the Woodruff, Meerow, Stults, and Wilkins (2022) study, resilience plans scored well in Strategies (61%), Coordination (62%), Public Participation (66%), and Goals (73%). There are commonalities between these areas. Likewise, resilience plans scored higher than general management plans except for the principle of public participation. The most significant difference with the compared study is in the principle of strategy identification. General

management plans scored significantly lower on the strategy identification principle than resilience and adaptation plans. In general, there are similarities between general management plans and resilience plans in terms of their strengths and weaknesses. However, resilience plans scored higher than general management plans in all areas except public participation. This situation shows that general management plans need to be stronger than resilience plans in meeting the criteria.

Strengths of general management plans include public participation, coordination, and goals. However, there are also some weaknesses in these areas. Visioning and the exclusion of some stakeholders, such as local universities and neighborhood governments, are important shortcomings. In addition, its public participation and coordination principles perform well, but by excluding key stakeholders, it is weak in ensuring broader stakeholder engagement. Engaging a wider range of stakeholders can improve effective management strategies. This situation would make the engagement process more effective, rather than just being a well-performing state requirement.

Principles where plans are weak are fact-based, strategy identification, uncertainty, and implementation and monitoring. In the fact-based principle, critical criteria such as vulnerability assessments are not addressed. Vulnerability assessments that prioritize the impacts of climate change are of great importance in terms of identifying priority action areas (Meerow & Woodruff, 2020). Plans often lack prioritized actions and detailed strategies. Moreover, the implementation and monitoring principle revealed that plans often lack detailed financing plans for strategy implementation and comprehensive monitoring and feedback mechanisms. Developing detailed plans and objectives, prioritizing strategies, estimating implementation costs, and identifying co-benefits are

important for effective adaptation to climate change (Meerow & Woodruff, 2020). The uncertainty principle was identified as the weakest point, with plans largely ignoring the uncertainty of climate change, a crucial consideration for effective adaptation planning. The fact that only two plans addressed the uncertainty of climate change is another aspect of this principle being the weakest point of the plans. Nearly three-quarters of adaptation plans analyzed in a study by Stults and Larsen (2020) acknowledge the existence of uncertainty during climate change planning. However, in national park general management plans, the uncertainty of climate change is not addressed at all in most of the plans. Despite the overarching threats of climate change, the Badlands Plan did not incorporate climate change-related strategies into the planning process. The rationale is that the region is currently arid, and climate change will only exacerbate the drought (Badlands GMP, 2012). However, this perspective ignores other impacts of climate change and leaves the planned environment vulnerable, and this approach contributed to the Badlands Plan being the lowest-scoring plan. Since there is a linear correlation between overall plan quality and the ability to address climate change effectively, it is not easy to assess based on only one plan, but there is a relationship.

The negative impacts of climate change are not limited to ecological threats. Considering that national parks are intensive touristic places, heat stress will have serious negative effects on visitors. More frequent occurrence of extreme heat affects the experience of visitors and causes negatives on touristic activities (Yañez, Hopkins & Porter, 2020). Although it is a positive development that a few plans have mentioned this threat perception, the fact that targets and strategies have not been developed for this situation emerges as an important deficiency. In addition, given that tourism is the primary economic

base of national parks, there is an increased likelihood of not only physical but also economic hardship on these parks and neighboring communities.

US federal climate change policy has undergone significant changes over the last decade. In 2017, President Trump's administration decided to withdraw from the Paris Agreement due to the unfair economic burden (US Department of State, 2019). In 2021, President Joe Biden's administration re-engaged the United States in the Paris Agreement and announced new climate goals, including carbon neutrality by 2050 (The White House, 2021). When we examine the National Park Service's policies on climate change in the historical process, it started with the National Park Service Climate Change Response Strategy published in 2010 (National Park Service, 2010). Also, in 2012, the Climate Change Action Plan was released, expanding and improving on the previous strategy and providing a list of prioritized actions (National Park Service, 2012). Then, in 2014, the policy paper Climate Change and Cultural Resource Management was published to provide guidance on protecting cultural resources in the context of climate change (National Park Service, 2014). Finally, in 2021, the Planning for a Changing Climate report was published to guide smart adaptation planning (National Park Service, 2021). When we examine the relationship between federal climate change policies and climate change policies related to National Parks, it is very difficult to infer a direct cause and effect relationship. In addition, there is no policy cancellation for National Parks after 2017, the date of withdrawal from the Paris climate agreement. However, it is noteworthy that the National Park Service did not publish any significant new policies between 2017, the date of withdrawal from the Paris climate agreement, and 2021, when it returned to the agreement.

As a result, the plans analyzed generally showed similar strengths and weaknesses. I think this is due to the fact that the plans are very stereotyped and prepared in a similar way. Another point is that the plans were deliberately selected from general management plans because they are more comprehensive. However, these plans still lack detailed assessments and strategies. In my professional opinion, strong plans should acknowledge the impacts of climate change, including its uncertainty, and conduct a vulnerability assessment. They should then develop detailed strategies to address these impacts and establish a good monitoring program for these strategies. However, general management plans are inadequate in these areas. I think this is due to the fact that national parks are generally not urban areas and, therefore, have a lower perception of risk. Improving the weaknesses of general management plans to make them stronger will ensure that future plans will perform better. More detailed recommendations will be explained in the next section.

## 2- Recommendations

In this section, I tried to explain some recommendations for making the plans stronger and for future studies. The plans examined in the evaluations have many weaknesses in adaptation to climate change and contain similar issues. For this reason, recommendations have been made to strengthen the weak aspects of the plans and take steps to eliminate these deficiencies to adapt to climate change effectively.

To increase the effectiveness of plans to provide an effective climate adaptation, they should develop a clear vision and articulate detailed strategies. Using steering committees composed of elected officials and involving elected officials in the planning process can bring a more inclusive approach to plans, leading to more effective governance in



achieving the desired goals. Involving a wider range of stakeholders can improve the comprehensive nature of park management strategies. In addition, detailed analysis of climate change and the use of local knowledge can play an important role in setting effective targets. The fact that only two plans address the uncertainty of climate change is another aspect of why this principle is the weakest aspect of the plans. Addressing this gap is crucial for the development of operational strategies to adapt to the impacts of climate change. Developing detailed plans and targets is important to overcome barriers to achieving effective climate adaptation. Plans should also include comprehensive monitoring and feedback mechanisms for strategy implementation that go beyond monitoring of park assets to encompass strategy implementation.

For future studies, given the limitations of this study, it may be useful to develop a more comprehensive methodology, given the simplified scoring system of the evaluation criteria, the limited selection of plans, and the fact that the evaluation criteria were originally designed for cities. It would be useful to develop a new methodology specifically designed for National Parks and to increase the sample of plans investigated. In addition, It was observed that the plans examined were prepared using similar, formulaic methods. It would be useful for future research to try to understand why this is the case.

### 3- Conclusion

In conclusion, this master's thesis provided a comprehensive assessment of National Park Management Plans in nine different climate zones in the United States in the context of climate change adaptation. The findings highlight the urgent need to develop and adapt these plans to address the challenges posed by climate change effectively. While some

aspects, such as public participation and coordination, perform relatively well, there are critical gaps in articulating a vision for climate adaptation, addressing uncertainty, and developing detailed strategies and monitoring mechanisms.

The recommendations summarized in this study provide a clear pathway for improving the readiness of National Park Management Plans. Incorporating resilience and adaptation strategies, developing detailed strategies, conducting vulnerability assessments, improving monitoring and feedback mechanisms, involving local stakeholders, and addressing the uncertainty of climate change are key steps to improve the effectiveness of these plans.

By implementing these recommendations, National Park Management Plans can better protect and conserve these natural treasures and ensure their continued existence and enjoyment by current and future generations in a changing climate. This research will add valuable knowledge to the planning literature and practitioners working on climate change adaptation strategies in protected areas.

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APPENDIX A  
PLAN EVALUATION CODEBOOKS



1- Gates of the Arctic National Park and Preserve General Management Plan Amendment / Wilderness Stewardship Plan / Environmental Assessment Codebook

Criterion	Description	Code	Score
<b>ARTICULATION OF PURPOSE, GOALS, AND OBJECTIVES</b>			
Plan purpose	States the purpose of the plan.	"The purpose of this GMP Amendment is to update the 1986 General Management Plan for Gates of the Arctic National Park and Preserve. This GMP Amendment will update the 1986 General Management Plan and, together with other elements of the park's Portfolio of Management Plans (portfolio), will guide planning and decision making for the next 15 to 20 years for park resources, visitor use, and facilities." (p.8)	1
Vision statement	Includes a vision statement, which establishes an overall image of a desired future (Berke et al. 2006).	-	0
Define resilience, adaptation, or preparedness	Defines resilience, adaptation or preparedness.	-	0

Goals	Includes goals, which are outcomes that the community aspires towards. Goals are usually expressed in adjectives and nouns (not verbs) and are not quantified (Berke et al. 2006). Goals reflect public values and express future desired conditions (Berke and Godschalk 2009).	"Desired conditions articulate the ideal conditions the National Park Service is striving to attain. The term "desired conditions" is used interchangeably with goals."(p. 255)	1
Objectives	Includes objectives, which are tangible, measurable outcomes leading to the achievement of a goal (Berke et al. 2006).	"The primary objectives of the plan are to maintain the wild and undeveloped character of the area, provide continued opportunities for wilderness recreational activities, protect park resources and values, and offer opportunities for traditional subsistence practices by local residents." (p.30)	1
Objectives detailed	Includes quantifiable objectives for each goal (e.g., increase the use of alternative energy sources to 70% by	-	0

	2030; there should be targets for each goal).		
<b>PUBLIC PARTICIPATION</b>			
Planning process	Describes the process undertaken to create the plan.	"This GMP planning process provides an opportunity to proactively develop stronger relationships with neighboring communities that will play a key role in the future of the park." (p. 9)	1
Plan preparation involvement	Describes the stakeholders involved in plan preparation.	"The environmental assessment for Gates of the Arctic National Park and Preserve General Management Plan Amendment represents thoughts presented by the National Park Service, park staff, Alaska Native groups, the state of Alaska, and the public. Consultation and coordination among the agencies and the public were vitally important throughout the planning process." (p.233)	1
Plan preparation involvement detailed	Includes detailed description of organizations and individuals involved in plan preparation. Description must include number of stakeholders and the	"A total of 24 people attended meetings in Resident Zone Communities. Comments came from a wide range of stakeholders, including local residents and subsistence users, corporations, organizations, and agencies with economic or recreational interests in the park, as well as from	1

	<p>general categories of stakeholders (e.g. residents, companies, non-profits, governmental agencies).</p>	<p>private citizens who have visited in the past." (p. 233)</p>	
<p>Representative stakeholders</p>	<p>Mentions how stakeholders who were involved represent all the groups affected by proposed policies or how the planning process sought to engage disadvantaged populations.</p> <p>Disadvantaged populations are those that may not traditionally be included in the planning process and may be adversely affected by climate change, such as the poor, elderly, or those for whom English is a second language.</p>	-	0

Participation techniques	Mentions participation techniques used to create the plan, such as meetings, surveys, charettes, public comments on drafts, etc.	"Public meetings and newsletters were used to keep the public informed and involved in the planning process for Gates of the Arctic National Park and Preserve." (p. 233)	1
Participation techniques detailed	Describes participation techniques with details about each method including number of participants, main topics covered, and activities used to elicit input.	"In February 2010, a scoping newsletter was distributed inviting the general public to open house events in Anchorage and Fairbanks, and public meetings in the following Gates of the Arctic National Park and Preserve Resident Zone Communities: Anaktuvuk Pass, Bettles/ Evansville, Wiseman, Alatna, Allakaket, Nuiqsut, Kobuk and Shungnak. All meetings were completed by late April 2010. A total of 40 electronic and mailed comments were received in response to this newsletter." (p. 233)	1
Public meetings	States that meetings were used to engage stakeholders and that these meetings were open to the public.	"The public had three primary avenues by which it participated during the development of the plan: participation in public meetings, responses to newsletters by mail, and through the NPS Planning, Environment, and Public Comment (PEPC) website." (p. 233)	1

Planning or steering committee	States that a steering committee or advisory committee was used to guide plan creation.	-	0
Public participation maintenance	Discusses how public engagement will continue in plan maintenance/evaluation.	-	0
<b>COORDINATION</b>			
Local university	States that local universities were engaged in the planning process.	-	0
Federal agencies	States that federal agencies were engaged in the planning process.	"This GMP Amendment was developed by an interdisciplinary team in consultation with National Park Service (NPS) offices; federal, state, and local agencies; Alaska Natives; other interested parties; and input and participation from the general public. " (p. 3)	1
State agencies	States that state agencies were engaged in the planning process.	"This GMP Amendment was developed by an interdisciplinary team in consultation with National Park Service (NPS) offices; federal, state, and local agencies; Alaska Natives; other interested parties; and input and participation from the general public." (p. 3)	1

Nonprofits	States that nonprofits were engaged in the planning process.	"NPS staff communicated on occasion with representatives of federal and state agencies and regional and local governments (as appropriate) on topics of mutual interest and concern, such as operating the park, preserving park resources, and making the park safe and enjoyable for visitors. The National Park Service informed these groups of the draft plan and indicated that discussion topics and planning issues were welcomed." (p. 235)	1
Businesses	States that businesses were engaged in the planning process.	"NPS staff communicated on occasion with representatives of federal and state agencies and regional and local governments (as appropriate) on topics of mutual interest and concern, such as operating the park, preserving park resources, and making the park safe and enjoyable for visitors. The National Park Service informed these groups of the draft plan and indicated that discussion topics and planning issues were welcomed." (p. 235)	1
Neighboring jurisdictions	States that neighboring jurisdictions were given the opportunity to	-	0

	<p>participate in the planning process.</p> <p>Neighboring jurisdictions include regional planning organizations and counties as well as other cities, towns, or villages.</p>		
Elected official engagement	Mentions involvement of elected official(s) in the planning process.	-	0
<b>FACT BASE</b>			
Data collection	Provides information about the type of data collected and analyzed in order to make the plan.	"The plan emphasizes the collection of baseline resource data, outlines the requirements of a subsistence plan, discusses visitor capacity indicators and standards, and describes park operations." (p. 30)	1
National studies	States that national studies were used to inform the plan. Studies may include climate, demographics, economic projections, etc.	"Demographic projections prepared by the State of Alaska show that the population of the North Slope Borough and Northwest Arctic Borough are expected to increase by approximately 22% and 23%, respectively, by the summer of 2030." (p. 223)	1



Regional studies	States that regional studies were used to inform the plan. Studies may include climate, demographics, economic projections, etc.	"Greater energy absorption initiates a feedback loop that further increases temperatures and melt rates. In Alaska, mean annual temperatures increased 3.1°F (1.7°C) from 1951 to 2001(Alaska Climate Research Center et al. 2009), and minimum temperatures warmed proportionally more than maximum temperatures (Keyser et al. 2000)." (p. 143-144)	1
International studies	States that international studies were used to inform the plan. Studies may include climate, demographics, economic projections, etc.	"Average arctic temperatures have risen at almost twice the global rate over the last 100 years, resulting in less snow and ice cover and increased absorption of solar radiation (Jeziarski et al. 2010)." (p. 143)	1
Local knowledge	States that local, indigenous, or traditional knowledge was used to inform the plan.	-	0
Existing impacts	Identifies ways that climate change or changing weather conditions are already	-	0

	affecting the community.		
Existing conditions	Discusses existing social, economic, environmental, or built infrastructure conditions that could lead to enhanced vulnerability in the future.	-	0
Existing actions	Identifies actions and plans that are in progress or planned that have adaptation value. Actions do not need to be specifically designed to address climate change.	-	0
Historic changes weather/climate	Discusses how climate or weather trends in the area have changed to date.	"Greater energy absorption initiates a feedback loop that further increases temperatures and melt rates. In Alaska, mean annual temperatures increased 3.1°F (1.7°C) from 1951 to 2001(Alaska Climate Research Center et al. 2009), and minimum temperatures warmed proportionally more than maximum	1

		temperatures (Keyser et al. 2000)." (p. 143-144)	
Primary economic base(s)	Identifies the major economic sectors associated with the park.	The people living in communities in or near the park have utilized the knowledge, wisdom, and skills developed over generations and continue to thrive in this sometimes challenging environment. The way that people earn a living in Alaska is often by subsistence traditions. In this part of the country, earning a living often does not take the form of cash-based employment. For those that do earn a living from cash-based employment, their job is often tied to government services or seasonal employment opportunities. Due to the area's geographic isolation, lack of convenient connectivity with major economic centers, such as Fairbanks or Anchorage, and a small population, cash-based employment opportunities are limited. (P. 172)	1

<p>Primary cultural base(s)</p>	<p>Identifies the main cultural assets of the park.</p>	<p>The lands encompassed by the park have deep human connections, beginning with some of the first people to traverse the Bering Land Bridge and settle the Americas at the end of the last ice age. Subsequent cultural developments are documented by a rich archeological record composed of thousands of sites. The park contains particularly good examples of sites spanning the last 6,000 years, from the Northern Archaic, Denbigh Flint Complex, and Late Prehistoric and historic Nunamiut periods. (P. 155)</p>	<p>1</p>
<p>Primary natural system(s)</p>	<p>Identifies the major natural systems that are part of the park.</p>	<p>Gates of the Arctic National Park and Preserve has been maintained in a predominantly “natural” condition, with intact arctic ecosystems. The park remains one of the largest, most remote and difficult to access wilderness areas in the national park system. (p. 151)</p>	<p>1</p>
<p>Presidentially declared disaster</p>	<p>Indicates that the community has experienced a presidentially declared disaster.</p>	<p>-</p>	<p>0</p>

Previous hazardous events	Includes information on previous occurrences of hazardous events.	-	0
Repetitive loss properties	Discusses areas or specific properties that have been repetitively damaged by hazardous events.	-	0
Projected changes	Identifies climate change exposure, which is the climate change effects a community expects to feel, e.g., warmer temperature, increased precipitation, rising sea level (CA APG 2012).	Climate change refers to any substantial changes in average climatic conditions, climatic variability, or duration lasting for an extended period of time. There is increasing evidence from scientific and traditional knowledge that climate is rapidly changing in Alaska. Global circulation models indicate that northern Alaska is one of the areas of the world that is warming the fastest. Precipitation is also predicted to increase, but there is less certainty regarding this projection. (P. 282)	1
Prioritized exposure	Prioritizes climate change effects or hazards.	-	0
Non-climatic drivers	Mentions other factors that may impact future vulnerability or resilience. Non-climatic	-	0

	factors include a shifting economy, growing or depleting population, or changing land use patterns.		
Non-climatic drivers detailed	Explicitly discusses projections for non-climatic factors over time and how this could affect vulnerability or resilience. Non-climatic factors include a shifting economy, growing or depleting population, or changing land use patterns.	-	0
Vulnerability assessment	Clearly indicates that a vulnerability assessment was undertaken as part of the planning process. A vulnerability assessment includes an analysis of exposure, sensitivity, and adaptive capacity.	-	0

Adaptive capacity	Clearly indicates that an assessment of adaptive capacity was undertaken. Adaptive capacity is the community's current and future ability to address projected impacts (CA APG 2012).	-	0
Adaptive capacity detailed	Provides a detailed description of adaptive capacity, including a clear description of what factors were considered in assessing adaptive capacity.	-	0
Risk assessment	Clearly indicates that a risk assessment was undertaken as part of the planning process. A risk assessment includes an assessment of the likelihood and consequence of an event.	-	0

Water quality	Discusses impacts of changing climate conditions on the park's water quality.	The anticipated hotter, drier summers that cause drought stress may also increase stress from wildfires and pest outbreaks, impacting air and water quality and altering the extent of some vegetation. (P. 144)	1
Water quality detailed	Provides a detailed description of the vulnerability of water quality to changing climate conditions. Must include a map of areas at risk of low water quality or a detailed text description of at-risk areas that includes the location of specific vulnerable areas.	-	0
Natural systems	Discusses impacts of changing climate conditions on natural systems.	The diverse ecosystems and natural processes of Gates of the Arctic are especially vulnerable to the impacts of climate change. (P. 143)	1
Natural systems detailed	Provides a detailed description of the vulnerability of natural systems to changing	-	0



	<p>climate conditions.</p> <p>Vulnerable natural systems must be mapped, or a detailed text description including the specific location of vulnerable natural systems must be provided.</p>		
Cultural assets	<p>Identifies cultural assets that will be impacted by changing climate conditions. Includes things such as archeologically significant sites, recreational opportunities, events such as sports tournaments, museums, public art, and other culturally relevant places.</p>	<p>Climate change is affecting ecological systems of the park and those individuals living in the area. A variety of potential developments outside the park could affect park resources and has implications for how visitors access and use the park. Park managers have had 26 years to better understand the natural and cultural resources of the park and the changing needs of park visitors. This includes increased knowledge about park resources; for example, park staff have inventoried more than 1,000 additional archeological and historic sites during the last 26 years.</p> <p>(P. 8)</p>	1
Cultural assets detailed	<p>Provides a detailed description of cultural assets that are</p>	-	0

	vulnerable to changing climate conditions. The location of vulnerable cultural assets must be mapped, or a detailed description of the cultural assets and their location must be provided.		
Built environments / infrastructure	Identifies infrastructure that will be impacted by changing climate conditions.	-	0
Built environments / infrastructure detailed	Provides a detailed description of infrastructure vulnerable to changing climate conditions. Vulnerable locations are mapped, or a detailed description of the vulnerable built environments and their location is provided.	-	0
Public services	Identifies sensitive public services, including emergency	-	0

	services, that will be impacted by climate change.		
Public services detailed	Provides a detailed description of public services vulnerable to changing climate conditions. Vulnerable public services must be mapped, or a detailed description, including a list of vulnerable services, must be included.	-	0
Economic systems	Identifies economic impacts of changing climate conditions. This may be a general discussion of impacts to entire economic sectors such as agriculture, forestry, tourism, OR a more specific discussion of impacts such as reduced patronage during extreme heat, or	-	0

	business closure and damage during extreme events.		
Economic systems detailed	Provides a detailed description of the economies vulnerable to changing climate conditions. Vulnerable economies must be mapped, or a detailed description, including a list of the vulnerable economic sectors, must be provided.	-	0
Prioritization of vulnerabilities or risks	Includes the results of a prioritization of identified vulnerabilities.	-	0
Prioritization of vulnerabilities or risks detailed	Prioritizes risks and clearly describes how risks were ranked.	-	0

<p>Underlying Causes / Transformation</p>	<p>Mentions the need to address fundamental drivers of human vulnerability or "transformational" adaptation/change. "Fundamental drivers of vulnerability" refers to underlying causes of social vulnerability reinforced by existing institutions and social systems; "transformational" adaptation or change reassesses the way a system operates and may take the form of new rights claims and changes in political systems (PROVIA 2013). Transformational change affects how individuals and society make decisions and allocate resources to cope with climate</p>	<p>-</p>	<p>0</p>
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	change; it may alternatively include changes in institutional arrangements, priorities, and norms (Kates et al. 2012)		
<b>UNCERTAINTY</b>			
Acknowledgement of uncertainties	The plan acknowledges uncertainties involved in projection of climate change or estimation of vulnerabilities.	-	0
Acknowledgement of uncertainty detailed	Describes sources of uncertainty.	-	0
Multiple scenarios	Mentions that different climate scenarios were considered.	-	0
Multiple scenarios detailed	Provides a detailed description of scenarios. Description must include how scenarios were developed and how scenarios differ in terms of assumptions and impacts.	-	0

Adaptive management	Mentions adaptive management. Adaptive management is the process of incorporating new information from monitoring and science into decision-making with an emphasis on learning.	-	0
Adaptive management detailed	Emphasizes adaptive management and learning throughout the plan and establishes a process for incorporating new information from monitoring and science into decision-making.	-	0
Multiple time frames	Includes both short-term (next 5 years) and long-term (5+ years) strategies.	-	0
Flexible strategies	Explicitly recognizes the need for flexible adaptation strategies.	-	0
Flexible strategies detailed	Includes flexible strategies and explicitly	-	0

	identifies strategies as being flexible.		
Robust strategies	Discusses robust strategies as an option to address uncertainty. Robust strategies are those that produce positive outcomes across a range of different scenarios or future conditions.	-	0
Robust strategies detailed	Includes robust strategies. Robust strategies produce positive outcomes across a range of different scenarios or future conditions. Must identify the strategies as robust.	-	0
No- or low-regrets strategies	Discusses no- or low-regrets strategies as an option to address uncertainty. No-regrets strategies are those that can be justified under current climate	-	0



	<p>conditions but also make even more sense with climate change (CCS 2011); these may also be called win-win strategies. Low-regret strategies are low-cost strategies with relatively large benefits, although those benefits are realized mainly under projected future climate change. Must explicitly discuss no- or low- regrets strategies.</p>		
<p>No- or low-regrets strategies detailed</p>	<p>Includes no- or low-regret strategies. No-regrets strategies are those that can be justified under current climate conditions but also make even more sense with climate change (CCS 2011); these may also be called win-win strategies. Low-regret strategies</p>	<p>-</p>	<p>0</p>

	are low-cost strategies with relatively large benefits, although those benefits are realized mainly under projected future climate change. Must explicitly identify strategies as no- or low-regrets.		
<b>STRATEGY IDENTIFICATION</b>			
Prioritized actions	Prioritizes adaptation strategies.	-	0
Prioritized strategies detailed	Prioritizes adaptation strategies and describes how strategies were ranked.	-	0
Specific adaptation strategies	Includes strategies that are linked to specific impacts.	-	0
Capacity building	Includes capacity-building strategies. Capacity building is developing human resources, institutions, and communities,	NPS staff will collaborate with partners to identify and monitor climate change effects in the park and apply accurate and relevant science to management and policy decisions. (P. 282)	1

	equipping them with the capability to adapt.		
Advocacy	Includes advocacy strategies. Advocacy includes encouraging regional and state agencies to have adaptation-appropriate strategies.	-	0
General strategies	Includes generic adaptation strategies, which are strategies not specific enough to be classified in another category.	"Key resources in management zones/areas will be identified that may require different management responses to climate change impacts."(P. 282)	1
Information and awareness	Includes information and awareness strategies, which focus on increasing public knowledge.	NPS staff will use the dynamic environment of the central Brooks Range as a teaching opportunity about climate change. Visitors (both site visitors and Web visitors) will be educated about climate change and related research at the park and on climate change impacts on the resources they are enjoying. Through	1

		leadership and education, visitors will be inspired to action and response. (P. 282)	
Research and monitoring	Includes research or monitoring strategies, which focus on gathering information and creating reports, maps, or models. Monitoring includes observation or repeated measurements over time.	"NPS staff will inventory and monitor key natural and cultural resources and visitor amenities that are at risk from climate change. Baseline resource conditions will be established, natural variations identified, and changes monitored." (P. 282)	1
Planning	Includes planning-related strategies, including strategies that incorporate understanding of climate science, impacts, vulnerability and risk into government and institutional planning	The park will be come amember of the Climate Friendly Parks program, measuring park-based greenhouse emissions, developing sustainable strategies to mitigate these emissions and adapt to climate change impacts, educating the public about these efforts and developing future action plans. (P. 282)	1

	processes, efforts, or existing initiatives.		
Practice and behavior	Includes strategies to change practice and behavior. Practice and behavior strategies revise or expand practices and on-the-ground behavior that affect resilience.	-	0
Policy and legislation	Includes policy and legislative strategies aimed at preparing for climate change.	-	0
Physical infrastructure	Includes physical infrastructure strategies to prepare for climate change.	-	0
Building codes and engineering design standards	Includes strategies to improve physical infrastructure's response to changing climate through	-	0

	improved standards or engineering.		
Green infrastructure	Includes green infrastructure strategies aimed at providing protection from climate hazards.	-	0
Land use	Includes land use strategies focused on preparing for climate change.	-	0
Conservation	Includes conservation strategies to preserve biodiversity and protect open space under a changing climate.	Partnerships will be formed with other resource management entities to maintain regional habitat connectivity and refugia that allow species dependent on park resources to better adapt to changing conditions. NPS staff will use best management practices to reduce human-caused stresses (e.g., park operations and visitor-related disturbances) that hinder the ability of species or ecosystems to withstand the impacts of climate change. (P. 282)	1
Financing	Includes financing or insurance strategies to prepare for future climate changes.	-	0

Technology	Includes technology strategies.	-	0
Cost	Estimates the cost of implementing specific adaptation actions.	-	0
Cost detailed	Identifies the cost of implementing each adaptation strategy.	-	0
Cost of inaction	States that taking action to adapt to climate change costs less than not acting.	-	0
Cost of inaction detailed	Provides specific dollar figures on the cost of inaction versus adaptation-related action.	-	0
Co-benefits	Identifies co-benefits associated with taking adaptation action.	-	0
<b>IMPLEMENTATION AND MONITORING</b>			
Timetable for implementation	Provides a timetable for when each action will be implemented.	-	0
Implementation responsibilities	Assigns responsibility for policies broadly to	-	0

	organizations or agencies.		
Implementation responsibilities detailed	Assigns responsibility for the implementation of each strategy.	-	0
Funding (need for)	Describes the need for funding sources to implement the plan.	Cost Estimates for the Alternatives Table (P. 101)	1
Potential funding sources detailed	Clearly describes potential funding sources and associates them with particular strategies.	-	0
Reporting requirements	Includes requirements for the regular reporting of implementation progress.	-	0
Monitoring responsibility	Mentions assignment of responsibility for monitoring.	-	0
Evaluation method	Establishes a process to evaluate the plan.	-	0
Evaluation method detailed	Describes when analyses of progress toward objectives will take place and how results will be used.	-	0



Evaluation metrics	Mentions how to measure progress towards implementing strategies.	-	0
Evaluation metrics detailed	Mentions how to measure progress towards implementing each strategy identified in the plan.	-	0
Mainstreaming	Discusses mainstreaming climate change adaptation. Mainstreaming refers to the integration of climate adaptation into other sector policies or plans (Rauken et al. 2014).	-	0
Mainstreaming detailed	Identifies specific plans and programs as opportunities for mainstreaming. Mainstreaming refers to the integration of climate adaptation into other sector policies or	-	0

	plans (Rauken et al. 2014).		
Plan updates	Mentions need for updates.	-	0
Plan updates detailed	Includes timetable for updating plan.	-	0
Barriers	Mentions barriers to climate adaptation.	-	0

2- Hawaii Volcanoes National Park Draft General Management Plan / Wilderness Study / Environmental Impact Statement Codebook

Criterion	Description	Code	Score
<b>ARTICULATION OF PURPOSE, GOALS, AND OBJECTIVES</b>			
Plan purpose	States the purpose of the plan.	The purpose of a general management plan is to ensure that a national park system unit (park unit) has a clearly defined direction for resource preservation and visitor use that will best achieve the npS mandate to preserve resources unimpaired for the enjoyment of future generations. (p. 15)	1
Vision statement	Includes a vision statement, which establishes an overall image of a desired future (Berke et al. 2006).	-	0
Define resilience, adaptation, or preparedness	Defines resilience, adaptation or preparedness.	-	0
Goals	Includes goals, which are outcomes that the community aspires towards. Goals are usually expressed in adjectives and nouns (not verbs) and are not quantified (Berke et al. 2006). Goals reflect public values and express future desired conditions (Berke and Godschalk 2009).	All of these future plans will tier from this approved general management plan and will be based on the goals, future conditions, and appropriate types of activities established in this plan. (p. 43)	1

Objectives	Includes objectives, which are tangible, measurable outcomes leading to the achievement of a goal (Berke et al. 2006).	The general management plan will provide guidance on how the park will assess, respond to, and interpret the impacts of global climate change on fundamental resources, including objectives for reducing or offsetting emissions. (p. 20)	1
Objectives detailed	Includes quantifiable objectives for each goal (e.g., increase the use of alternative energy sources to 70% by 2030; there should be targets for each goal).	-	0
<b>PUBLIC PARTICIPATION</b>			
Planning process	Describes the process undertaken to create the plan.	After distribution of the draft GMP/WS/EIS, there will be a 60-day public review and comment period after which the npS planning team will evaluate comments from federal agencies, native hawaiian groups, organizations, businesses, and individuals regarding the draft plan. The planning team will then incorporate appropriate changes to produce a final GMP/WS/EIS. (p. 43)	1
Plan preparation involvement	Describes the stakeholders involved in plan preparation.	Public involvement included outreach to Hawai'i Volcanoes National Park visitors, Native Hawaiian groups, Hawaiian communities, federal, state, and local agencies, organizations, and businesses. (p. 343)	1

Plan preparation involvement detailed	Includes detailed description of organizations and individuals involved in plan preparation. Description must include number of stakeholders and the general categories of stakeholders (e.g. residents, companies, non-profits, governmental agencies).	The National park Service received correspondence from more than 130 individuals and organizations, including comment forms, letters, and e-mails that, combined with public meeting comments, totaled 1,251 specific responses. (p. 345)	1
Representative stakeholders	Mentions how stakeholders who were involved represent all the groups affected by proposed policies or how the planning process sought to engage disadvantaged populations. Disadvantaged populations are those that may not traditionally be included in the planning process and may be adversely affected by climate change, such as the poor, elderly, or those for whom English is a second language.	-	0
Participation techniques	Mentions participation techniques used to create the plan, such as meetings, surveys, charettes, public comments on drafts, etc.	Methods to reach the public included Federal Register notices, news releases, public meetings and workshops, newsletter mailings, and website postings. (p. 343)	1

<p>Participation techniques detailed</p>	<p>Describes participation techniques with details about each method including number of participants, main topics covered, and activities used to elicit input.</p>	<p>During this initial scoping phase, the park also conducted several stakeholder meetings. Invitations to attend stakeholder meetings were also extended by letter and e-mail to representatives of city, county, and federal agencies; business and community organizations; and all research permit holders to attend one of two different meetings held at the federal office building on Oahu and at Kilauea Military camp on hawai'i Island. During the 2009 initial scoping period, the park planning team spoke with approximately 400 people at public and stakeholder meetings and approximately 1,500 people at park and community tabling events. (p. 344)</p>	<p>1</p>
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Public meetings	States that meetings were used to engage stakeholders and that these meetings were open to the public.	<p>The planning team held the following stakeholder meetings (numbers noted are total participants at each meeting):</p> <ul style="list-style-type: none"> <li>• USGS hawaiian Volcanoes Observatory (13)</li> <li>• Hawai'i Volcanoes National park Science community (15)</li> <li>• Oahu Science community (10)</li> <li>• Kalapana Fishing council (24)</li> <li>• Hawai'i Volcanoes National park Business community (15)</li> <li>• Ka'u chamber of commerce (25)</li> <li>• Volcano community association (20)</li> <li>• Hawai'i county planning Department (3)</li> <li>• Friends of hawai'i Volcanoes National park annual Meeting/ retreat (120)</li> <li>• Hawai'i Volcanoes National park Kupuna Group Meeting (7) (p. 345)</li> </ul>	1
Planning or steering committee	States that a steering committee or advisory committee was used to guide plan creation.	-	0
Public participation maintenance	Discusses how public engagement will continue in plan maintenance/evaluation.	-	0
<b>COORDINATION</b>			
Local university	States that local universities were engaged in the planning process.	-	0

Federal agencies	States that federal agencies were engaged in the planning process.	The general public; NPS staff; and representatives from native Hawaiian groups; local communities; county, state, and federal agencies; and various organizations and businesses identified issues and concerns about park management during the scoping phase (early information gathering) for this general management plan. (p. 18)	1
State agencies	States that state agencies were engaged in the planning process.	The general public; NPS staff; and representatives from native Hawaiian groups; local communities; county, state, and federal agencies; and various organizations and businesses identified issues and concerns about park management during the scoping phase (early information gathering) for this general management plan. (p. 18)	1
Nonprofits	States that nonprofits were engaged in the planning process.	The Nature Conservancy of Hawai'i partners with indigenous communities, businesses, governments, multilateral institutions, and other nonprofits to address threats to conservation including those concerning climate change, fire, freshwater, forests, nonnative species, and marine ecosystems (tNC 2009). (p. 283)	1



Businesses	States that businesses were engaged in the planning process.	The general public; NPS staff; and representatives from native Hawaiian groups; local communities; county, state, and federal agencies; and various organizations and businesses identified issues and concerns about park management during the scoping phase (early information gathering) for this general management plan. (p. 18)	1
Neighboring jurisdictions	States that neighboring jurisdictions were given the opportunity to participate in the planning process. Neighboring jurisdictions include regional planning organizations and counties as well as other cities, towns, or villages.	-	0
Elected official engagement	Mentions involvement of elected official(s) in the planning process.	-	0
<b>FACT BASE</b>			
Data collection	Provides information about the type of data collected and analyzed in order to make the plan.	The foundation for planning and management is generally developed (or revised or expanded) early in the general management planning process, as part of agency scoping and data collection for a park's general management plan. (p. 47)	1
National studies	States that national studies were used to inform the plan. Studies may include climate, demographics, economic projections, etc.	As of 2010, the county has a population of approximately 185,079 people, making it the second-most populous county in the state (see Table 5.8. Population Growth and 2010 Urban and Rural Demographics, Hawai'i State Counties, 2010) (US Census Bureau 2000a, 2010). (p. 275)	1

Regional studies	States that regional studies were used to inform the plan. Studies may include climate, demographics, economic projections, etc.	At the time of the 2010 Census, Hawaii County reported a total of 82,324 housing units, a 31.4% increase from 2000. In comparison, with a reported 519,508 housing units in 2010, housing in the state of Hawaii experienced a much slower growth rate of 12.8% during the same time period (US Census Bureau 2000a, 2010). (p. 276)	1
International studies	States that international studies were used to inform the plan. Studies may include climate, demographics, economic projections, etc.	Temperatures are predicted to rise an average of 4°F in the Pacific Islands by 2090 (Schramm and Loehman 2011). (p. 238)	1
Local knowledge	States that local, indigenous, or traditional knowledge was used to inform the plan.	Native Hawaiian traditional ecological knowledge would be used to enhance current scientific understanding to protect park resources and provide additional interpretive and educational opportunities for visitors. (p. 117)	1
Existing impacts	Identifies ways that climate change or changing weather conditions are already affecting the community.	-	0
Existing conditions	Discusses existing social, economic, environmental, or built infrastructure conditions that could lead to enhanced vulnerability in the future.	-	0
Existing actions	Identifies actions and plans that are in progress or planned that have adaptation value. Actions do not need to be specifically designed to address climate change.	-	0

<p>Historic changes weather/climate</p>	<p>Discusses how climate or weather trends in the area have changed to date.</p>	<p>Climate data has been recorded at park headquarters (around 4,000 feet above sea level) since 1949 and shows that temperatures range from an average minimum of 59°F to a maximum of 67°F in winter, and from 63° to 71°F in summer. average annual temperature from 1949 to 2006 was about 61°F. the highest recorded temperature was 89°F in December of 2000, while the lowest was 34°F in January of 1978 (WrCC n.d., 2006). From 2002 to 2007, annual average precipitation was 105 inches: the wettest months were December (twice), January (twice), March (once), and September (once). (p. 215)</p>	<p>1</p>
<p>Primary economic base(s)</p>	<p>Identifies the major economic sectors associated with the park.</p>	<p>According to the state of hawai'i Department of Business and economic Development and tourism, the largest sources of employment in the county are in service-based industries (retail trade, 13.6%, and health care and social assistance, 10.5%) and with the government (20.3%). (p. 281)</p>	<p>1</p>
<p>Primary cultural base(s)</p>	<p>Identifies the main cultural assets of the park.</p>	<p>Hawai'i Volcanoes national park protects, studies, and provides access to Kīlauea and Mauna loa, two of the world's most active volcanoes and perpetuates endemic hawaiian ecosystems and the traditional hawaiian culture connected to these landscapes. (p. 49)</p>	<p>1</p>

Primary natural system(s)	Identifies the major natural systems that are part of the park.	Hawai'i Volcanoes national park protects, studies, and provides access to Kīlauea and Mauna loa, two of the world's most active volcanoes and perpetuates endemic Hawaiian ecosystems and the traditional Hawaiian culture connected to these landscapes. (p. 49)	1
Presidentially declared disaster	Indicates that the community has experienced a presidentially declared disaster.	-	0
Previous hazardous events	Includes information on previous occurrences of hazardous events.	Kīlauea Volcano has erupted large volumes of lava along its remote east rift Zone. Over the past 150 years, lava flows have inundated the Southwest and east rifts of Mauna Loa and Kīlauea. In the past 50 years, both Chain of Craters road and Crater rim Drive have been inundated by lava at various times and at various locations. Chain of Craters road through the south section of the park remained closed by lava flows near hōlei Sea arch to the park boundary until 2014. (p. 218)	1
Repetitive loss properties	Discusses areas or specific properties that have been repetitively damaged by hazardous events.	-	0
Projected changes	Identifies climate change exposure, which is the climate change effects a community expects to feel, e.g., warmer temperature, increased precipitation, rising sea level (CA APG 2012).	Under climate change projections, these resources may be affected by changes in vegetation that could impact the integrity of ethnographic resources. (p. 317)	1
Prioritized exposure	Prioritizes climate change effects or hazards.	-	0

Non-climatic drivers	Mentions other factors that may impact future vulnerability or resilience. Non-climatic factors include a shifting economy, growing or depleting population, or changing land use patterns.	-	0
Non-climatic drivers detailed	Explicitly discusses projections for non-climatic factors over time and how this could affect vulnerability or resilience. Non-climatic factors include a shifting economy, growing or depleting population, or changing land use patterns.	-	0
Vulnerability assessment	Clearly indicates that a vulnerability assessment was undertaken as part of the planning process. A vulnerability assessment includes an analysis of exposure, sensitivity, and adaptive capacity.	-	0
Adaptive capacity	Clearly indicates that an assessment of adaptive capacity was undertaken. Adaptive capacity is the community's current and future ability to address projected impacts (CA APG 2012).	-	0
Adaptive capacity detailed	Provides a detailed description of adaptive capacity, including a clear description of what factors were considered in assessing adaptive capacity.	-	0
Risk assessment	Clearly indicates that a risk assessment was undertaken as part of the planning process. A risk assessment includes an assessment of the likelihood and	-	0

	consequence of an event.		
Water quality	Discusses impacts of changing climate conditions on the park's water quality.	As a result of global climate change, variability in the occurrence or height of the trade wind inversion, carbon dioxide, temperature, water availability, nutrient availability, and cloud cover can all affect the resistance of plants and trees to introduced herbivores. (p. 238)	1
Water quality detailed	Provides a detailed description of the vulnerability of water quality to changing climate conditions. Must include a map of areas at risk of low water quality or a detailed text description of at-risk areas that includes the location of specific vulnerable areas.	-	0

Natural systems	Discusses impacts of changing climate conditions on natural systems.	As a result of global climate change, variability in the occurrence or height of the trade wind inversion, carbon dioxide, temperature, water availability, nutrient availability, and cloud cover can all affect the resistance of plants and trees to introduced herbivores. For example, increased carbon dioxide can reduce leaf nitrogen, and herbivores will respond with either decreased growth or increased consumption. herbivores and pathogens can alter the species composition and size structure of forests, which can in turn affect ecosystem processes such as evapotranspiration (loss of water from the soil by evaporation and transpiration from plants), carbon dioxide flux (change in the output and intake of carbon dioxide), and heat transfer, thereby creating feedbacks to climate (ayres and Lombardero 2000). (p. 238)	1
Natural systems detailed	Provides a detailed description of the vulnerability of natural systems to changing climate conditions. Vulnerable natural systems must be mapped, or a detailed text description including the specific location of vulnerable natural systems must be provided.	-	0

Cultural assets	Identifies cultural assets that will be impacted by changing climate conditions. Includes things such as archeologically significant sites, recreational opportunities, events such as sports tournaments, museums, public art, and other culturally relevant places.	One of the known threats of climate change is a rise in sea level. along with sea level rise will come an increase in high waves, seasonal increases in storm intensity, and increased frequency of hurricanes and severe tsunamis. For the coastal area within Hawai'i Volcanoes National park these threats are of great concern. (p. 259)	1
Cultural assets detailed	Provides a detailed description of cultural assets that are vulnerable to changing climate conditions. The location of vulnerable cultural assets must be mapped, or a detailed description of the cultural assets and their location must be provided.	-	0
Built environments / infrastructure	Identifies infrastructure that will be impacted by changing climate conditions.	-	0
Built environments / infrastructure detailed	Provides a detailed description of infrastructure vulnerable to changing climate conditions. Vulnerable locations are mapped, or a detailed description of the vulnerable built environments and their location is provided.	-	0
Public services	Identifies sensitive public services, including emergency services, that will be impacted by climate change.	-	0
Public services detailed	Provides a detailed description of public services vulnerable to changing climate conditions. Vulnerable public services must be	-	0



	mapped, or a detailed description, including a list of vulnerable services, must be included.		
Economic systems	Identifies economic impacts of changing climate conditions. This may be a general discussion of impacts to entire economic sectors such as agriculture, forestry, tourism, OR a more specific discussion of impacts such as reduced patronage during extreme heat, or business closure and damage during extreme events.	-	0
Economic systems detailed	Provides a detailed description of the economies vulnerable to changing climate conditions. Vulnerable economies must be mapped, or a detailed description, including a list of the vulnerable economic sectors, must be provided.	-	0
Prioritization of vulnerabilities or risks	Includes the results of a prioritization of identified vulnerabilities.	-	0
Prioritization of vulnerabilities or risks detailed	Prioritizes risks and clearly describes how risks were ranked.	-	0
Underlying Causes / Transformation	Mentions the need to address fundamental drivers of human vulnerability or "transformational" adaptation/change. "Fundamental drivers of vulnerability" refers to underlying causes of social vulnerability reinforced by existing institutions and social systems; "transformational" adaptation or change	-	0

	reassesses the way a system operates and may take the form of new rights claims and changes in political systems (PROVIA 2013). Transformational change affects how individuals and society make decisions and allocate resources to cope with climate change; it may alternatively include changes in institutional arrangements, priorities, and norms (Kates et al. 2012)		
<b>UNCERTAINTY</b>			
Acknowledgement of uncertainties	The plan acknowledges uncertainties involved in projection of climate change or estimation of vulnerabilities.	-	0
Acknowledgement of uncertainty detailed	Describes sources of uncertainty.	-	0
Multiple scenarios	Mentions that different climate scenarios were considered.	-	0
Multiple scenarios detailed	Provides a detailed description of scenarios. Description must include how scenarios were developed and how scenarios differ in terms of assumptions and impacts.	-	0
Adaptive management	Mentions adaptive management. Adaptive management is the process of incorporating new information from monitoring and science into decision-making with an emphasis on learning.	-	0
Adaptive management detailed	Emphasizes adaptive management and learning throughout the plan and establishes a process for incorporating new information from	-	0

	monitoring and science into decision-making.		
Multiple time frames	Includes both short-term (next 5 years) and long-term (5+ years) strategies.	-	0
Flexible strategies	Explicitly recognizes the need for flexible adaptation strategies.	-	0
Flexible strategies detailed	Includes flexible strategies and explicitly identifies strategies as being flexible.	-	0
Robust strategies	Discusses robust strategies as an option to address uncertainty. Robust strategies are those that produce positive outcomes across a range of different scenarios or future conditions.	-	0
Robust strategies detailed	Includes robust strategies. Robust strategies produce positive outcomes across a range of different scenarios or future conditions. Must identify the strategies as robust.	-	0
No- or low-regrets strategies	Discusses no- or low-regrets strategies as an option to address uncertainty. No-regrets strategies are those that can be justified under current climate conditions but also make even more sense with climate change (CCS 2011); these may also be called win-win strategies. Low-regret strategies are low-cost strategies with relatively large benefits, although those benefits are realized mainly under projected future climate change. Must	-	0

	explicitly discuss no- or low- regrets strategies.		
No- or low-regrets strategies detailed	Includes no- or low-regret strategies. No-regrets strategies are those that can be justified under current climate conditions but also make even more sense with climate change (CCS 2011); these may also be called win-win strategies. Low-regret strategies are low-cost strategies with relatively large benefits, although those benefits are realized mainly under projected future climate change. Must explicitly identify strategies as no- or low-regrets.	-	0
<b>STRATEGY IDENTIFICATION</b>			
Prioritized actions	Prioritizes adaptation strategies.	-	0
Prioritized strategies detailed	Prioritizes adaptation strategies and describes how strategies were ranked.	-	0
Specific adaptation strategies	Includes strategies that are linked to specific impacts.	-	0

Capacity building	Includes capacity-building strategies. Capacity building is developing human resources, institutions, and communities, equipping them with the capability to adapt.	As a leader in responding to the potential impacts from climate change, the park would continue to implement the climate action plan for Hawai'i volcanoes national park and participate in the Climate Friendly parks program. the park would strive to reduce greenhouse gas emissions, continue monitoring and research, increase climate change education and outreach, and develop climate change adaptation strategies. (p. 114)	1
Advocacy	Includes advocacy strategies. Advocacy includes encouraging regional and state agencies to have adaptation-appropriate strategies.	-	0
General strategies	Includes generic adaptation strategies, which are strategies not specific enough to be classified in another category.	As a leader in how parks and land managers are responding to threats from climate change, the park would continue to implement the climate action plan for Hawai'i volcanoes national park and participate in the Climate Friendly parks program. the park would strive for increased energy efficiency, conservation, and sustainability in development of facilities and would give priority to green facility design for any new construction, retrofitting, and upgrading of facilities to the greatest extent possible. increased reliance would be placed by the park on temporary and movable facilities to improve flexibility for both visitors and operations during periods of eruptive activity. (p. 145)	1

Information and awareness	Includes information and awareness strategies, which focus on increasing public knowledge.		0
Research and monitoring	Includes research or monitoring strategies, which focus on gathering information and creating reports, maps, or models. Monitoring includes observation or repeated measurements over time.	The park would serve as a model for climate change adaptation by supporting climate change-related research, adapting management activities based on climate projections, and building resilience among populations of rare native species, communities, and ecosystems. examples include long-term weather monitoring of park ecosystems, establishing wildlife corridors through restoration of forest fragments, and expanding populations of rare species throughout their former range. (p. 146)	1

Planning	Includes planning-related strategies, including strategies that incorporate understanding of climate science, impacts, vulnerability and risk into government and institutional planning processes, efforts, or existing initiatives.	As a leader in how parks and land managers are responding to threats from climate change, the park would continue to implement the climate action plan for Hawai'i volcanoes national park and participate in the Climate Friendly parks program. the park would strive for increased energy efficiency, conservation, and sustainability in development of facilities and would give priority to green facility design for any new construction, retrofitting, and upgrading of facilities to the greatest extent possible. increased reliance would be placed by the park on temporary and movable facilities to improve flexibility for both visitors and operations during periods of eruptive activity. (p. 145)	1
Practice and behavior	Includes strategies to change practice and behavior. Practice and behavior strategies revise or expand practices and on-the-ground behavior that affect resilience.	-	0
Policy and legislation	Includes policy and legislative strategies aimed at preparing for climate change.	-	0
Physical infrastructure	Includes physical infrastructure strategies to prepare for climate change.	-	0
Building codes and engineering design standards	Includes strategies to improve physical infrastructure's response to changing climate through improved standards or engineering.	-	0

Green infrastructure	Includes green infrastructure strategies aimed at providing protection from climate hazards.	-	0
Land use	Includes land use strategies focused on preparing for climate change.	-	0
Conservation	Includes conservation strategies to preserve biodiversity and protect open space under a changing climate.	The park would serve as a model for climate change adaptation by supporting climate change-related research, adapting management activities based on climate projections, and building resilience among populations of rare native species, communities, and ecosystems. examples include long-term weather monitoring of park ecosystems, establishing wildlife corridors through restoration of forest fragments, and expanding populations of rare species throughout their former range. (p. 146)	1
Financing	Includes financing or insurance strategies to prepare for future climate changes.	-	0
Technology	Includes technology strategies.	-	0
Cost	Estimates the cost of implementing specific adaptation actions.	-	0
Cost detailed	Identifies the cost of implementing each adaptation strategy.	-	0
Cost of inaction	States that taking action to adapt to climate change costs less than not acting.	-	0
Cost of inaction detailed	Provides specific dollar figures on the cost of inaction versus adaptation-related action.	-	0



Co-benefits	Identifies co-benefits associated with taking adaptation action.	-	0
<b>IMPLEMENTATION AND MONITORING</b>			
Timetable for implementation	Provides a timetable for when each action will be implemented.	-	0
Implementation responsibilities	Assigns responsibility for policies broadly to organizations or agencies.	-	0
Implementation responsibilities detailed	Assigns responsibility for the implementation of each strategy.	-	0
Funding (need for)	Describes the need for funding sources to implement the plan.	Summary of Cost Table (p. 197)	1
Potential funding sources detailed	Clearly describes potential funding sources and associates them with particular strategies.	-	0
Reporting requirements	Includes requirements for the regular reporting of implementation progress.	-	0
Monitoring responsibility	Mentions assignment of responsibility for monitoring.	-	0
Evaluation method	Establishes a process to evaluate the plan.	-	0
Evaluation method detailed	Describes when analyses of progress toward objectives will take place and how results will be used.	-	0
Evaluation metrics	Mentions how to measure progress towards implementing strategies.	-	0
Evaluation metrics detailed	Mentions how to measure progress towards implementing each strategy identified in the plan.	-	0
Mainstreaming	Discusses mainstreaming climate change adaptation. Mainstreaming refers to the integration of climate adaptation into other sector policies or	-	0

	plans (Rauken et al. 2014).		
Mainstreaming detailed	Identifies specific plans and programs as opportunities for mainstreaming. Mainstreaming refers to the integration of climate adaptation into other sector policies or plans (Rauken et al. 2014).	-	0
Plan updates	Mentions need for updates.	-	0
Plan updates detailed	Includes timetable for updating plan.	-	0
Barriers	Mentions barriers to climate adaptation.	-	0

3- Ross Lake National Recreation Area Final General Management Plan and Environmental Impact Statement Codebook

Criterion	Description	Code	Score
<b>ARTICULATION OF PURPOSE, GOALS, AND OBJECTIVES</b>			
Plan purpose	States the purpose of the plan.	The new general management plan will set the management philosophy for Ross Lake National Recreation Area for the next 15 to 20 years. (vol1, p. 8)	1
Vision statement	Includes a vision statement, which establishes an overall image of a desired future (Berke et al. 2006).	-	0
Define resilience, adaptation, or preparedness	Defines resilience, adaptation or preparedness.	-	0
Goals	Includes goals, which are outcomes that the community aspires towards. Goals are usually expressed in adjectives and nouns (not verbs) and are not quantified (Berke et al. 2006). Goals reflect public values and express future desired conditions (Berke and Godschalk 2009).	The alternatives in this general management plan address desired future conditions that are not already mandated by law and policy and which must be determined through a planning process. (vol1, p. 9)	1
Objectives	Includes objectives, which are tangible, measurable outcomes leading to the achievement of a goal (Berke et al. 2006).	The NPS would continue to operate a monitoring program on glaciers and associated processes to assess impacts of climate change, and educate the public about these resources and their implications. (vol1, p.96)	1
Objectives detailed	Includes quantifiable objectives for each goal (e.g., increase the use of alternative energy sources to 70% by 2030; there should be targets for each goal).	-	0

<b>PUBLIC PARTICIPATION</b>			
Planning process	Describes the process undertaken to create the plan.	The process of creating a GMP ensures that park managers, stakeholders, and the public share a clearly defined understanding of the resource conditions, opportunities for visitor experiences, and general kinds of management, access, and development that will best achieve a park's purpose and conserve its resources unimpaired for the enjoyment of future generations. (p. 10)	1
Plan preparation involvement	Describes the stakeholders involved in plan preparation.	The Ross Lake National Recreation Area general management planning team launched the planning process in late September 2006. The official public scoping period was initiated on September 29, 2006 and closed on December 30, 2006. A comprehensive scoping outreach effort was planned to elicit early public comment regarding issues and concerns, the nature and extent of potential environmental impacts, and possible alternatives that should be addressed in the preparation of the GMP. Through various scoping outreach activities, the NPS welcomed information and suggestions from the public regarding resource protection, visitor use, and land management. (vol2, p.185)	1

Plan preparation involvement detailed	Includes detailed description of organizations and individuals involved in plan preparation. Description must include number of stakeholders and the general categories of stakeholders (e.g. residents, companies, non-profits, governmental agencies).	The following summary incorporates both the public workshop comments and the written comments received by the NPS through the close of the public comment period. The NPS received correspondence from over 80 individuals and organizations during the public comment period that provided a total of over 750 specific comments. All comments received were reviewed and considered by the NPS staff for the preparation of this GMP. (vol2, p. 186)	1
Representative stakeholders	Mentions how stakeholders who were involved represent all the groups affected by proposed policies or how the planning process sought to engage disadvantaged populations. Disadvantaged populations are those that may not traditionally be included in the planning process and may be adversely affected by climate change, such as the poor, elderly, or those for whom English is a second language.	-	0
Participation techniques	Mentions participation techniques used to create the plan, such as meetings, surveys, charettes, public comments on drafts, etc.	The NPS formally announced the public scoping period and invited public comment through newsletters, correspondence, press releases, public workshops, informal meetings, the NPS Planning, Environment, and Public Comment (PEPC) website, and a Federal Register notice. (vol2, p.185)	1

Participation techniques detailed	Describes participation techniques with details about each method including number of participants, main topics covered, and activities used to elicit input.	NPS staff produced and mailed Newsletter Number 1 to approximately 350 individuals and entities on the mailing list. Agencies, organizations, governmental representatives, and tribal governments were sent letters of invitation to attend the public workshops or individual meetings. Press releases were distributed to local and regional news media. The project was launched on the NPS Planning, Environment, and Public Comment (PEPC) website: <a href="http://parkplanning.nps.gov/rola">http://parkplanning.nps.gov/rola</a> , providing access to information about the Ross Lake NRA GMP and a method for taking public comments. A notice of intent to prepare a general management plan and environmental impact statement for Ross Lake National Recreation Area was published in the Federal Register on October 30, 2006 (Vol. 71, No. 209, pp. 63351-63352). The public was invited to submit comments by regular mail, e-mail, fax, online, and at public workshops and individual meetings. (vol2, p. 185)	1
Public meetings	States that meetings were used to engage stakeholders and that these meetings were open to the public.	Meetings were held in Washington State in Concrete, Marblemount, Sedro-Woolley, Seattle and Bellingham; and in Surrey and Chilliwack, British Columbia. 63 people attended the meetings overall. (vol2, p.185)	1
Planning or steering committee	States that a steering committee or advisory committee was used to guide plan creation.	-	0
Public participation maintenance	Discusses how public engagement will continue in plan maintenance/evaluation.	-	0
<b>COORDINATION</b>			

Local university	States that local universities were engaged in the planning process.	-	0
Federal agencies	States that federal agencies were engaged in the planning process.	The NPS Management Policies 2006 (§1.6) stresses the need for cooperative conservation beyond park boundaries. This cooperation is necessary in order for the National Park Service to fulfill its mandate to preserve the natural and cultural resources unimpaired for future generations. Local and regional cooperation may involve other federal agencies, tribal, state, and local governments, neighboring landowners, and nongovernmental and private sector organizations. (voll, p. 41)	1
State agencies	States that state agencies were engaged in the planning process.	The NPS Management Policies 2006 (§1.6) stresses the need for cooperative conservation beyond park boundaries. This cooperation is necessary in order for the National Park Service to fulfill its mandate to preserve the natural and cultural resources unimpaired for future generations. Local and regional cooperation may involve other federal agencies, tribal, state, and local governments, neighboring landowners, and nongovernmental and private sector organizations. (voll, p. 41)	1

Nonprofits	States that nonprofits were engaged in the planning process.	The NPS Management Policies 2006 (§1.6) stresses the need for cooperative conservation beyond park boundaries. This cooperation is necessary in order for the National Park Service to fulfill its mandate to preserve the natural and cultural resources unimpaired for future generations. Local and regional cooperation may involve other federal agencies, tribal, state, and local governments, neighboring landowners, and nongovernmental and private sector organizations. (voll, p. 41)	1
Businesses	States that businesses were engaged in the planning process.	The NPS Management Policies 2006 (§1.6) stresses the need for cooperative conservation beyond park boundaries. This cooperation is necessary in order for the National Park Service to fulfill its mandate to preserve the natural and cultural resources unimpaired for future generations. Local and regional cooperation may involve other federal agencies, tribal, state, and local governments, neighboring landowners, and nongovernmental and private sector organizations. (voll, p. 41)	1
Neighboring jurisdictions	States that neighboring jurisdictions were given the opportunity to participate in the planning process. Neighboring jurisdictions include regional planning organizations and counties as well as other cities, towns, or villages.	-	0



Elected official engagement	Mentions involvement of elected official(s) in the planning process.	Of the comments received, 7 were from agencies and elected officials, 5 from businesses, and 22 from organizations. (vol2, p. 196)	1
<b>FACT BASE</b>			
Data collection	Provides information about the type of data collected and analyzed in order to make the plan.	They provide a valuable focus throughout the planning process and the life of the plan and may include systems, processes, features, visitor experiences, stories, scenes, sounds, or other resources and values. They are the reasons for data collection, planning issues, management prescriptions, impact assessments, and value analyses. (vol1, p. 12)	1
National studies	States that national studies were used to inform the plan. Studies may include climate, demographics, economic projections, etc.	Population projections to the year 2030 indicate rates of growth very similar to those from 2000 to 2006 for each of the regions. The influence area is projected to grow at a greater rate than either the state of Washington or the province of British Columbia during the period from 2000 to 2030, with a projected 1.9 percent average annual growth vs. 1.5 percent and 1.4 percent respectively (Washington State Office of Financial Management 2008 and British Columbia Stats, 2008). (vol 2, p. 73)	1

Regional studies	States that regional studies were used to inform the plan. Studies may include climate, demographics, economic projections, etc.	The University of Washington's Climate Impacts Group has done extensive research on the potential impacts of climate change in the Pacific Northwest. The Climate Impacts Group computer modeling has modeled accelerated warming in Washington State beginning in the 1920s and projected through the 2080s. Climate models indicate an average increase in annual temperature of approximately 2.2 degrees Fahrenheit, on average, within the lifetime of the GMP (2020s). By the 2040s, that temperature increase is anticipated to rise to 3.5 degrees. (vol 2, p. 6-7)	1
International studies	States that international studies were used to inform the plan. Studies may include climate, demographics, economic projections, etc.	While climate change is a global phenomenon, it manifests differently depending on regional and local factors. A 2007 report by the Intergovernmental Panel on Climate Change (representing 39 countries and reporting on the greenhouse effect) projected that the average global temperature will increase by 1.8 to 4.0 degrees Celsius (3.2 to 7.2 degrees Fahrenheit) by the end of the 21st century, as compared to 1980-1999 temperatures. (vol 2, p. 6)	1
Local knowledge	States that local, indigenous, or traditional knowledge was used to inform the plan.	-	0
Existing impacts	Identifies ways that climate change or changing weather conditions are already affecting the community.	-	0

Existing conditions	Discusses existing social, economic, environmental, or built infrastructure conditions that could lead to enhanced vulnerability in the future.	-	0
Existing actions	Identifies actions and plans that are in progress or planned that have adaptation value. Actions do not need to be specifically designed to address climate change.	-	0
Historic changes weather/climate	Discusses how climate or weather trends in the area have changed to date.	<p>Climate of Ross Lake NRA is currently warming rapidly; mean annual temperature has risen about 1°C (1.8°F) since the end of the 19th century, as illustrated by the loss of half the glacier area in the park complex. This change is beyond observed temperature variation over the past millennium. Projected future climate changes for the Pacific Northwest will be influenced by rising sea level warming sea surface temperatures, which may enhance El Niño conditions. Rapid warming will result in stronger coastal winds, less snowfall, continued rapid loss of glaciers, higher treeline, and intense periods of rainfall and associated flooding. A stronger Sonoran High pressure cell in summer could result in longer, more severe seasonal and interannual droughts. Average climate model projections of mean annual temperature increases in the coming decades for this region are 0.45°C (.81°F) per decade. Mean annual precipitation is expected to increase by as much as 14 percent by the 2040s (Climate Impacts Group). (vol 2, p. 6)</p>	1

Primary economic base(s)	Identifies the major economic sectors associated with the park.	Recreation and tourism also have a role in the economy of the influence area. Ross Lake is one of several visitor attractions in the area, which also includes North Cascades National Park, Lake Chelan National Recreation Area, and Mount Baker (located within the Mt. Baker Snoqualmie National Forest). Forests, rivers, and towns in the influence area attract visitors with opportunities for skiing, whitewater rafting, camping, hiking, fishing, boating, and art and cultural experiences. Visitors and travelers support numerous jobs in the influence area's retail trade, accommodations, dining, entertainment, and other affiliated industries. In the three U.S. counties, 6 percent of jobs are in the tourism industry, making up 3 percent of the counties' earnings (Washington State, 2006). (vol2, p. 76)	1
Primary cultural base(s)	Identifies the main cultural assets of the park.	Preserved within North Cascades NPS Complex is abundant evidence of over 9,000 years of cultural and technological development. This long history reveals a range of human adaptations to changing climates and environments at all elevations of the North Cascades. (vol1, p. 14)	1
Primary natural system(s)	Identifies the major natural systems that are part of the park.	From deep forested valleys to alpine peaks, the North Cascades NPS Complex encompasses extreme gradients of climate and topography that contribute to an impressive diversity of habitats and species. (vol1, p.14)	1

Presidentially declared disaster	Indicates that the community has experienced a presidentially declared disaster.	-	0
Previous hazardous events	Includes information on previous occurrences of hazardous events.	-	0
Repetitive loss properties	Discusses areas or specific properties that have been repetitively damaged by hazardous events.	-	0
Projected changes	Identifies climate change exposure, which is the climate change effects a community expects to feel, e.g., warmer temperature, increased precipitation, rising sea level (CA APG 2012).	Climate of Ross Lake NRA is currently warming rapidly; mean annual temperature has risen about 1°C (1.8°F) since the end of the 19th century, as illustrated by the loss of half the glacier area in the park complex. This change is beyond observed temperature variation over the past millennium. Projected future climate changes for the Pacific Northwest will be influenced by rising sea level warming sea surface temperatures, which may enhance El Niño conditions. Rapid warming will result in stronger coastal winds, less snowfall, continued rapid loss of glaciers, higher treeline, and intense periods of rainfall and associated flooding. A stronger Sonoran High pressure cell in summer could result in longer, more severe seasonal and interannual droughts. Average climate model projections of mean annual temperature increases in the coming decades for this region are 0.45°C (.81°F) per decade. Mean annual precipitation is expected to increase by as much as 14 percent by the 2040s (Climate Impacts Group). (vol 2, p. 6)	1
Prioritized exposure	Prioritizes climate change effects or hazards.	-	0

Non-climatic drivers	Mentions other factors that may impact future vulnerability or resilience. Non-climatic factors include a shifting economy, growing or depleting population, or changing land use patterns.	-	0
Non-climatic drivers detailed	Explicitly discusses projections for non-climatic factors over time and how this could affect vulnerability or resilience. Non-climatic factors include a shifting economy, growing or depleting population, or changing land use patterns.	-	0
Vulnerability assessment	Clearly indicates that a vulnerability assessment was undertaken as part of the planning process. A vulnerability assessment includes an analysis of exposure, sensitivity, and adaptive capacity.	-	0
Adaptive capacity	Clearly indicates that an assessment of adaptive capacity was undertaken. Adaptive capacity is the community's current and future ability to address projected impacts (CA APG 2012).	-	0
Adaptive capacity detailed	Provides a detailed description of adaptive capacity, including a clear description of what factors were considered in assessing adaptive capacity.	-	0
Risk assessment	Clearly indicates that a risk assessment was undertaken as part of the planning process. A risk assessment includes an assessment of the likelihood and	-	0

	consequence of an event.		
Water quality	Discusses impacts of changing climate conditions on the park's water quality.	-	0
Water quality detailed	Provides a detailed description of the vulnerability of water quality to changing climate conditions. Must include a map of areas at risk of low water quality or a detailed text description of at-risk areas that includes the location of specific vulnerable areas.	-	0

Natural systems	Discusses impacts of changing climate conditions on natural systems.	<p>Climate of Ross Lake NRA is currently warming rapidly; mean annual temperature has risen about 1°C (1.8°F) since the end of the 19th century, as illustrated by the loss of half the glacier area in the park complex. This change is beyond observed temperature variation over the past millennium. Projected future climate changes for the Pacific Northwest will be influenced by rising sea level warming sea surface temperatures, which may enhance El Niño conditions. Rapid warming will result in stronger coastal winds, less snowfall, continued rapid loss of glaciers, higher treeline, and intense periods of rainfall and associated flooding. A stronger Sonoran High pressure cell in summer could result in longer, more severe seasonal and interannual droughts. Average climate model projections of mean annual temperature increases in the coming decades for this region are 0.45°C (.81°F) per decade. Mean annual precipitation is expected to increase by as much as 14 percent by the 2040s (Climate Impacts Group). (vol 2, p. 6)</p>	1
Natural systems detailed	<p>Provides a detailed description of the vulnerability of natural systems to changing climate conditions. Vulnerable natural systems must be mapped, or a detailed text description including the specific location of vulnerable natural systems must be provided.</p>	-	0



Cultural assets	Identifies cultural assets that will be impacted by changing climate conditions. Includes things such as archeologically significant sites, recreational opportunities, events such as sports tournaments, museums, public art, and other culturally relevant places.	Within lands managed by the National Park Service nationwide, climate change has already had noticeable impacts on both natural and cultural resources. Conditions for sustaining the health and prosperity of animal and plant habitats, glacial, marine, and wetland ecosystems have been diminished and changing patterns of weather and natural hazards such as flooding and wildfires have damaged habitat areas and cultural resource sites. (vol 2, p. 6)	1
Cultural assets detailed	Provides a detailed description of cultural assets that are vulnerable to changing climate conditions. The location of vulnerable cultural assets must be mapped, or a detailed description of the cultural assets and their location must be provided.	-	0
Built environments / infrastructure	Identifies infrastructure that will be impacted by changing climate conditions.	-	0
Built environments / infrastructure detailed	Provides a detailed description of infrastructure vulnerable to changing climate conditions. Vulnerable locations are mapped, or a detailed description of the vulnerable built environments and their location is provided.	-	0
Public services	Identifies sensitive public services, including emergency services, that will be impacted by climate change.	-	0

Public services detailed	Provides a detailed description of public services vulnerable to changing climate conditions. Vulnerable public services must be mapped, or a detailed description, including a list of vulnerable services, must be included.	-	0
Economic systems	Identifies economic impacts of changing climate conditions. This may be a general discussion of impacts to entire economic sectors such as agriculture, forestry, tourism, OR a more specific discussion of impacts such as reduced patronage during extreme heat, or business closure and damage during extreme events.	-	0
Economic systems detailed	Provides a detailed description of the economies vulnerable to changing climate conditions. Vulnerable economies must be mapped, or a detailed description, including a list of the vulnerable economic sectors, must be provided.	-	0
Prioritization of vulnerabilities or risks	Includes the results of a prioritization of identified vulnerabilities.	-	0
Prioritization of vulnerabilities or risks detailed	Prioritizes risks and clearly describes how risks were ranked.	-	0

Underlying Causes / Transformation	Mentions the need to address fundamental drivers of human vulnerability or "transformational" adaptation/change. "Fundamental drivers of vulnerability" refers to underlying causes of social vulnerability reinforced by existing institutions and social systems; "transformational" adaptation or change reassesses the way a system operates and may take the form of new rights claims and changes in political systems (PROVIA 2013). Transformational change affects how individuals and society make decisions and allocate resources to cope with climate change; it may alternatively include changes in institutional arrangements, priorities, and norms (Kates et al. 2012)	-	0
<b>UNCERTAINTY</b>			
Acknowledgement of uncertainties	The plan acknowledges uncertainties involved in projection of climate change or estimation of vulnerabilities.	The cumulative effect of human-forced climate change would be uncertain, but likely to be adverse. (vol 2, p. 171)	1
Acknowledgement of uncertainty detailed	Describes sources of uncertainty.	-	0
Multiple scenarios	Mentions that different climate scenarios were considered.	-	0
Multiple scenarios detailed	Provides a detailed description of scenarios. Description must include how scenarios were developed and how scenarios differ in terms of assumptions and impacts.	-	0

Adaptive management	Mentions adaptive management. Adaptive management is the process of incorporating new information from monitoring and science into decision-making with an emphasis on learning.	-	0
Adaptive management detailed	Emphasizes adaptive management and learning throughout the plan and establishes a process for incorporating new information from monitoring and science into decision-making.	-	0
Multiple time frames	Includes both short-term (next 5 years) and long-term (5+ years) strategies.	-	0
Flexible strategies	Explicitly recognizes the need for flexible adaptation strategies.	-	0
Flexible strategies detailed	Includes flexible strategies and explicitly identifies strategies as being flexible.	-	0
Robust strategies	Discusses robust strategies as an option to address uncertainty. Robust strategies are those that produce positive outcomes across a range of different scenarios or future conditions.	-	0
Robust strategies detailed	Includes robust strategies. Robust strategies produce positive outcomes across a range of different scenarios or future conditions. Must identify the strategies as robust.	-	0

No- or low-regrets strategies	Discusses no- or low-regrets strategies as an option to address uncertainty. No-regrets strategies are those that can be justified under current climate conditions but also make even more sense with climate change (CCS 2011); these may also be called win-win strategies. Low-regret strategies are low-cost strategies with relatively large benefits, although those benefits are realized mainly under projected future climate change. Must explicitly discuss no- or low- regrets strategies.	-	0
No- or low-regrets strategies detailed	Includes no- or low-regret strategies. No-regrets strategies are those that can be justified under current climate conditions but also make even more sense with climate change (CCS 2011); these may also be called win-win strategies. Low-regret strategies are low-cost strategies with relatively large benefits, although those benefits are realized mainly under projected future climate change. Must explicitly identify strategies as no- or low-regrets.	-	0
<b>STRATEGY IDENTIFICATION</b>			
Prioritized actions	Prioritizes adaptation strategies.	-	0
Prioritized strategies detailed	Prioritizes adaptation strategies and describes how strategies were ranked.	-	0
Specific adaptation strategies	Includes strategies that are linked to specific impacts.	-	0

Capacity building	Includes capacity-building strategies. Capacity building is developing human resources, institutions, and communities, equipping them with the capability to adapt.	The NPS would work together with other federal, state, tribal and local governments, and private landowner partners to develop strategies at multiple scales, including landscape-level strategies, for understanding and responding to climate change impacts. (vol1, p.42)	1
Advocacy	Includes advocacy strategies. Advocacy includes encouraging regional and state agencies to have adaptation-appropriate strategies.	-	0
General strategies	Includes generic adaptation strategies, which are strategies not specific enough to be classified in another category.	The NPS would be a leader in interpreting climate change and its effects on glaciers, watersheds, resources, and people. (vol1, p.174)	1
Information and awareness	Includes information and awareness strategies, which focus on increasing public knowledge.	Continue to operate a monitoring program on glaciers and associated processes to assess impacts of climate change and educate the public. (vol1, p.138)	1
Research and monitoring	Includes research or monitoring strategies, which focus on gathering information and creating reports, maps, or models. Monitoring includes observation or repeated measurements over time.	Support, encourage, and conduct scientific programs and research related to climate change. Programs and research would include understanding the effects of climate change on park resources, natural processes, recreation, operations, facilities, and hydropower. (vol1, p.174)	1
Planning	Includes planning-related strategies, including strategies that incorporate understanding of climate science, impacts, vulnerability and risk into government and institutional planning	Same as Alternative A plus lead regional efforts for North Coast Cascades Network on climate change research and planning. (vol1, p.174)	1

	processes, efforts, or existing initiatives.		
Practice and behavior	Includes strategies to change practice and behavior. Practice and behavior strategies revise or expand practices and on-the-ground behavior that affect resilience.	-	0
Policy and legislation	Includes policy and legislative strategies aimed at preparing for climate change.	-	0
Physical infrastructure	Includes physical infrastructure strategies to prepare for climate change.	-	0
Building codes and engineering design standards	Includes strategies to improve physical infrastructure's response to changing climate through improved standards or engineering.	-	0
Green infrastructure	Includes green infrastructure strategies aimed at providing protection from climate hazards.	-	0
Land use	Includes land use strategies focused on preparing for climate change.	-	0

Conservation	Includes conservation strategies to preserve biodiversity and protect open space under a changing climate.	The NPS would work with other agencies, non-governmental organizations, and the public to develop ecosystem adaptation strategies to address anticipated changes to natural and cultural resources and the park infrastructure. Such adaptation planning is in a very early stage of development within the global community, but in general the body of knowledge is currently coalescing around several key aspects of adaptation planning. These steps would include: 1) establish a measurable natural and cultural resource baseline, 2) develop key partnerships among land management agencies, non-governmental organizations, and individuals which would be affected by any actions taken, 3) identify and develop adaptation strategies, including identifying opportunities and projects that would increase ecosystem resiliency, 4) implement adaptation strategies, and 5) revisit and revise these strategies based on experience and updated science. (vol1, p. 103)	1
Financing	Includes financing or insurance strategies to prepare for future climate changes.	-	0
Technology	Includes technology strategies.	-	0
Cost	Estimates the cost of implementing specific adaptation actions.	-	0
Cost detailed	Identifies the cost of implementing each adaptation strategy.	-	0
Cost of inaction	States that taking action to adapt to climate change costs less than not acting.	-	0
Cost of inaction detailed	Provides specific dollar figures on the cost of inaction versus	-	0



	adaptation-related action.		
Co-benefits	Identifies co-benefits associated with taking adaptation action.	-	0
<b>IMPLEMENTATION AND MONITORING</b>			
Timetable for implementation	Provides a timetable for when each action will be implemented.	-	0
Implementation responsibilities	Assigns responsibility for policies broadly to organizations or agencies.	-	0
Implementation responsibilities detailed	Assigns responsibility for the implementation of each strategy.	-	0
Funding (need for)	Describes the need for funding sources to implement the plan.	Summary of Cost Table (voll, p. 196)	1
Potential funding sources detailed	Clearly describes potential funding sources and associates them with particular strategies.	-	0
Reporting requirements	Includes requirements for the regular reporting of implementation progress.	-	0
Monitoring responsibility	Mentions assignment of responsibility for monitoring.	-	0
Evaluation method	Establishes a process to evaluate the plan.	-	0
Evaluation method detailed	Describes when analyses of progress toward objectives will take place and how results will be used.	-	0
Evaluation metrics	Mentions how to measure progress towards implementing strategies.	-	0
Evaluation metrics detailed	Mentions how to measure progress towards implementing each strategy identified in the plan.	-	0
Mainstreaming	Discusses mainstreaming climate change adaptation. Mainstreaming refers to the integration of	-	0

	climate adaptation into other sector policies or plans (Rauken et al. 2014).		
Mainstreaming detailed	Identifies specific plans and programs as opportunities for mainstreaming. Mainstreaming refers to the integration of climate adaptation into other sector policies or plans (Rauken et al. 2014).	-	0
Plan updates	Mentions need for updates.	-	0
Plan updates detailed	Includes timetable for updating plan.	-	0
Barriers	Mentions barriers to climate adaptation.	-	0

4- Golden Gate National Recreation Area Muir Woods National Monument Final General Management Plan/ Environmental Impact Statement Codebook

Criterion	Description	Code	Score
<b>ARTICULATION OF PURPOSE, GOALS, AND OBJECTIVES</b>			
Plan purpose	States the purpose of the plan.	The purpose of this general management plan (GMP) is to guide planning and decision making at Golden Gate National Recreation Area and Muir Woods National Monument for the next 20 years. (vol1, p. 5)	1
Vision statement	Includes a vision statement, which establishes an overall image of a desired future (Berke et al. 2006).	-	0
Define resilience, adaptation, or preparedness	Defines resilience, adaptation or preparedness.	-	0
Goals	Includes goals, which are outcomes that the community aspires towards. Goals are usually expressed in adjectives and nouns (not verbs) and are not quantified (Berke et al. 2006). Goals reflect public values and express future desired conditions (Berke and Godschalk 2009).	Reconnect fragmented habitat within and adjacent to the park to strengthen the integrity and resiliency of the coastal ecosystem to respond to climate change and urban pressures. (vol 1, p. 51)	1
Objectives	Includes objectives, which are tangible, measurable outcomes leading to the achievement of a goal (Berke et al. 2006).	Therefore, this general management plan provides guidance on how to assess, respond to, and interpret the impacts of global climate change on park resources and identifies objectives for reducing greenhouse gas emissions. (vol1, p.32)	1
Objectives detailed	Includes quantifiable objectives for each goal (e.g., increase the use of alternative energy sources to 70% by	-	0

	2030; there should be targets for each goal).		
<b>PUBLIC PARTICIPATION</b>			
Planning process	Describes the process undertaken to create the plan.	This planning process is based on a comprehensive look at the park as a whole rather than its individual sections. This comprehensive parkwide approach will help ensure that management of natural and cultural resources and visitor experience is consistent across all park areas. (vol1, p. 5)	1
Plan preparation involvement	Describes the stakeholders involved in plan preparation.	Throughout the multiyear planning process, the National Park Service used a variety of methods to regularly communicate with the public interested in the development of the general management plan. The foundation of two-way communication was the preparation of informative newsletters and the many open house-style public meetings held by the park in neighboring communities. (vol2, p. 385)	1
Plan preparation involvement detailed	Includes detailed description of organizations and individuals involved in plan preparation. Description must include number of stakeholders and the general categories of stakeholders (e.g. residents, companies, non-profits, governmental agencies).	More than 180 letters and comment forms were received from a variety of individuals, organizations, and agencies. Overall, more than 45 people provided some 1,500 substantive comments on the preliminary alternatives. (vol2, p. 387)	1
Representative stakeholders	Mentions how stakeholders who were involved represent all the groups affected by proposed policies or how the planning process sought to engage disadvantaged populations. Disadvantaged	-	0

	populations are those that may not traditionally be included in the planning process and may be adversely affected by climate change, such as the poor, elderly, or those for whom English is a second language.		
Participation techniques	Mentions participation techniques used to create the plan, such as meetings, surveys, charettes, public comments on drafts, etc.	Throughout the multiyear planning process, the National Park Service used a variety of methods to regularly communicate with the public interested in the development of the general management plan. The foundation of two-way communication was the preparation of informative newsletters and the many open house-style public meetings held by the park in neighboring communities. (vol2, p. 385)	1
Participation techniques detailed	Describes participation techniques with details about each method including number of participants, main topics covered, and activities used to elicit input.	The core public involvement activity centered on a series of five public open houses dedicated to discussion of the preliminary alternatives. These were held in June 2008, in Marin (Sausalito), San Francisco, and San Mateo communities (Princeton and Woodside). These workshops were attended by approximately 300 people. (vol2, p. 386)	1
Public meetings	States that meetings were used to engage stakeholders and that these meetings were open to the public.	The core public involvement activity centered on a series of five public open houses dedicated to discussion of the preliminary alternatives. These were held in June 2008, in Marin (Sausalito), San Francisco, and San Mateo communities (Princeton and Woodside). These workshops were attended by approximately 300 people. (vol2, p. 386)	1

Planning or steering committee	States that a steering committee or advisory committee was used to guide plan creation.	The GMP planning team included a steering committee made up of managers who guided the entire planning process. When developing and reviewing the issues and alternatives, the planning team included more than 50 managers and resource/technical specialists from the National Park Service and Golden Gate Parks Conservancy. (vol2, p. 452)	1
Public participation maintenance	Discusses how public engagement will continue in plan maintenance/evaluation.		0
<b>COORDINATION</b>			
Local university	States that local universities were engaged in the planning process.	-	0
Federal agencies	States that federal agencies were engaged in the planning process.	The plan represents important contributions from not only NPS staff, but hundreds of members of the public: individuals, organizations, and a variety of local, state, and federal public agencies—all of whom are interested in the vision that will successfully guide the park in the future. (vol2, p.385)	1
State agencies	States that state agencies were engaged in the planning process.	The plan represents important contributions from not only NPS staff, but hundreds of members of the public: individuals, organizations, and a variety of local, state, and federal public agencies—all of whom are interested in the vision that will successfully guide the park in the future. (vol2, p.385)	1

Nonprofits	States that nonprofits were engaged in the planning process.	The plan represents important contributions from not only NPS staff, but hundreds of members of the public: individuals, organizations, and a variety of local, state, and federal public agencies—all of whom are interested in the vision that will successfully guide the park in the future. (vol2, p.385)	1
Businesses	States that businesses were engaged in the planning process.	-	0
Neighboring jurisdictions	States that neighboring jurisdictions were given the opportunity to participate in the planning process. Neighboring jurisdictions include regional planning organizations and counties as well as other cities, towns, or villages.	-	0
Elected official engagement	Mentions involvement of elected official(s) in the planning process.	-	0
<b>FACT BASE</b>			
Data collection	Provides information about the type of data collected and analyzed in order to make the plan.	In addition to Golden Gate National Recreation Area activities, the inventory included air emissions associated with park partners and concession operations and visitor activities to the extent that data were available. (vol2, p. 17)	1

National studies	States that national studies were used to inform the plan. Studies may include climate, demographics, economic projections, etc.	By 2030, the population of the Bay Area is expected to grow to 8.7 million, and the surrounding counties are projected to reach 5.7 million, resulting in a total population within a two-hour drive of Golden Gate National Recreation Area Park sites of approximately 14.4 million. The total number of vehicle miles traveled in the Bay Area on an average weekday is projected to increase from approximately 136 million in 2006 to as much as 179 million by 2035 (Metropolitan Transportation Commission 2008). (vol2, p. 134)	1
Regional studies	States that regional studies were used to inform the plan. Studies may include climate, demographics, economic projections, etc.	Predictions of sea level rise are useful in determining what resources and facilities could be affected. "Map 1. Sea Level Rise: Golden Gate National Recreation Area" illustrates the likely effect of the projected 4.7 feet (1.4 meters) sea level rise on the coastal corridors of the park by combining the effects of the sea level rise with a modeled 100-year flood (Heberger et al. 2009). (vol2, p. 23)	1
International studies	States that international studies were used to inform the plan. Studies may include climate, demographics, economic projections, etc.	For example, scientists who factor in the melting of the Greenland ice sheets predict that sea levels could rise 13 to 20 feet (approximately 4 to 6 meters) over the next 100 years as a result of global warming (Overpeck et al. 2006). (vol2, p. 23)	1
Local knowledge	States that local, indigenous, or traditional knowledge was used to inform the plan.	-	0
Existing impacts	Identifies ways that climate change or changing weather conditions are already affecting the community.	-	0



Existing conditions	Discusses existing social, economic, environmental, or built infrastructure conditions that could lead to enhanced vulnerability in the future.	-	0
Existing actions	Identifies actions and plans that are in progress or planned that have adaptation value. Actions do not need to be specifically designed to address climate change.	-	0
Historic changes weather/climate	Discusses how climate or weather trends in the area have changed to date.	-	0
Primary economic base(s)	Identifies the major economic sectors associated with the park.	Each year, park visitors contribute hundreds of millions of dollars to the Bay Area economy. This money directly sustains the revenue stream and jobs at hotels, restaurants, and stores that serve park visitors. Economic modeling indicates that in 2010, park visitors spent \$260 million in the local economy and supported 1,500 local jobs (Stynes 2011). (vol1, p. 4)	1
Primary cultural base(s)	Identifies the main cultural assets of the park.	The park's planning area covered by this general management plan includes over 366 historic structures, 5 national historic landmark (NHL) districts, 13 National Register of Historic Places properties, 7 national register-eligible properties, 9 documented cultural landscapes, 365 identified and over 500 predicted archeological sites, and the fourth-largest museum collection in the National Park Service. (vol2, p. 73)	1

Primary natural system(s)	Identifies the major natural systems that are part of the park.	Area is rich in natural resources—it comprises 19 separate ecosystems and is home to more than 1,250 plant and wildlife species. With 80 sensitive, rare, threatened, or endangered species, Golden Gate National Recreation Area ranks fourth among all units in the national park system in the number of federally protected and threatened species found within the park. (vol2, p. 15)	1
Presidentially declared disaster	Indicates that the community has experienced a presidentially declared disaster.	-	0
Previous hazardous events	Includes information on previous occurrences of hazardous events.	-	0
Repetitive loss properties	Discusses areas or specific properties that have been repetitively damaged by hazardous events.	-	0
Projected changes	Identifies climate change exposure, which is the climate change effects a community expects to feel, e.g., warmer temperature, increased precipitation, rising sea level (CA APG 2012).	Predictions of sea level rise are useful in determining what resources and facilities could be affected. “Map 1. Sea Level Rise: Golden Gate National Recreation Area” illustrates the likely effect of the projected 4.7 feet (1.4 meters) sea level rise on the coastal corridors of the park by combining the effects of the sea level rise with a modeled 100-year flood (Heberger et al. 2009). (vol2, p. 23)	1
Prioritized exposure	Prioritizes climate change effects or hazards.	-	0
Non-climatic drivers	Mentions other factors that may impact future vulnerability or resilience. Non-climatic factors include a shifting economy, growing or depleting population, or changing land use patterns.	-	0

Non-climatic drivers detailed	Explicitly discusses projections for non-climatic factors over time and how this could affect vulnerability or resilience. Non-climatic factors include a shifting economy, growing or depleting population, or changing land use patterns.	-	0
Vulnerability assessment	Clearly indicates that a vulnerability assessment was undertaken as part of the planning process. A vulnerability assessment includes an analysis of exposure, sensitivity, and adaptive capacity.	-	0
Adaptive capacity	Clearly indicates that an assessment of adaptive capacity was undertaken. Adaptive capacity is the community's current and future ability to address projected impacts (CA APG 2012).	-	0
Adaptive capacity detailed	Provides a detailed description of adaptive capacity, including a clear description of what factors were considered in assessing adaptive capacity.	-	0
Risk assessment	Clearly indicates that a risk assessment was undertaken as part of the planning process. A risk assessment includes an assessment of the likelihood and consequence of an event.	-	0
Water quality	Discusses impacts of changing climate conditions on the park's water quality.	-	0

Water quality detailed	Provides a detailed description of the vulnerability of water quality to changing climate conditions. Must include a map of areas at risk of low water quality or a detailed text description of at-risk areas that includes the location of specific vulnerable areas.	-	0
Natural systems	Discusses impacts of changing climate conditions on natural systems.	"More recent research was conducted for the California Energy Commission's Climate Change Research Program to assess the effects of climate change and sea level rise on California over the next 90 years. Using a set of climate change scenarios of medium to medium-high emissions, researchers projected that the mean sea level will rise 3.3 to 4.6 feet (1.0 to 1.4 meters) along California's coast by the year 2100 (Cayan et al. 2009; Heberger et al. 2009). This is the most commonly used sea level rise forecast in the park's planning area. " (vol2, p. 23) While active restoration efforts are reclaiming wetlands, some bays are accumulating too much sediment. Although sedimentation is a natural process, Tomales Bay, Drakes Bay, and Bolinas Lagoon appear to be experiencing higher than normal sedimentation rates. The evaluation of these complex tidal system dynamics and the possible impacts due to climate change will depend on accurate habitat mapping procedures. (vol2, p. 37)	1
Natural systems detailed	Provides a detailed description of the vulnerability of natural systems to changing climate conditions. Vulnerable natural	-	0

	systems must be mapped, or a detailed text description including the specific location of vulnerable natural systems must be provided.		
Cultural assets	Identifies cultural assets that will be impacted by changing climate conditions. Includes things such as archeologically significant sites, recreational opportunities, events such as sports tournaments, museums, public art, and other culturally relevant places.	Climate change has begun to affect both park resources and visitors. The effects are predicted to include changes in temperature, precipitation, evaporation rate, ocean and atmospheric chemistry, local weather patterns, and increases in storm intensities and sea levels. These effects will likely have direct implications for resource management and park operations and influence the way visitors experience the park. (vol1, p.32)	1
Cultural assets detailed	Provides a detailed description of cultural assets that are vulnerable to changing climate conditions. The location of vulnerable cultural assets must be mapped, or a detailed description of the cultural assets and their location must be provided.	-	0
Built environments / infrastructure	Identifies infrastructure that will be impacted by changing climate conditions.	-	0
Built environments / infrastructure detailed	Provides a detailed description of infrastructure vulnerable to changing climate conditions. Vulnerable locations are mapped, or a detailed description of the vulnerable built environments and their location is provided.	-	0
Public services	Identifies sensitive public services, including emergency services, that will be	-	0

	impacted by climate change.		
Public services detailed	Provides a detailed description of public services vulnerable to changing climate conditions. Vulnerable public services must be mapped, or a detailed description, including a list of vulnerable services, must be included.	-	0
Economic systems	Identifies economic impacts of changing climate conditions. This may be a general discussion of impacts to entire economic sectors such as agriculture, forestry, tourism, OR a more specific discussion of impacts such as reduced patronage during extreme heat, or business closure and damage during extreme events.	-	0
Economic systems detailed	Provides a detailed description of the economies vulnerable to changing climate conditions. Vulnerable economies must be mapped, or a detailed description, including a list of the vulnerable economic sectors, must be provided.	-	0
Prioritization of vulnerabilities or risks	Includes the results of a prioritization of identified vulnerabilities.	-	0
Prioritization of vulnerabilities or risks detailed	Prioritizes risks and clearly describes how risks were ranked.	-	0

Underlying Causes / Transformation	Mentions the need to address fundamental drivers of human vulnerability or "transformational" adaptation/change. "Fundamental drivers of vulnerability" refers to underlying causes of social vulnerability reinforced by existing institutions and social systems; "transformational" adaptation or change reassesses the way a system operates and may take the form of new rights claims and changes in political systems (PROVIA 2013). Transformational change affects how individuals and society make decisions and allocate resources to cope with climate change; it may alternatively include changes in institutional arrangements, priorities, and norms (Kates et al. 2012)	-	0
<b>UNCERTAINTY</b>			
Acknowledgement of uncertainties	The plan acknowledges uncertainties involved in projection of climate change or estimation of vulnerabilities.	-	0
Acknowledgement of uncertainty detailed	Describes sources of uncertainty.	-	0
Multiple scenarios	Mentions that different climate scenarios were considered.	-	0
Multiple scenarios detailed	Provides a detailed description of scenarios. Description must include how scenarios were developed and how scenarios differ in terms of assumptions and impacts.	-	0

Adaptive management	Mentions adaptive management. Adaptive management is the process of incorporating new information from monitoring and science into decision-making with an emphasis on learning.	-	0
Adaptive management detailed	Emphasizes adaptive management and learning throughout the plan and establishes a process for incorporating new information from monitoring and science into decision-making.	-	0
Multiple time frames	Includes both short-term (next 5 years) and long-term (5+ years) strategies.	-	0
Flexible strategies	Explicitly recognizes the need for flexible adaptation strategies.	-	0
Flexible strategies detailed	Includes flexible strategies and explicitly identifies strategies as being flexible.	-	0
Robust strategies	Discusses robust strategies as an option to address uncertainty. Robust strategies are those that produce positive outcomes across a range of different scenarios or future conditions.	-	0
Robust strategies detailed	Includes robust strategies. Robust strategies produce positive outcomes across a range of different scenarios or future conditions. Must identify the strategies as robust.	-	0



No- or low-regrets strategies	Discusses no- or low-regrets strategies as an option to address uncertainty. No-regrets strategies are those that can be justified under current climate conditions but also make even more sense with climate change (CCS 2011); these may also be called win-win strategies. Low-regret strategies are low-cost strategies with relatively large benefits, although those benefits are realized mainly under projected future climate change. Must explicitly discuss no- or low- regrets strategies.	-	0
No- or low-regrets strategies detailed	Includes no- or low-regret strategies. No-regrets strategies are those that can be justified under current climate conditions but also make even more sense with climate change (CCS 2011); these may also be called win-win strategies. Low-regret strategies are low-cost strategies with relatively large benefits, although those benefits are realized mainly under projected future climate change. Must explicitly identify strategies as no- or low-regrets.	-	0
<b>STRATEGY IDENTIFICATION</b>			
Prioritized actions	Prioritizes adaptation strategies.	-	0
Prioritized strategies detailed	Prioritizes adaptation strategies and describes how strategies were ranked.	-	0
Specific adaptation strategies	Includes strategies that are linked to specific impacts.	-	0

Capacity building	Includes capacity-building strategies. Capacity building is developing human resources, institutions, and communities, equipping them with the capability to adapt.	NPS staff would use and promote innovation, best practices, and partnerships to respond to the challenges of climate change and its effects on park resources. By using and developing tools and monitoring methods, including seeking outside assistance, the park staff can better respond to climate change. (vol1, p. 85 - 86)	1
Advocacy	Includes advocacy strategies. Advocacy includes encouraging regional and state agencies to have adaptation-appropriate strategies.	-	0
General strategies	Includes generic adaptation strategies, which are strategies not specific enough to be classified in another category.	National parks can demonstrate how to minimize their contribution to global warming through practices such as energy efficiency and use of renewable energy. (vol1, p. 85)	1
Information and awareness	Includes information and awareness strategies, which focus on increasing public knowledge.	The park staff will help park visitors understand the process of global warming, climate change, the threats to the park, and how they can respond. Visitors are inspired to action through leadership and education. (vol1, p. 85)	1
Research and monitoring	Includes research or monitoring strategies, which focus on gathering information and creating reports, maps, or models. Monitoring includes observation or repeated measurements over time.	The park staff will proactively monitor, plan, and adapt to the effects of climate change by using the best information as it becomes available. (vol1, p. 85)	1
Planning	Includes planning-related strategies, including strategies that incorporate understanding of climate science, impacts, vulnerability and risk into	In addition, the park maintains a Climate Change Action Plan that outlines the actions that would be taken to accomplish these broad goals. (vol1, p. 85)	1

	government and institutional planning processes, efforts, or existing initiatives.		
Practice and behavior	Includes strategies to change practice and behavior. Practice and behavior strategies revise or expand practices and on-the-ground behavior that affect resilience.	-	0
Policy and legislation	Includes policy and legislative strategies aimed at preparing for climate change.	-	0
Physical infrastructure	Includes physical infrastructure strategies to prepare for climate change.	-	0
Building codes and engineering design standards	Includes strategies to improve physical infrastructure's response to changing climate through improved standards or engineering.	-	0
Green infrastructure	Includes green infrastructure strategies aimed at providing protection from climate hazards.	-	0
Land use	Includes land use strategies focused on preparing for climate change.	-	0
Conservation	Includes conservation strategies to preserve biodiversity and protect open space under a changing climate.	Determine which species and habitats are most vulnerable to the effects of climate change (e.g., changes in temperature, increased storms, flooding and erosion, and ocean acidification) and evaluate the appropriateness of added protection for these resources. (voll, p. 86)	1
Financing	Includes financing or insurance strategies to prepare for future climate changes.	-	0
Technology	Includes technology strategies.	-	0

Cost	Estimates the cost of implementing specific adaptation actions.	-	0
Cost detailed	Identifies the cost of implementing each adaptation strategy.	-	0
Cost of inaction	States that taking action to adapt to climate change costs less than not acting.	-	0
Cost of inaction detailed	Provides specific dollar figures on the cost of inaction versus adaptation-related action.	-	0
Co-benefits	Identifies co-benefits associated with taking adaptation action.	-	0
<b>IMPLEMENTATION AND MONITORING</b>			
Timetable for implementation	Provides a timetable for when each action will be implemented.	-	0
Implementation responsibilities	Assigns responsibility for policies broadly to organizations or agencies.	-	0
Implementation responsibilities detailed	Assigns responsibility for the implementation of each strategy.	-	0
Funding (need for)	Describes the need for funding sources to implement the plan.	Summary of Cost Table (vol1, p. S-xx)	1
Potential funding sources detailed	Clearly describes potential funding sources and associates them with particular strategies.	-	0
Reporting requirements	Includes requirements for the regular reporting of implementation progress.	-	0
Monitoring responsibility	Mentions assignment of responsibility for monitoring.	-	0
Evaluation method	Establishes a process to evaluate the plan.	-	0
Evaluation method detailed	Describes when analyses of progress toward objectives will take place and how results will be used.	-	0
Evaluation metrics	Mentions how to measure progress	-	0

	towards implementing strategies.		
Evaluation metrics detailed	Mentions how to measure progress towards implementing each strategy identified in the plan.	-	0
Mainstreaming	Discusses mainstreaming climate change adaptation. Mainstreaming refers to the integration of climate adaptation into other sector policies or plans (Rauken et al. 2014).	-	0
Mainstreaming detailed	Identifies specific plans and programs as opportunities for mainstreaming. Mainstreaming refers to the integration of climate adaptation into other sector policies or plans (Rauken et al. 2014).	-	0
Plan updates	Mentions need for updates.	-	0
Plan updates detailed	Includes timetable for updating plan.	-	0
Barriers	Mentions barriers to climate adaptation.	-	0

5- Badlands National Park - South Unit, Final General Management Plan and Environmental Impact Statement Codebook

Criterion	Description	Code	Score
<b>ARTICULATION OF PURPOSE, GOALS, AND OBJECTIVES</b>			
Plan purpose	States the purpose of the plan.	The purpose of the GMP/EIS is to ensure that park managers and the public share the same vision of how best to achieve the park's purpose and protect its resources unimpaired for future generations. (p. 9)	1
Vision statement	Includes a vision statement, which establishes an overall image of a desired future (Berke et al. 2006).	-	0
Define resilience, adaptation, or preparedness	Defines resilience, adaptation or preparedness.	-	0
Goals	Includes goals, which are outcomes that the community aspires towards. Goals are usually expressed in adjectives and nouns (not verbs) and are not quantified (Berke et al. 2006). Goals reflect public values and express future desired conditions (Berke and Godschalk 2009).	The principles and strategies guide actions taken by park managers on such topics as natural and cultural resource, park facilities, and visitor use management. Each topic discussed below has two parts: desired conditions for that topic, and broad strategies that may be used to achieve those desired conditions. (p. 19)	1
Objectives	Includes objectives, which are tangible, measurable outcomes leading to the achievement of a goal (Berke et al. 2006).	The outcome of such negotiations will form the basis for determining which management option will ultimately work for the greater good for both entities while keeping in mind the goals and objectives (p. 45)	1
Objectives detailed	Includes quantifiable objectives for each goal (e.g., increase the use of alternative energy sources to 70% by 2030; there should be targets for each goal).	-	0

<b>PUBLIC PARTICIPATION</b>			
Planning process	Describes the process undertaken to create the plan.	Public meetings and two newsletters were used to keep the public informed and involved in the planning process for Big Thicket National Preserve. (p. 291)	1
Plan preparation involvement	Describes the stakeholders involved in plan preparation.	During initial scoping, the public had two primary avenues by which it participated during the development of the plan: participation in public scoping meetings and responses to newsletters. In each of these formats, the public was invited to comment on the concepts for management provided in newsletters and to share with the team any issues or concerns to be considered in the South Unit GMP/EIS. (p. 209)	1
Plan preparation involvement detailed	Includes detailed description of organizations and individuals involved in plan preparation. Description must include number of stakeholders and the general categories of stakeholders (e.g. residents, companies, non-profits, governmental agencies).	A month after the newsletter was released, 17 public open houses were held in Wall, Rapid City, Denver, and on the Pine Ridge Reservation. A total of 254 people attended those meetings, as shown in table 16. A total of 255 comments were recorded at the open houses and submitted by mail, email, and on the park and NPS websites. (p. 210)	1
Representative stakeholders	Mentions how stakeholders who were involved represent all the groups affected by proposed policies or how the planning process sought to engage disadvantaged populations. Disadvantaged populations are those that may not traditionally be included in the planning process and may be adversely affected by	-	0

	climate change, such as the poor, elderly, or those for whom English is a second language.		
Participation techniques	Mentions participation techniques used to create the plan, such as meetings, surveys, charettes, public comments on drafts, etc.	During initial scoping, the public had two primary avenues by which it participated during the development of the plan: participation in public scoping meetings and responses to newsletters. In each of these formats, the public was invited to comment on the concepts for management provided in newsletters and to share with the team any issues or concerns to be considered in the South Unit GMP/EIS. (p. 209)	1



Participation techniques detailed	Describes participation techniques with details about each method including number of participants, main topics covered, and activities used to elicit input.	<p>The preliminary management options were presented to the public during open houses in the spring of 2008. Approximately 10,000 scoping newsletters (Newsletter #1) were printed in English and Lakota and distributed to announce the beginning of the South Unit GMP process. In addition, a press release was distributed to approximately 30 media outlets.</p> <p>A month after the newsletter was released, 17 public open houses were held in Wall, Rapid City, Denver, and on the Pine Ridge Reservation. A total of 254 people attended those meetings, as shown in table 16. A total of 255 comments were recorded at the open houses and submitted by mail, email, and on the park and NPS websites. The comments from all sources were compiled and reviewed by the GMP planning team as it refined the preliminary management options, and developed the resource and visitor experience alternatives.</p> <p>The comments reflected a public that is passionate about the future of the South Unit's resources, uses, and management. Many of the commenters provided detailed recommendations on how areas in the park should be managed, which resources are most important to protect or preserve, and what they would like to see for the future of the South Unit. (p. 210)</p>	1
Public meetings	States that meetings were used to engage stakeholders and that these meetings were open to the public.	<p>A month after the newsletter was released, 17 public open houses were held in Wall, Rapid City, Denver, and on the Pine Ridge Reservation. A total of 254 people attended those meetings, as shown in table 16. A total of 255 comments were recorded at the open houses and submitted by mail, email, and on the park and NPS websites. (p. 210)</p>	1
Planning or steering committee	States that a steering committee or advisory committee was used to guide plan creation.	-	0

Public participation maintenance	Discusses how public engagement will continue in plan maintenance/evaluation.	-	0
<b>COORDINATION</b>			
Local university	States that local universities were engaged in the planning process.	-	0
Federal agencies	States that federal agencies were engaged in the planning process.	Three formal meetings were held in Omaha between OST representatives (including Tribal president) and NPS Midwest Regional Office reps (including Regional Director). Four formal briefings were held in Washington, D.C., with leadership from the NPS and the Department of the Interior. One briefing was held with the Coalition of NPS Retirees. (p. 209)	1
State agencies	States that state agencies were engaged in the planning process.	Three formal meetings were held in Omaha between OST representatives (including Tribal president) and NPS Midwest Regional Office reps (including Regional Director). Four formal briefings were held in Washington, D.C., with leadership from the NPS and the Department of the Interior. One briefing was held with the Coalition of NPS Retirees. (p. 209)	1
Nonprofits	States that nonprofits were engaged in the planning process.	-	0
Businesses	States that businesses were engaged in the planning process.	-	0
Neighboring jurisdictions	States that neighboring jurisdictions were given the opportunity to participate in the planning process. Neighboring jurisdictions include regional planning organizations and	-	0

	counties as well as other cities, towns, or villages.		
Elected official engagement	Mentions involvement of elected official(s) in the planning process.	-	0
<b>FACT BASE</b>			
Data collection	Provides information about the type of data collected and analyzed in order to make the plan.	The total population of the Alabama-Coushatta Tribe of Texas Reservation was estimated at 832 in 2009, per the U.S. Census Bureau. (p. 187)	1
National studies	States that national studies were used to inform the plan. Studies may include climate, demographics, economic projections, etc.	Population numbers for each study area county for the years 1969 through 2008 were retrieved from the U.S. Department of Commerce, Bureau of Economic Analysis (BEA). As shown in figure 3, Pennington County has grown at a rate considerably faster than either Jackson or Shannon Counties. Over the approximate forty- year period, Jackson County experienced a decrease of slightly less than 10.0 percent while Pennington and Shannon Counties experienced population growth of 64 percent and 68 percent, respectively. (p. 114)	1
Regional studies	States that regional studies were used to inform the plan. Studies may include climate, demographics, economic projections, etc.	The BIA issues a report every few years on population, employment, and poverty levels for tribal populations across the country. The most recent report, entitled the 2005 American Indian Population and Labor Force Report, identifies approximately 43,146 individuals as part of the OST, an increase of approximately 9 percent from 1997. (p. 114)	1
International studies	States that international studies were used to inform the plan. Studies may include climate, demographics,	-	0

	economic projections, etc.		
Local knowledge	States that local, indigenous, or traditional knowledge was used to inform the plan.	-	0
Existing impacts	Identifies ways that climate change or changing weather conditions are already affecting the community.	-	0
Existing conditions	Discusses existing social, economic, environmental, or built infrastructure conditions that could lead to enhanced vulnerability in the future.	-	0
Existing actions	Identifies actions and plans that are in progress or planned that have adaptation value. Actions do not need to be specifically designed to address climate change.	-	0
Historic changes weather/climate	Discusses how climate or weather trends in the area have changed to date.	-	0
Primary economic base(s)	Identifies the major economic sectors associated with the park.	-	0

Primary cultural base(s)	Identifies the main cultural assets of the park.	Currently, there are 27 known and recorded archeological sites in the South Unit. Fourteen of the known sites are prehistoric artifact scatters; eleven of the sites are hearth or fire pit features that have been exposed in erosional surfaces, such as gullies or mesa edges. There is also one circular feature and one historic foundation. Four of these sites have been dated, and range from 1390 to 2280 years old. Sites in the South Unit could be as old as 10,000 years. There are additional known archeological locations, which are unrecorded. (p. 107)	1
Primary natural system(s)	Identifies the major natural systems that are part of the park.	Badlands National Park is at the western edge of what was once the mixed-grass prairie ecosystem. The mixed-grass prairie of the central United States was a transition zone between the arid short-grass prairie to the west and the moist tall-grass prairie to the east. In conjunction with the adjacent Buffalo Gap National Grassland today the park supports one of the largest contiguous native mixed-grass prairies under federal protection in the United States, and it is part of one of the largest remaining mixed-grass prairies in North America (NPS 2007c). (p. 96)	1
Presidentially declared disaster	Indicates that the community has experienced a presidentially declared disaster.	-	0
Previous hazardous events	Includes information on previous occurrences of hazardous events.	-	0
Repetitive loss properties	Discusses areas or specific properties that have been repetitively damaged by hazardous events.	-	0

Projected changes	Identifies climate change exposure, which is the climate change effects a community expects to feel, e.g., warmer temperature, increased precipitation, rising sea level (CA APG 2012).	-	0
Prioritized exposure	Prioritizes climate change effects or hazards.	-	0
Non-climatic drivers	Mentions other factors that may impact future vulnerability or resilience. Non-climatic factors include a shifting economy, growing or depleting population, or changing land use patterns.	-	0
Non-climatic drivers detailed	Explicitly discusses projections for non-climatic factors over time and how this could affect vulnerability or resilience. Non-climatic factors include a shifting economy, growing or depleting population, or changing land use patterns.	-	0
Vulnerability assessment	Clearly indicates that a vulnerability assessment was undertaken as part of the planning process. A vulnerability assessment includes an analysis of exposure, sensitivity, and adaptive capacity.	-	0
Adaptive capacity	Clearly indicates that an assessment of adaptive capacity was undertaken. Adaptive capacity is the community's current and future ability to address projected impacts (CA APG 2012).	-	0

Adaptive capacity detailed	Provides a detailed description of adaptive capacity, including a clear description of what factors were considered in assessing adaptive capacity.	-	0
Risk assessment	Clearly indicates that a risk assessment was undertaken as part of the planning process. A risk assessment includes an assessment of the likelihood and consequence of an event.	-	0
Water quality	Discusses impacts of changing climate conditions on the park's water quality.	-	0
Water quality detailed	Provides a detailed description of the vulnerability of water quality to changing climate conditions. Must include a map of areas at risk of low water quality or a detailed text description of at-risk areas that includes the location of specific vulnerable areas.	-	0
Natural systems	Discusses impacts of changing climate conditions on natural systems.	-	0
Natural systems detailed	Provides a detailed description of the vulnerability of natural systems to changing climate conditions. Vulnerable natural systems must be mapped, or a detailed text description including the specific location of vulnerable natural systems must be provided.	-	0

Cultural assets	Identifies cultural assets that will be impacted by changing climate conditions. Includes things such as archeologically significant sites, recreational opportunities, events such as sports tournaments, museums, public art, and other culturally relevant places.	-	0
Cultural assets detailed	Provides a detailed description of cultural assets that are vulnerable to changing climate conditions. The location of vulnerable cultural assets must be mapped, or a detailed description of the cultural assets and their location must be provided.	-	0
Built environments / infrastructure	Identifies infrastructure that will be impacted by changing climate conditions.	-	0
Built environments / infrastructure detailed	Provides a detailed description of infrastructure vulnerable to changing climate conditions. Vulnerable locations are mapped, or a detailed description of the vulnerable built environments and their location is provided.	-	0
Public services	Identifies sensitive public services, including emergency services, that will be impacted by climate change.	-	0
Public services detailed	Provides a detailed description of public services vulnerable to changing climate conditions. Vulnerable public services must be mapped, or a detailed	-	0



	description, including a list of vulnerable services, must be included.		
Economic systems	Identifies economic impacts of changing climate conditions. This may be a general discussion of impacts to entire economic sectors such as agriculture, forestry, tourism, OR a more specific discussion of impacts such as reduced patronage during extreme heat, or business closure and damage during extreme events.	-	0
Economic systems detailed	Provides a detailed description of the economies vulnerable to changing climate conditions. Vulnerable economies must be mapped, or a detailed description, including a list of the vulnerable economic sectors, must be provided.	-	0
Prioritization of vulnerabilities or risks	Includes the results of a prioritization of identified vulnerabilities.	-	0
Prioritization of vulnerabilities or risks detailed	Prioritizes risks and clearly describes how risks were ranked.	-	0
Underlying Causes / Transformation	Mentions the need to address fundamental drivers of human vulnerability or "transformational" adaptation/change. "Fundamental drivers of vulnerability" refers to underlying causes of social vulnerability reinforced by existing institutions and social systems; "transformational" adaptation or change reassesses the way a	-	0

	system operates and may take the form of new rights claims and changes in political systems (PROVIA 2013). Transformational change affects how individuals and society make decisions and allocate resources to cope with climate change; it may alternatively include changes in institutional arrangements, priorities, and norms (Kates et al. 2012)		
<b>UNCERTAINTY</b>			
Acknowledgement of uncertainties	The plan acknowledges uncertainties involved in projection of climate change or estimation of vulnerabilities.	-	0
Acknowledgement of uncertainty detailed	Describes sources of uncertainty.	-	0
Multiple scenarios	Mentions that different climate scenarios were considered.	-	0
Multiple scenarios detailed	Provides a detailed description of scenarios. Description must include how scenarios were developed and how scenarios differ in terms of assumptions and impacts.	-	0
Adaptive management	Mentions adaptive management. Adaptive management is the process of incorporating new information from monitoring and science into decision-making with an emphasis on learning.	-	0
Adaptive management detailed	Emphasizes adaptive management and learning throughout the plan and establishes a process for incorporating new information from monitoring and science into decision-making.	-	0

Multiple time frames	Includes both short-term (next 5 years) and long-term (5+ years) strategies.	-	0
Flexible strategies	Explicitly recognizes the need for flexible adaptation strategies.	-	0
Flexible strategies detailed	Includes flexible strategies and explicitly identifies strategies as being flexible.	-	0
Robust strategies	Discusses robust strategies as an option to address uncertainty. Robust strategies are those that produce positive outcomes across a range of different scenarios or future conditions.	-	0
Robust strategies detailed	Includes robust strategies. Robust strategies produce positive outcomes across a range of different scenarios or future conditions. Must identify the strategies as robust.	-	0
No- or low-regrets strategies	Discusses no- or low-regrets strategies as an option to address uncertainty. No-regrets strategies are those that can be justified under current climate conditions but also make even more sense with climate change (CCS 2011); these may also be called win-win strategies. Low-regret strategies are low-cost strategies with relatively large benefits, although those benefits are realized mainly under projected future climate change. Must explicitly discuss no- or low- regrets strategies.	-	0

No- or low-regrets strategies detailed	Includes no- or low-regret strategies. No-regrets strategies are those that can be justified under current climate conditions but also make even more sense with climate change (CCS 2011); these may also be called win-win strategies. Low-regret strategies are low-cost strategies with relatively large benefits, although those benefits are realized mainly under projected future climate change. Must explicitly identify strategies as no- or low-regrets.	-	0
<b>STRATEGY IDENTIFICATION</b>			
Prioritized actions	Prioritizes adaptation strategies.	-	0
Prioritized strategies detailed	Prioritizes adaptation strategies and describes how strategies were ranked.	-	0
Specific adaptation strategies	Includes strategies that are linked to specific impacts.	-	0
Capacity building	Includes capacity-building strategies. Capacity building is developing human resources, institutions, and communities, equipping them with the capability to adapt.	-	0
Advocacy	Includes advocacy strategies. Advocacy includes encouraging regional and state agencies to have adaptation-appropriate strategies.	-	0
General strategies	Includes generic adaptation strategies, which are strategies not specific enough to be classified in another category.	-	0

Information and awareness	Includes information and awareness strategies, which focus on increasing public knowledge.	-	0
Research and monitoring	Includes research or monitoring strategies, which focus on gathering information and creating reports, maps, or models. Monitoring includes observation or repeated measurements over time.	-	0
Planning	Includes planning-related strategies, including strategies that incorporate understanding of climate science, impacts, vulnerability and risk into government and institutional planning processes, efforts, or existing initiatives.	-	0
Practice and behavior	Includes strategies to change practice and behavior. Practice and behavior strategies revise or expand practices and on-the-ground behavior that affect resilience.	-	0
Policy and legislation	Includes policy and legislative strategies aimed at preparing for climate change.	-	0
Physical infrastructure	Includes physical infrastructure strategies to prepare for climate change.	-	0
Building codes and engineering design standards	Includes strategies to improve physical infrastructure's response to changing climate through improved standards or engineering.	-	0
Green infrastructure	Includes green infrastructure strategies aimed at providing	-	0

	protection from climate hazards.		
Land use	Includes land use strategies focused on preparing for climate change.	-	0
Conservation	Includes conservation strategies to preserve biodiversity and protect open space under a changing climate.	-	0
Financing	Includes financing or insurance strategies to prepare for future climate changes.	-	0
Technology	Includes technology strategies.	-	0
Cost	Estimates the cost of implementing specific adaptation actions.	-	0
Cost detailed	Identifies the cost of implementing each adaptation strategy.	-	0
Cost of inaction	States that taking action to adapt to climate change costs less than not acting.	-	0
Cost of inaction detailed	Provides specific dollar figures on the cost of inaction versus adaptation-related action.	-	0
Co-benefits	Identifies co-benefits associated with taking adaptation action.	-	0
<b>IMPLEMENTATION AND MONITORING</b>			
Timetable for implementation	Provides a timetable for when each action will be implemented.	-	0
Implementation responsibilities	Assigns responsibility for policies broadly to organizations or agencies.	-	0
Implementation responsibilities detailed	Assigns responsibility for the implementation of each strategy.	-	0
Funding (need for)	Describes the need for funding sources to implement the plan.	Summary of Cost Table (p. 255)	1
Potential funding sources detailed	Clearly describes potential funding sources and associates	-	0

	them with particular strategies.		
Reporting requirements	Includes requirements for the regular reporting of implementation progress.	-	0
Monitoring responsibility	Mentions assignment of responsibility for monitoring.	-	0
Evaluation method	Establishes a process to evaluate the plan.	-	0
Evaluation method detailed	Describes when analyses of progress toward objectives will take place and how results will be used.	-	0
Evaluation metrics	Mentions how to measure progress towards implementing strategies.	-	0
Evaluation metrics detailed	Mentions how to measure progress towards implementing each strategy identified in the plan.	-	0
Mainstreaming	Discusses mainstreaming climate change adaptation. Mainstreaming refers to the integration of climate adaptation into other sector policies or plans (Rauken et al. 2014).	-	0
Mainstreaming detailed	Identifies specific plans and programs as opportunities for mainstreaming. Mainstreaming refers to the integration of climate adaptation into other sector policies or plans (Rauken et al. 2014).	-	0
Plan updates	Mentions need for updates.	-	0
Plan updates detailed	Includes timetable for updating plan.	-	0
Barriers	Mentions barriers to climate adaptation.	-	0

6- Big Thicket National Preserve Final General Management Plan / Environmental Impact Statement Codebook

Criterion	Description	Code	Score
<b>ARTICULATION OF PURPOSE, GOALS, AND OBJECTIVES</b>			
Plan purpose	States the purpose of the plan.	The purpose of a general management plan is to articulate a management philosophy and establish a framework for long-term decision making. A general management plan is a programmatic document and is expected to provide management guidance for 15–20 years. (p. 3)	1
Vision statement	Includes a vision statement, which establishes an overall image of a desired future (Berke et al. 2006).	-	0
Define resilience, adaptation, or preparedness	Defines resilience, adaptation or preparedness.	-	0
Goals	Includes goals, which are outcomes that the community aspires towards. Goals are usually expressed in adjectives and nouns (not verbs) and are not quantified (Berke et al. 2006). Goals reflect public values and express future desired conditions (Berke and Godschalk 2009).	As in alternative 1, the National Park Service would continue to adaptively manage resources by using the best available scientific information; conducting research on susceptible species as resources allow; and working to meet agency goals for sustainability, energy conservation, and greenhouse gas emissions. (p. 75)	1



Objectives	Includes objectives, which are tangible, measurable outcomes leading to the achievement of a goal (Berke et al. 2006).	The preserve staff would continue to protect and preserve significant cultural resources consistent with law and policy. Appropriate visitor opportunities would be expanded. As a means to achieve these objectives, the preserve staff would expand existing partnerships and seek new partnership agreements with outside public and private organizations having similar overall objectives for resource protection, law enforcement, public education, interpretation, and other operational requirements. (p. 75)	1
Objectives detailed	Includes quantifiable objectives for each goal (e.g., increase the use of alternative energy sources to 70% by 2030; there should be targets for each goal).	-	0
<b>PUBLIC PARTICIPATION</b>			
Planning process	Describes the process undertaken to create the plan.	"Congress has also specifically directed the National Park Service, as part of the planning process" (p. 9)	1
Plan preparation involvement	Describes the stakeholders involved in plan preparation.	Public meetings and two newsletters were used to keep the public informed and involved in the planning process for Big Thicket National Preserve. A mailing list was compiled that consisted of members of government agencies, nongovernment groups, businesses, legislators, local governments, and interested citizens. (p. 291)	1

Plan preparation involvement detailed	Includes detailed description of organizations and individuals involved in plan preparation. Description must include number of stakeholders and the general categories of stakeholders (e.g. residents, companies, non-profits, governmental agencies).	Several people responded to scoping for this management plan. The first newsletter (June 2009) received 384 comments in 32 correspondences and the second newsletter (October2010) received 214 comments in 42 correspondences. In July 2009, four open houses were held so the public could learn more about the general management planning process. (p. 291)	1
Representative stakeholders	Mentions how stakeholders who were involved represent all the groups affected by proposed policies or how the planning process sought to engage disadvantaged populations. Disadvantaged populations are those that may not traditionally be included in the planning process and may be adversely affected by climate change, such as the poor, elderly, or those for whom English is a second language.	-	0
Participation techniques	Mentions participation techniques used to create the plan, such as meetings, surveys, charettes, public comments on drafts, etc.	The public had three primary avenues through which to participate during the development of the general management plan. These included participating in public meetings, responding to newsletters, and submitting comments on the NPS planning website. (p. 291)	1

Participation techniques detailed	Describes participation techniques with details about each method including number of participants, main topics covered, and activities used to elicit input.	<p>Several people responded to scoping for this management plan. The first newsletter (June 2009) received 384 comments in 32 correspondences and the second newsletter (October 2010) received 214 comments in 42 correspondences. In July 2009, four open houses were held so the public could learn more about the general management planning process. These open houses were held at Wheat Elementary School in Woodville, Texas; the Silsbee Community Center in Silsbee, Texas; the Rogers Park Community Center in Beaumont, Texas; and the Forest Building in Houston, Texas. In November 2010, four open houses were held so the public could learn about the draft alternatives. These open houses were held at the Silsbee Community Center in Silsbee, Texas; the Community Resource Center in Houston, Texas; Wheat Elementary School in Woodville, Texas; and the Rogers Park Community Center in Beaumont, Texas. In total, 124 people attended these meetings.</p> <p>A general management plan alternatives workshop was held at the preserve headquarters in November 2010. A total of 15 National Park Service employees from the preserve, Denver Service Center, and peer reviewers from Lyndon B. Johnson National Historical Park and Lake Meredith National Recreation Area and Alibates Flint Quarries National Monument attended. (p. 291)</p>	1
Public meetings	States that meetings were used to engage stakeholders and that these meetings were open to the public.	<p>These open houses were held at the Silsbee Community Center in Silsbee, Texas; the Community Resource Center in Houston, Texas; Wheat Elementary School in Woodville, Texas; and the Rogers Park Community Center in Beaumont, Texas. In total, 124 people attended these meetings. (p. 291)</p>	1
Planning or steering committee	States that a steering committee or advisory committee was used to guide plan creation.	-	0
Public participation maintenance	Discusses how public engagement will	-	0

	continue in plan maintenance/evaluation.		
<b>COORDINATION</b>			
Local university	States that local universities were engaged in the planning process.	-	0
Federal agencies	States that federal agencies were engaged in the planning process.	In developing the Final General Management Plan / Environmental Impact Statement, the National Park Service considered public and agency comments on the draft plan and environmental impact statement, plus internal NPS comments, guidance, and direction. This general management plan addresses substantive comments as necessary and presents a response to those comments in appendix G. (p. 292)	1
State agencies	States that state agencies were engaged in the planning process.	In developing the Final General Management Plan / Environmental Impact Statement, the National Park Service considered public and agency comments on the draft plan and environmental impact statement, plus internal NPS comments, guidance, and direction. This general management plan addresses substantive comments as necessary and presents a response to those comments in appendix G. (p. 292)	1
Nonprofits	States that nonprofits were engaged in the planning process.	Public meetings and two newsletters were used to keep the public informed and involved in the planning process for Big Thicket National Preserve. A mailing list was compiled that consisted of members of government agencies, nongovernment groups, businesses, legislators, local governments, and interested citizens (p. 292)	1

Businesses	States that businesses were engaged in the planning process.	Public meetings and two newsletters were used to keep the public informed and involved in the planning process for Big Thicket National Preserve. A mailing list was compiled that consisted of members of government agencies, nongovernment groups, businesses, legislators, local governments, and interested citizens (p. 292)	1
Neighboring jurisdictions	States that neighboring jurisdictions were given the opportunity to participate in the planning process. Neighboring jurisdictions include regional planning organizations and counties as well as other cities, towns, or villages.	-	0
Elected official engagement	Mentions involvement of elected official(s) in the planning process.	-	0
<b>FACT BASE</b>			
Data collection	Provides information about the type of data collected and analyzed in order to make the plan.	A relatively large amount of water quality data exists for the major drainages in the preserve. These data are essentially of two types: (1) studies that were either very limited geographically or temporally, or (2) more comprehensive monitoring programs where the period of data collection spanned months or years, and included numerous stations. Separate monitoring programs have been undertaken by both the U.S. Geological Survey and the National Park Service. (p. 151)	1

National studies	States that national studies were used to inform the plan. Studies may include climate, demographics, economic projections, etc.	The U.S. Census Bureau reports that the population of the seven counties in the region in 2000 was 552,852. In 2007, the population was estimated by the American Communities Survey to have dropped by approximately 2,122 to 550,730—a decrease of 0.4% (U.S. Census 2000, 2007) (p. 184)	1
Regional studies	States that regional studies were used to inform the plan. Studies may include climate, demographics, economic projections, etc.	The 2008 Money Generation Model (MGM) estimates that the 93,634 visitors to Big Thicket National Preserve generated \$6,485,000 in spending, of which \$6,162,000 was nonlocal spending. The nonlocal spending is estimated to have generated 124 jobs in the area with \$2,461,000 in labor income (Stynes 2009). (p. 189)	1
International studies	States that international studies were used to inform the plan. Studies may include climate, demographics, economic projections, etc.	-	0
Local knowledge	States that local, indigenous, or traditional knowledge was used to inform the plan.	-	0
Existing impacts	Identifies ways that climate change or changing weather conditions are already affecting the community.	-	0
Existing conditions	Discusses existing social, economic, environmental, or built infrastructure conditions that could lead to enhanced vulnerability in the future.	-	0
Existing actions	Identifies actions and plans that are in progress or planned that	-	0

	have adaptation value. Actions do not need to be specifically designed to address climate change.		
Historic changes weather/climate	Discusses how climate or weather trends in the area have changed to date.	-	0
Primary economic base(s)	Identifies the major economic sectors associated with the park.	The 2008 Money Generation Model (MGM) estimates that the 93,634 visitors to Big Thicket National Preserve generated \$6,485,000 in spending, of which \$6,162,000 was nonlocal spending. The nonlocal spending is estimated to have generated 124 jobs in the area with \$2,461,000 in labor income (Stynes 2009). (p. 189)	1
Primary cultural base(s)	Identifies the main cultural assets of the park.	In the late 1970s, historians of Texas A&M University surveyed the preserve and identified approximately 150 structures. (p. 172)	1
Primary natural system(s)	Identifies the major natural systems that are part of the park.	The preserve is on the western edge of the humid subtropical climatic region. This region is characterized by long, warm to hot humid summers and fairly short, mild winters. Onshore winds from the Gulf of Mexico provide maritime influence during the spring, summer, and fall. Arctic, Rocky Mountain, and Pacific storms occur frequently in the winter months and result in depressed temperatures; however, warming periods usually occur between fronts. Subzero temperatures are rare with typically less than a dozen freezing nights per year. (p. 146)	1
Presidentially declared disaster	Indicates that the community has experienced a presidentially declared disaster.	-	0

Previous hazardous events	Includes information on previous occurrences of hazardous events.	-	0
Repetitive loss properties	Discusses areas or specific properties that have been repetitively damaged by hazardous events.	-	0
Projected changes	Identifies climate change exposure, which is the climate change effects a community expects to feel, e.g., warmer temperature, increased precipitation, rising sea level (CA APG 2012).	-	0
Prioritized exposure	Prioritizes climate change effects or hazards.	-	0
Non-climatic drivers	Mentions other factors that may impact future vulnerability or resilience. Non-climatic factors include a shifting economy, growing or depleting population, or changing land use patterns.	-	0
Non-climatic drivers detailed	Explicitly discusses projections for non-climatic factors over time and how this could affect vulnerability or resilience. Non-climatic factors include a shifting economy, growing or depleting population, or changing land use patterns.	-	0
Vulnerability assessment	Clearly indicates that a vulnerability assessment was undertaken as part of the planning process. A vulnerability assessment includes an analysis of exposure, sensitivity, and adaptive capacity.	-	0
Adaptive capacity	Clearly indicates that an assessment of adaptive capacity was undertaken. Adaptive	-	0



	capacity is the community's current and future ability to address projected impacts (CA APG 2012).		
Adaptive capacity detailed	Provides a detailed description of adaptive capacity, including a clear description of what factors were considered in assessing adaptive capacity.	-	0
Risk assessment	Clearly indicates that a risk assessment was undertaken as part of the planning process. A risk assessment includes an assessment of the likelihood and consequence of an event.	-	0
Water quality	Discusses impacts of changing climate conditions on the park's water quality.	-	0
Water quality detailed	Provides a detailed description of the vulnerability of water quality to changing climate conditions. Must include a map of areas at risk of low water quality or a detailed text description of at-risk areas that includes the location of specific vulnerable areas.	-	0

Natural systems	Discusses impacts of changing climate conditions on natural systems.	Some of these changes are already occurring. Many effects of climate change are being experienced globally, but there are also regionally and locally specific impacts. Big Thicket National Preserve is an uncommon unit of the national park system in that it is influenced by regional climatic impacts typical of both the Gulf Coast region and the eastern woodlands and forests. In southeast Texas, it is possible that there would be hotter summer temperatures, fewer winter freezes, warmer water temperatures, fewer and more intense rainfall events, earlier and increased annual runoff, rises in sea level, and stronger tropical storms and storm surges (NPS 2010c). Specific impacts on Big Thicket National Preserve could include saltwater intrusion into freshwater environments, advancing shorelines interfering with preserve ecosystems, and changes in the composition of flora and fauna. These dynamic changes are expected to have effects on the natural resources and visitor use patterns in the preserve. (p. 146)	1
Natural systems detailed	Provides a detailed description of the vulnerability of natural systems to changing climate conditions. Vulnerable natural systems must be mapped, or a detailed text description including the specific location of vulnerable natural systems must be provided.	-	0
Cultural assets	Identifies cultural assets that will be impacted by changing climate conditions. Includes things such as archeologically	-	0

	significant sites, recreational opportunities, events such as sports tournaments, museums, public art, and other culturally relevant places.		
Cultural assets detailed	Provides a detailed description of cultural assets that are vulnerable to changing climate conditions. The location of vulnerable cultural assets must be mapped, or a detailed description of the cultural assets and their location must be provided.	-	0
Built environments / infrastructure	Identifies infrastructure that will be impacted by changing climate conditions.	-	0
Built environments / infrastructure detailed	Provides a detailed description of infrastructure vulnerable to changing climate conditions. Vulnerable locations are mapped, or a detailed description of the vulnerable built environments and their location is provided.	-	0
Public services	Identifies sensitive public services, including emergency services, that will be impacted by climate change.	-	0
Public services detailed	Provides a detailed description of public services vulnerable to changing climate conditions. Vulnerable public services must be mapped, or a detailed description, including a list of vulnerable services, must be included.	-	0

Economic systems	Identifies economic impacts of changing climate conditions. This may be a general discussion of impacts to entire economic sectors such as agriculture, forestry, tourism, OR a more specific discussion of impacts such as reduced patronage during extreme heat, or business closure and damage during extreme events.	-	0
Economic systems detailed	Provides a detailed description of the economies vulnerable to changing climate conditions. Vulnerable economies must be mapped, or a detailed description, including a list of the vulnerable economic sectors, must be provided.	-	0
Prioritization of vulnerabilities or risks	Includes the results of a prioritization of identified vulnerabilities.	-	0
Prioritization of vulnerabilities or risks detailed	Prioritizes risks and clearly describes how risks were ranked.	-	0
Underlying Causes / Transformation	Mentions the need to address fundamental drivers of human vulnerability or "transformational" adaptation/change. "Fundamental drivers of vulnerability" refers to underlying causes of social vulnerability reinforced by existing institutions and social systems; "transformational" adaptation or change reassesses the way a system operates and may take the form of new rights claims and changes in political	-	0

	systems (PROVIA 2013). Transformational change affects how individuals and society make decisions and allocate resources to cope with climate change; it may alternatively include changes in institutional arrangements, priorities, and norms (Kates et al. 2012)		
<b>UNCERTAINTY</b>			
Acknowledgement of uncertainties	The plan acknowledges uncertainties involved in projection of climate change or estimation of vulnerabilities.	-	0
Acknowledgement of uncertainty detailed	Describes sources of uncertainty.	-	0
Multiple scenarios	Mentions that different climate scenarios were considered.	-	0
Multiple scenarios detailed	Provides a detailed description of scenarios. Description must include how scenarios were developed and how scenarios differ in terms of assumptions and impacts.	-	0
Adaptive management	Mentions adaptive management. Adaptive management is the process of incorporating new information from monitoring and science into decision-making with an emphasis on learning.	-	0
Adaptive management detailed	Emphasizes adaptive management and learning throughout the plan and establishes a process for incorporating new information from monitoring and science into decision-making.	-	0
Multiple time frames	Includes both short-term (next 5 years) and	-	0

	long-term (5+ years) strategies.		
Flexible strategies	Explicitly recognizes the need for flexible adaptation strategies.	-	0
Flexible strategies detailed	Includes flexible strategies and explicitly identifies strategies as being flexible.	-	0
Robust strategies	Discusses robust strategies as an option to address uncertainty. Robust strategies are those that produce positive outcomes across a range of different scenarios or future conditions.	-	0
Robust strategies detailed	Includes robust strategies. Robust strategies produce positive outcomes across a range of different scenarios or future conditions. Must identify the strategies as robust.	-	0
No- or low-regrets strategies	Discusses no- or low-regrets strategies as an option to address uncertainty. No-regrets strategies are those that can be justified under current climate conditions but also make even more sense with climate change (CCS 2011); these may also be called win-win strategies. Low-regret strategies are low-cost strategies with relatively large benefits, although those benefits are realized mainly under projected future climate change. Must explicitly discuss no- or low- regrets strategies.	-	0

No- or low-regrets strategies detailed	Includes no- or low-regret strategies. No-regrets strategies are those that can be justified under current climate conditions but also make even more sense with climate change (CCS 2011); these may also be called win-win strategies. Low-regret strategies are low-cost strategies with relatively large benefits, although those benefits are realized mainly under projected future climate change. Must explicitly identify strategies as no- or low-regrets.	-	0
<b>STRATEGY IDENTIFICATION</b>			
Prioritized actions	Prioritizes adaptation strategies.	-	0
Prioritized strategies detailed	Prioritizes adaptation strategies and describes how strategies were ranked.	-	0
Specific adaptation strategies	Includes strategies that are linked to specific impacts.	-	0
Capacity building	Includes capacity-building strategies. Capacity building is developing human resources, institutions, and communities, equipping them with the capability to adapt.	The staff would also partner with other agencies, universities, and organization to conduct regionwide scientific studies to address the resiliency of local habitats to climate change, in part by establishing baseline data and identifying at-risk species. (p. 76)	1
Advocacy	Includes advocacy strategies. Advocacy includes encouraging regional and state agencies to have adaptation-appropriate strategies.	-	0

General strategies	Includes generic adaptation strategies, which are strategies not specific enough to be classified in another category.	Under this alternative, further efforts would be undertaken to increase understanding of the effects of climate change on preserve resources and to enhance the resiliency of habitats to the effects of climate change. (p. 75)	1
Information and awareness	Includes information and awareness strategies, which focus on increasing public knowledge.	The preserve staff would also partner with local schools and communities to expand environmental education initiatives (i.e., climate change, energy conservation, watershed academies). (p. 81)	1
Research and monitoring	Includes research or monitoring strategies, which focus on gathering information and creating reports, maps, or models. Monitoring includes observation or repeated measurements over time.	-	0
Planning	Includes planning-related strategies, including strategies that incorporate understanding of climate science, impacts, vulnerability and risk into government and institutional planning processes, efforts, or existing initiatives.	The National Park Service would also pursue climate-friendly designation. Alternative energy sources would be used where possible for facilities and utility vehicles. (p. 82)	1
Practice and behavior	Includes strategies to change practice and behavior. Practice and behavior strategies revise or expand practices and on-the-ground behavior that affect resilience.	-	0
Policy and legislation	Includes policy and legislative strategies aimed at preparing for climate change.	-	0
Physical infrastructure	Includes physical infrastructure strategies to prepare for climate change.	-	



Building codes and engineering design standards	Includes strategies to improve physical infrastructure's response to changing climate through improved standards or engineering.	-	0
Green infrastructure	Includes green infrastructure strategies aimed at providing protection from climate hazards.	-	0
Land use	Includes land use strategies focused on preparing for climate change.	-	0
Conservation	Includes conservation strategies to preserve biodiversity and protect open space under a changing climate.	Preservation treatments would be carried out to protect historic properties from weathering, erosion, and other impacts including climate change, and to correct unsafe conditions. (p. 78)	1
Financing	Includes financing or insurance strategies to prepare for future climate changes.	-	0
Technology	Includes technology strategies.	-	0
Cost	Estimates the cost of implementing specific adaptation actions.	-	0
Cost detailed	Identifies the cost of implementing each adaptation strategy.	-	0
Cost of inaction	States that taking action to adapt to climate change costs less than not acting.	-	0
Cost of inaction detailed	Provides specific dollar figures on the cost of inaction versus adaptation-related action.	-	0
Co-benefits	Identifies co-benefits associated with taking adaptation action.	-	0
<b>IMPLEMENTATION AND MONITORING</b>			
Timetable for implementation	Provides a timetable for when each action will be implemented.	-	0
Implementation responsibilities	Assigns responsibility for policies broadly to	-	0

	organizations or agencies.		
Implementation responsibilities detailed	Assigns responsibility for the implementation of each strategy.	-	0
Funding (need for)	Describes the need for funding sources to implement the plan.	Summary of Cost Table (p. 87)	1
Potential funding sources detailed	Clearly describes potential funding sources and associates them with particular strategies.	-	0
Reporting requirements	Includes requirements for the regular reporting of implementation progress.	-	0
Monitoring responsibility	Mentions assignment of responsibility for monitoring.	-	0
Evaluation method	Establishes a process to evaluate the plan.	-	0
Evaluation method detailed	Describes when analyses of progress toward objectives will take place and how results will be used.	-	0
Evaluation metrics	Mentions how to measure progress towards implementing strategies.	-	0
Evaluation metrics detailed	Mentions how to measure progress towards implementing each strategy identified in the plan.	-	0
Mainstreaming	Discusses mainstreaming climate change adaptation. Mainstreaming refers to the integration of climate adaptation into other sector policies or plans (Rauken et al. 2014).	-	0
Mainstreaming detailed	Identifies specific plans and programs as opportunities for mainstreaming. Mainstreaming refers to the integration of climate adaptation into other sector policies or	-	0

	plans (Rauken et al. 2014).		
Plan updates	Mentions need for updates.	-	0
Plan updates detailed	Includes timetable for updating plan.	-	0
Barriers	Mentions barriers to climate adaptation.	-	0

7- Apostle Islands National Lakeshore General Management Plan / Wilderness Management Plan/Environmental Impact Statement Codebook

Criterion	Description	Code	Score
<b>ARTICULATION OF PURPOSE, GOALS, AND OBJECTIVES</b>			
Plan purpose	States the purpose of the plan.	The purpose of a general management plan is to ensure that a national park system unit (park unit) has a clearly defined direction for resource preservation and visitor use to best achieve the National Park Service's mandate to preserve resources unimpaired for the enjoyment of future generations. (p. 5)	1
Vision statement	Includes a vision statement, which establishes an overall image of a desired future (Berke et al. 2006).	-	0
Define resilience, adaptation, or preparedness	Defines resilience, adaptation or preparedness.	-	0

Goals	Includes goals, which are outcomes that the community aspires towards. Goals are usually expressed in adjectives and nouns (not verbs) and are not quantified (Berke et al. 2006). Goals reflect public values and express future desired conditions (Berke and Godschalk 2009).	"Apostle Islands National Lakeshore is a leader in its efforts to address climate change, reducing its greenhouse gas emissions, and increasing its use of renewable energy and other sustainable practices so it is a carbon neutral park. Education and interpretive efforts help park visitors understand the process of global warming, climate change, the threats to the park and the wider environment, and how they can respond. Park staff promote innovation, best practices, adaptive management, and partnerships to respond to the challenges of climate change and its effects on park resources. Park staff proactively monitor, plan, and adapt to the effects of climate change by using the best information as it becomes available." (p. 42)	1
Objectives	Includes objectives, which are tangible, measurable outcomes leading to the achievement of a goal (Berke et al. 2006).	Energy use will be substantially reduced, and more energy-efficient practices and renewable energy sources will be promoted wherever possible. Vehicles and boats will be converted to alternative fuels, such as hybrid electric, biodiesel, or propane, and the number or size of vehicles or boats will be reduced if possible. (p. 41)	1
Objectives detailed	Includes quantifiable objectives for each goal (e.g., increase the use of alternative energy sources to 70% by 2030; there should be targets for each goal).	-	0
<b>PUBLIC PARTICIPATION</b>			

Planning process	Describes the process undertaken to create the plan.	The planning process also ensures that this foundation for decision making has been developed in consultation with interested stakeholders and adopted by the NPS leadership after an adequate analysis of the benefits and adverse impacts and economic costs of alternative courses of action. (p. 6)	1
Plan preparation involvement	Describes the stakeholders involved in plan preparation.	Public meetings and newsletters were used to keep the public informed and involved in the planning process. A mailing list was compiled of members of governmental agencies, tribes, organizations, businesses, legislators, local governments, and interested citizens. Comments and suggestions offered by participants have provided NPS planners with important insights about what visitors, neighbors, officials, and others expect from the general management plan / wilderness management plan. (p. 331)	1
Plan preparation involvement detailed	Includes detailed description of organizations and individuals involved in plan preparation. Description must include number of stakeholders and the general categories of stakeholders (e.g. residents, companies, non-profits, governmental agencies).	The National Park Service issued two newsletters between 2004 and 2006 during preparation of the draft plan. Overall, members of the public predominantly valued the scenic beauty of the views from and around the islands. The total number of people who responded to these newsletters was 427. In addition, the total number of organizations responding was 20 including municipalities. (p. 331)	1

<p>Representative stakeholders</p>	<p>Mentions how stakeholders who were involved represent all the groups affected by proposed policies or how the planning process sought to engage disadvantaged populations. Disadvantaged populations are those that may not traditionally be included in the planning process and may be adversely affected by climate change, such as the poor, elderly, or those for whom English is a second language.</p>	<p>-</p>	<p>0</p>
<p>Participation techniques</p>	<p>Mentions participation techniques used to create the plan, such as meetings, surveys, charettes, public comments on drafts, etc.</p>	<p>Public meetings and newsletters were used to keep the public informed and involved in the planning process. A mailing list was compiled of members of governmental agencies, tribes, organizations, businesses, legislators, local governments, and interested citizens. Comments and suggestions offered by participants have provided NPS planners with important insights about what visitors, neighbors, officials, and others expect from the general management plan / wilderness management plan. (p. 331)</p>	<p>1</p>

<p>Participation techniques detailed</p>	<p>Describes participation techniques with details about each method including number of participants, main topics covered, and activities used to elicit input.</p>	<p>"Five public open houses with brief presentations were held during October 2004 in different locations: in the Wisconsin municipalities of Bayfield, Ashland, and Madison, and in St. Paul and Duluth, Minnesota. Eight similar meetings were held during August 2006 at the visitor center on Presque Isle on Stockton Island and in Red Cliff, Bayfield, Olanah, Ashland, and Madison, Wisconsin, as well as in Bloomington and Hermantown, Minnesota. About 40 people attended the first set of public meetings, and about 150 people attended the second set. The meetings in Red Cliff and Olanah are referred to in the section below on American Indian consultations because they represent communities, respectively, on the reservations of the Red Cliff Band and Bad River Band of Lake Superior Chippewa Indians." (p. 331)</p>	<p>1</p>
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Public meetings	States that meetings were used to engage stakeholders and that these meetings were open to the public.	"Five public open houses with brief presentations were held during October 2004 in different locations: in the Wisconsin municipalities of Bayfield, Ashland, and Madison, and in St. Paul and Duluth, Minnesota. Eight similar meetings were held during August 2006 at the visitor center on Presque Isle on Stockton Island and in Red Cliff, Bayfield, Odanah, Ashland, and Madison, Wisconsin, as well as in Bloomington and Hermantown, Minnesota. About 40 people attended the first set of public meetings, and about 150 people attended the second set. The meetings in Red Cliff and Odanah are referred to in the section below on American Indian consultations because they represent communities, respectively, on the reservations of the Red Cliff Band and Bad River Band of Lake Superior Chippewa Indians." (p. 331)	1
Planning or steering committee	States that a steering committee or advisory committee was used to guide plan creation.	-	0
Public participation maintenance	Discusses how public engagement will continue in plan maintenance/evaluation.	-	0
<b>COORDINATION</b>			
Local university	States that local universities were engaged in the planning process.	-	0

Federal agencies	States that federal agencies were engaged in the planning process.	Public meetings and newsletters were used to keep the public informed and involved in the planning process. A mailing list was compiled of members of governmental agencies, tribes, organizations, businesses, legislators, local governments, and interested citizens. (p. 331)	1
State agencies	States that state agencies were engaged in the planning process.	Public meetings and newsletters were used to keep the public informed and involved in the planning process. A mailing list was compiled of members of governmental agencies, tribes, organizations, businesses, legislators, local governments, and interested citizens. (p. 331)	1
Nonprofits	States that nonprofits were engaged in the planning process.	Public meetings and newsletters were used to keep the public informed and involved in the planning process. A mailing list was compiled of members of governmental agencies, tribes, organizations, businesses, legislators, local governments, and interested citizens. (p. 331)	1
Businesses	States that businesses were engaged in the planning process.	Public meetings and newsletters were used to keep the public informed and involved in the planning process. A mailing list was compiled of members of governmental agencies, tribes, organizations, businesses, legislators, local governments, and interested citizens. (p. 331)	1
Neighboring jurisdictions	States that neighboring jurisdictions were given the opportunity to participate in the planning process. Neighboring jurisdictions include	-	0

	regional planning organizations and counties as well as other cities, towns, or villages.		
Elected official engagement	Mentions involvement of elected official(s) in the planning process.	-	0
<b>FACT BASE</b>			
Data collection	Provides information about the type of data collected and analyzed in order to make the plan.	Visitor use data is the information regarding how many people visit the park, when they visit, how often they visit, where they travel from, how long they stay in the park, etc. (p. 200)	1
National studies	States that national studies were used to inform the plan. Studies may include climate, demographics, economic projections, etc.	Table 14 summarizes the population of Bayfield and Ashland counties from 1950 through 2006. The table indicates that during this period of more than 50 years, Bayfield County has had an increase in population over the last 25 years. Ashland County's population has been stable for the last 35 years. (p. 212)	1
Regional studies	States that regional studies were used to inform the plan. Studies may include climate, demographics, economic projections, etc.	Total visits to Apostle Island National Lakeshore were recorded as 182,396 in 2007. Of that total, 25,636 visits involved overnight stays. Visitor spending in the region was estimated at \$19.3 million, with \$15.3 million coming from nonlocal visitors.3 Nonlocal visitor spending is new money coming to the area, and results in more local income being generated and supports local jobs. Visitors supported an estimated 333 jobs and \$6.5 million in personal income. This is in addition to jobs and income associated with park operations and staff, which are discussed in the next section. (p. 213)	1

International studies	States that international studies were used to inform the plan. Studies may include climate, demographics, economic projections, etc.	-	0
Local knowledge	States that local, indigenous, or traditional knowledge was used to inform the plan.	-	0
Existing impacts	Identifies ways that climate change or changing weather conditions are already affecting the community.	-	0
Existing conditions	Discusses existing social, economic, environmental, or built infrastructure conditions that could lead to enhanced vulnerability in the future.	-	0
Existing actions	Identifies actions and plans that are in progress or planned that have adaptation value. Actions do not need to be specifically designed to address climate change.	-	0
Historic changes weather/climate	Discusses how climate or weather trends in the area have changed to date.	-	0

<p>Primary economic base(s)</p>	<p>Identifies the major economic sectors associated with the park.</p>	<p>Total visits to Apostle Island National Lakeshore were recorded as 182,396 in 2007. Of that total, 25,636 visits involved overnight stays. Visitor spending in the region was estimated at \$19.3 million, with \$15.3 million coming from nonlocal visitors.<sup>3</sup> Nonlocal visitor spending is new money coming to the area, and results in more local income being generated and supports local jobs. Visitors supported an estimated 333 jobs and \$6.5 million in personal income. This is in addition to jobs and income associated with park operations and staff, which are discussed in the next section. (p. 213)</p>	<p>1</p>
<p>Primary cultural base(s)</p>	<p>Identifies the main cultural assets of the park.</p>	<p>The following thematic summary of historic sites, structures, and cultural landscape features highlights the national lakeshore's diverse array of light stations and other historic properties associated primarily with tourism and recreation, commercial fishing, farming, quarrying, and logging. Seventeen of these properties are listed in the National Register of Historic Places, and 158 structures are listed in the national lakeshore's list of classified structures (LCS). (p. 187)</p>	<p>1</p>

Primary natural system(s)	Identifies the major natural systems that are part of the park.	Wetland types in the park include alder thickets, beaver flowages, bogs, lagoons, marshes, ridge/swale communities, and wet sedge meadows. These wetlands contain unique flora and fauna species and add a considerable amount of ecological diversity to the park. Wetlands dominated by thickets of speckled alder are frequent on the Apostle Islands and are found in association with a number of habitats. (p. 170)	1
Presidentially declared disaster	Indicates that the community has experienced a presidentially declared disaster.	-	0
Previous hazardous events	Includes information on previous occurrences of hazardous events.	-	0
Repetitive loss properties	Discusses areas or specific properties that have been repetitively damaged by hazardous events.	-	0
Projected changes	Identifies climate change exposure, which is the climate change effects a community expects to feel, e.g., warmer temperature, increased precipitation, rising sea level (CA APG 2012).	-	0
Prioritized exposure	Prioritizes climate change effects or hazards.	-	0
Non-climatic drivers	Mentions other factors that may impact future vulnerability or resilience. Non-climatic factors include a shifting economy, growing or depleting population, or changing land use patterns.	-	0

Non-climatic drivers detailed	Explicitly discusses projections for non-climatic factors over time and how this could affect vulnerability or resilience. Non-climatic factors include a shifting economy, growing or depleting population, or changing land use patterns.	-	0
Vulnerability assessment	Clearly indicates that a vulnerability assessment was undertaken as part of the planning process. A vulnerability assessment includes an analysis of exposure, sensitivity, and adaptive capacity.	-	0
Adaptive capacity	Clearly indicates that an assessment of adaptive capacity was undertaken. Adaptive capacity is the community's current and future ability to address projected impacts (CA APG 2012).	-	0
Adaptive capacity detailed	Provides a detailed description of adaptive capacity, including a clear description of what factors were considered in assessing adaptive capacity.	-	0
Risk assessment	Clearly indicates that a risk assessment was undertaken as part of the planning process. A risk assessment includes an assessment of the likelihood and consequence of an event.	-	0
Water quality	Discusses impacts of changing climate conditions on the park's water quality.	-	0

Water quality detailed	Provides a detailed description of the vulnerability of water quality to changing climate conditions. Must include a map of areas at risk of low water quality or a detailed text description of at-risk areas that includes the location of specific vulnerable areas.	-	0
Natural systems	Discusses impacts of changing climate conditions on natural systems.	As noted in the impact topics above, the spread of nonnative species and climate change have affected, and are likely to continue adversely affecting the park’s biological communities— including the wilderness area—resulting in a long-term, minor to moderate, adverse impact to wilderness character (i.e., apparent naturalness of the wilderness areas) (p. 240)	1
Natural systems detailed	Provides a detailed description of the vulnerability of natural systems to changing climate conditions. Vulnerable natural systems must be mapped, or a detailed text description including the specific location of vulnerable natural systems must be provided.	-	0
Cultural assets	Identifies cultural assets that will be impacted by changing climate conditions. Includes things such as archeologically significant sites, recreational opportunities, events such as sports tournaments, museums, public art, and other	-	0



	culturally relevant places.		
Cultural assets detailed	Provides a detailed description of cultural assets that are vulnerable to changing climate conditions. The location of vulnerable cultural assets must be mapped, or a detailed description of the cultural assets and their location must be provided.	-	0
Built environments / infrastructure	Identifies infrastructure that will be impacted by changing climate conditions.	-	0
Built environments / infrastructure detailed	Provides a detailed description of infrastructure vulnerable to changing climate conditions. Vulnerable locations are mapped, or a detailed description of the vulnerable built environments and their location is provided.	-	0
Public services	Identifies sensitive public services, including emergency services, that will be impacted by climate change.	-	0
Public services detailed	Provides a detailed description of public services vulnerable to changing climate conditions. Vulnerable public services must be mapped, or a detailed description, including a list of vulnerable services, must be included.	-	0

Economic systems	Identifies economic impacts of changing climate conditions. This may be a general discussion of impacts to entire economic sectors such as agriculture, forestry, tourism, OR a more specific discussion of impacts such as reduced patronage during extreme heat, or business closure and damage during extreme events.	-	0
Economic systems detailed	Provides a detailed description of the economies vulnerable to changing climate conditions. Vulnerable economies must be mapped, or a detailed description, including a list of the vulnerable economic sectors, must be provided.	-	0
Prioritization of vulnerabilities or risks	Includes the results of a prioritization of identified vulnerabilities.	-	0
Prioritization of vulnerabilities or risks detailed	Prioritizes risks and clearly describes how risks were ranked.	-	0
Underlying Causes / Transformation	Mentions the need to address fundamental drivers of human vulnerability or "transformational" adaptation/change. "Fundamental drivers of vulnerability" refers to underlying causes of social vulnerability reinforced by existing institutions and social systems; "transformational" adaptation or change reassesses the way a system operates and may take the form of new rights claims and changes in political	-	0

	systems (PROVIA 2013). Transformational change affects how individuals and society make decisions and allocate resources to cope with climate change; it may alternatively include changes in institutional arrangements, priorities, and norms (Kates et al. 2012)		
<b>UNCERTAINTY</b>			
Acknowledgement of uncertainties	The plan acknowledges uncertainties involved in projection of climate change or estimation of vulnerabilities.	-	0
Acknowledgement of uncertainty detailed	Describes sources of uncertainty.	-	0
Multiple scenarios	Mentions that different climate scenarios were considered.	-	0
Multiple scenarios detailed	Provides a detailed description of scenarios. Description must include how scenarios were developed and how scenarios differ in terms of assumptions and impacts.	-	0
Adaptive management	Mentions adaptive management. Adaptive management is the process of incorporating new information from monitoring and science into decision-making with an emphasis on learning.	-	0
Adaptive management detailed	Emphasizes adaptive management and learning throughout the plan and establishes a process for incorporating new information from monitoring and science into decision-making.	-	0
Multiple time frames	Includes both short-term (next 5 years) and	-	0

	long-term (5+ years) strategies.		
Flexible strategies	Explicitly recognizes the need for flexible adaptation strategies.	-	0
Flexible strategies detailed	Includes flexible strategies and explicitly identifies strategies as being flexible.	-	0
Robust strategies	Discusses robust strategies as an option to address uncertainty. Robust strategies are those that produce positive outcomes across a range of different scenarios or future conditions.	-	0
Robust strategies detailed	Includes robust strategies. Robust strategies produce positive outcomes across a range of different scenarios or future conditions. Must identify the strategies as robust.	-	0
No- or low-regrets strategies	Discusses no- or low-regrets strategies as an option to address uncertainty. No-regrets strategies are those that can be justified under current climate conditions but also make even more sense with climate change (CCS 2011); these may also be called win-win strategies. Low-regret strategies are low-cost strategies with relatively large benefits, although those benefits are realized mainly under projected future climate change. Must explicitly discuss no- or low- regrets strategies.	-	0

No- or low-regrets strategies detailed	Includes no- or low-regret strategies. No-regrets strategies are those that can be justified under current climate conditions but also make even more sense with climate change (CCS 2011); these may also be called win-win strategies. Low-regret strategies are low-cost strategies with relatively large benefits, although those benefits are realized mainly under projected future climate change. Must explicitly identify strategies as no- or low-regrets.	-	0
<b>STRATEGY IDENTIFICATION</b>			
Prioritized actions	Prioritizes adaptation strategies.	-	0
Prioritized strategies detailed	Prioritizes adaptation strategies and describes how strategies were ranked.	-	0
Specific adaptation strategies	Includes strategies that are linked to specific impacts.	-	0
Capacity building	Includes capacity-building strategies. Capacity building is developing human resources, institutions, and communities, equipping them with the capability to adapt.	Park education and interpretive efforts will engage park employees, partners, visitors, and the public on climate change, providing the latest park research and monitoring data and trends, informing the public about what responses are being taken at the park, and inspiring visitors to reduce their carbon footprint. (p. 43)	1
Advocacy	Includes advocacy strategies. Advocacy includes encouraging regional and state agencies to have adaptation-appropriate strategies.	-	0

General strategies	Includes generic adaptation strategies, which are strategies not specific enough to be classified in another category.	Scientific studies and inventories will be encouraged to identify and document changes caused by climate change, to predict potential changes, and to assist in identifying potential responses to climate change. (p. 42)	1
Information and awareness	Includes information and awareness strategies, which focus on increasing public knowledge.	Park education and interpretive efforts will engage park employees, partners, visitors, and the public on climate change, providing the latest park research and monitoring data and trends, informing the public about what responses are being taken at the park, and inspiring visitors to reduce their carbon footprint. (p. 43)	1
Research and monitoring	Includes research or monitoring strategies, which focus on gathering information and creating reports, maps, or models. Monitoring includes observation or repeated measurements over time.	Park staff proactively monitor, plan, and adapt to the effects of climate change by using the best information as it becomes available. (p. 42)	1
Planning	Includes planning-related strategies, including strategies that incorporate understanding of climate science, impacts, vulnerability and risk into government and institutional planning processes, efforts, or existing initiatives.	Apostle Islands National Lakeshore will continue as a member of the Climate Friendly Parks program, measuring park-based greenhouse emissions, developing sustainable strategies to mitigate these emissions and adapt to climate change impacts, educating the public about these efforts, and developing future action plans. (p. 42)	1
Practice and behavior	Includes strategies to change practice and behavior. Practice and behavior strategies revise or expand practices and on-the-ground behavior that affect resilience.	-	0

Policy and legislation	Includes policy and legislative strategies aimed at preparing for climate change.	-	0
Physical infrastructure	Includes physical infrastructure strategies to prepare for climate change.	-	0
Building codes and engineering design standards	Includes strategies to improve physical infrastructure's response to changing climate through improved standards or engineering.	-	0
Green infrastructure	Includes green infrastructure strategies aimed at providing protection from climate hazards.	-	0
Land use	Includes land use strategies focused on preparing for climate change.	-	0
Conservation	Includes conservation strategies to preserve biodiversity and protect open space under a changing climate.	Managers will monitor and assess predicted and actual impacts of climate change on the park and develop, where possible, feasible strategies to mitigate impacts. (p.24)	1
Financing	Includes financing or insurance strategies to prepare for future climate changes.	-	0
Technology	Includes technology strategies.	-	0
Cost	Estimates the cost of implementing specific adaptation actions.	-	0
Cost detailed	Identifies the cost of implementing each adaptation strategy.	-	0
Cost of inaction	States that taking action to adapt to climate change costs less than not acting.	-	0
Cost of inaction detailed	Provides specific dollar figures on the cost of inaction versus adaptation-related action.	-	0

Co-benefits	Identifies co-benefits associated with taking adaptation action.	-	0
<b>IMPLEMENTATION AND MONITORING</b>			
Timetable for implementation	Provides a timetable for when each action will be implemented.	-	0
Implementation responsibilities	Assigns responsibility for policies broadly to organizations or agencies.	-	0
Implementation responsibilities detailed	Assigns responsibility for the implementation of each strategy.	-	0
Funding (need for)	Describes the need for funding sources to implement the plan.	Summary of Cost Table (p. 139)	1
Potential funding sources detailed	Clearly describes potential funding sources and associates them with particular strategies.	-	0
Reporting requirements	Includes requirements for the regular reporting of implementation progress.	-	0
Monitoring responsibility	Mentions assignment of responsibility for monitoring.	-	0
Evaluation method	Establishes a process to evaluate the plan.	-	0
Evaluation method detailed	Describes when analyses of progress toward objectives will take place and how results will be used.	-	0
Evaluation metrics	Mentions how to measure progress towards implementing strategies.	-	0
Evaluation metrics detailed	Mentions how to measure progress towards implementing each strategy identified in the plan.	-	0
Mainstreaming	Discusses mainstreaming climate change adaptation. Mainstreaming refers to the integration of climate adaptation into other sector policies or	-	0



	plans (Rauken et al. 2014).		
Mainstreaming detailed	Identifies specific plans and programs as opportunities for mainstreaming. Mainstreaming refers to the integration of climate adaptation into other sector policies or plans (Rauken et al. 2014).	-	0
Plan updates	Mentions need for updates.	-	0
Plan updates detailed	Includes timetable for updating plan.	-	0
Barriers	Mentions barriers to climate adaptation.	-	0

8- Everglades General Management Plan / East Everglades Wilderness Study / Environmental Impact Statement Codebook

Criterion	Description	Code	Score
<b>ARTICULATION OF PURPOSE, GOALS, AND OBJECTIVES</b>			
Plan purpose	States the purpose of the plan.	The purposes of this general management plan are as follows: Confirm the purpose, significance, and special mandates of Everglades National Park; Clearly define resource conditions and visitor uses and experiences to be achieved in the national park; Provide a framework for park managers to use when making decisions about how to best protect resources, how to provide quality visitor opportunities, how to manage visitor use, and what kinds of facilities, if any, to develop in/near the national park; Ensure that this foundation for decision making has been developed in consultation with interested stakeholders and adopted by NPS leadership after an adequate analysis of the benefits, impacts, and economic costs of alternative courses of action. (vol1, p. 8)	1
Vision statement	Includes a vision statement, which establishes an overall image of a desired future (Berke et al. 2006).	-	0
Define resilience, adaptation, or preparedness	Defines resilience, adaptation or preparedness.	-	0

Goals	Includes goals, which are outcomes that the community aspires towards. Goals are usually expressed in adjectives and nouns (not verbs) and are not quantified (Berke et al. 2006). Goals reflect public values and express future desired conditions (Berke and Godschalk 2009).	Everglades National Park is a leader in efforts to address climate change by reducing the contribution of NPS operations and visitor activities to climate change; preparing for and mitigating climate change impacts; and increasing its use of alternative transportation, renewable energy, and other sustainable practices. NPS staff proactively monitor and mitigate for climate change impacts on cultural and natural resources and visitor amenities. Education and interpretive programs help visitors understand climate change impacts in the national park and beyond, and how they can respond to climate change. Partnerships with various agencies and institutions allow NPS staff to participate in research on climate change impacts to park and ecosystem resources. (vol1, p. 30)	1
Objectives	Includes objectives, which are tangible, measurable outcomes leading to the achievement of a goal (Berke et al. 2006).	Identify key natural and cultural resources and visitor amenities that are at risk from climate change. Establish baseline resource conditions, identify thresholds, and monitor for change. Identify key resources in various management zones/areas (e.g., backcountry, seagrass protection, or NPS operations) that may require different management responses to climate change impacts. (vol1, p. 30)	1
Objectives detailed	Includes quantifiable objectives for each goal (e.g., increase the use of alternative energy sources to 70% by 2030; there should be targets for each goal).	-	0
<b>PUBLIC PARTICIPATION</b>			

Planning process	Describes the process undertaken to create the plan.	The alternatives in this general management plan address the desired future conditions that apply relevant law, regulation, and policy in the park and that must be determined through a planning process. (vol1, p. 8)	1
Plan preparation involvement	Describes the stakeholders involved in plan preparation.	Public meetings, Internet (GMP webpage link on the park's website) updates, and newsletters were used to keep the public informed and involved in the planning process. A mailing list was compiled of members of governmental agencies, organizations, businesses, legislators, and interested citizens. This list was updated throughout the process. Periodically, postcard and e-mail updates were sent out to inform the public of the project status and upcoming activities. (vol2, p. 3)	1
Plan preparation involvement detailed	Includes detailed description of organizations and individuals involved in plan preparation. Description must include number of stakeholders and the general categories of stakeholders (e.g. residents, companies, non-profits, governmental agencies).	The first newsletter, mailed to about 5,000 addresses in January 2003, introduced the planning effort and invited the public to participate. Public open houses were held in January and February of that year in Everglades City, Naples, Key Largo, Miami, Key Colony Beach, and Homestead. Three additional meetings were held to meet with area agencies, and several more meetings with various stakeholder groups were held. More than 1,800 comments were submitted in this phase of public input. These comments were summarized in Newsletter 2, published in September 2003. (vol2, p. 3)	1
Representative stakeholders	Mentions how stakeholders who were involved represent all the groups affected by proposed policies or how the planning process sought to engage disadvantaged populations. Disadvantaged	-	0

	populations are those that may not traditionally be included in the planning process and may be adversely affected by climate change, such as the poor, elderly, or those for whom English is a second language.		
Participation techniques	Mentions participation techniques used to create the plan, such as meetings, surveys, charettes, public comments on drafts, etc.	Public meetings, Internet (GMP webpage link on the park's website) updates, and newsletters were used to keep the public informed and involved in the planning process. A mailing list was compiled of members of governmental agencies, organizations, businesses, legislators, and interested citizens. This list was updated throughout the process. Periodically, postcard and e-mail updates were sent out to inform the public of the project status and upcoming activities. (vol2, p. 3)	1
Participation techniques detailed	Describes participation techniques with details about each method including number of participants, main topics covered, and activities used to elicit input.	During the public comment period, 15,762 pieces of correspondence (including 12,083 form letters from National Parks Conservation Association supporters) were entered into the NPS Planning, Environment, and Public Comment system, either through direct entry by commenter or uploading hard copy letters, electronic correspondence, or transcripts from public meetings. Over 30 local, state, and federal agencies and nongovernmental organizations submitted comments. In addition to the general public and businesses, members of over 60 organizations also submitted comments. (vol2, p. 5)	1

Public meetings	States that meetings were used to engage stakeholders and that these meetings were open to the public.	Meetings to review the draft GMP/EEWS/EIS and receive input were held with the public and focus groups in south Florida in March and April 2013. The nine public meetings were attended by over 1,000 people. These public meetings were held in Homestead (March 19, 2013); Islamorada (March 20, 2013); Everglades City (March 21, 2013); Dania Beach (April 8, 2013); Naples (April 9, 2013); Key Largo (April 10, 2013); Miami (April 11, 2013); Marathon (April 16, 2013); and Key West (April 17, 2013). More than 20 additional stakeholder meetings, including with the South Florida Congressional delegation were also held during the comment period. Additionally, 10 site visits, some with stakeholders, to key areas of the park took place later in 2013 to better understand resource conditions and identify optimal strategies for resource protection and visitor experience improvements. (vol2, p. 5)	1
Planning or steering committee	States that a steering committee or advisory committee was used to guide plan creation.	-	0
Public participation maintenance	Discusses how public engagement will continue in plan maintenance/evaluation.	-	0
<b>COORDINATION</b>			
Local university	States that local universities were engaged in the planning process.	-	0

Federal agencies	States that federal agencies were engaged in the planning process.	Public meetings, Internet (GMP webpage link on the park's website) updates, and newsletters were used to keep the public informed and involved in the planning process. A mailing list was compiled of members of governmental agencies, organizations, businesses, legislators, and interested citizens. This list was updated throughout the process. Periodically, postcard and e-mail updates were sent out to inform the public of the project status and upcoming activities. (vol2, p. 3)	1
State agencies	States that state agencies were engaged in the planning process.	Public meetings, Internet (GMP webpage link on the park's website) updates, and newsletters were used to keep the public informed and involved in the planning process. A mailing list was compiled of members of governmental agencies, organizations, businesses, legislators, and interested citizens. This list was updated throughout the process. Periodically, postcard and e-mail updates were sent out to inform the public of the project status and upcoming activities. (vol2, p. 3)	1
Nonprofits	States that nonprofits were engaged in the planning process.	Public meetings, Internet (GMP webpage link on the park's website) updates, and newsletters were used to keep the public informed and involved in the planning process. A mailing list was compiled of members of governmental agencies, organizations, businesses, legislators, and interested citizens. This list was updated throughout the process. Periodically, postcard and e-mail updates were sent out to inform the public of the project status and upcoming activities. (vol2, p. 3)	1

Businesses	States that businesses were engaged in the planning process.	Public meetings, Internet (GMP webpage link on the park's website) updates, and newsletters were used to keep the public informed and involved in the planning process. A mailing list was compiled of members of governmental agencies, organizations, businesses, legislators, and interested citizens. This list was updated throughout the process. Periodically, postcard and e-mail updates were sent out to inform the public of the project status and upcoming activities. (vol2, p. 3)	1
Neighboring jurisdictions	States that neighboring jurisdictions were given the opportunity to participate in the planning process. Neighboring jurisdictions include regional planning organizations and counties as well as other cities, towns, or villages.	-	0
Elected official engagement	Mentions involvement of elected official(s) in the planning process.	-	0
<b>FACT BASE</b>			
Data collection	Provides information about the type of data collected and analyzed in order to make the plan.	The region of influence extends from metropolitan urbanized Miami-Dade County on the east, to the Gulf Coast on the west (Collier County), and south to include the mid-Florida keys (Monroe County). Because economic and demographic data are generally available at the county level, data are typically presented for Collier, Miami-Dade, and Monroe counties in this document. (vol1, p. 257)	1



National studies	States that national studies were used to inform the plan. Studies may include climate, demographics, economic projections, etc.	In 2010, residents of the three-county area tended to be older than the general population in the nation (37.2 years), with median ages ranging from 38.2 years in Miami-Dade County to 46.9 years in Collier County (table 23). The percentages of residents 62 years and older in these counties are also higher than the national average, although Miami-Dade and Monroe counties were below the statewide average. (vol1, p. 267)	1
Regional studies	States that regional studies were used to inform the plan. Studies may include climate, demographics, economic projections, etc.	The peak recreation visitation reported at Everglades National Park was 1,534,328 visitors in 1972. Over the 22-year period 1990–2011, recreation use of the park has fluctuated dramatically, from about 820,000 to 1,300,000 recreational visits, averaging approximately 1,005,000 (not including visitors associated with private and commercial airboat operations based in the East Everglades Addition). Overnight visitors to the park, including backcountry campers using the chickees, historically accounted for over 100,000 of the annual visits. However, weather, hurricanes in particular, have a dramatic influence on visitation as is evident in figure 11, which displays the declines in visitation following hurricane Andrew in 1992 and hurricanes Katrina and Wilma in 2005. Overnight visitor use declined sharply in the wake of damages to the lodging and camping facilities at Flamingo caused by the latter two storms, averaging less than 39,000 visits annually over the five-year period (2007– 2011). (vol1, p. 268)	1
International studies	States that international studies were used to inform the plan. Studies may include climate, demographics,	-	0

	economic projections, etc.		
Local knowledge	States that local, indigenous, or traditional knowledge was used to inform the plan.	-	0
Existing impacts	Identifies ways that climate change or changing weather conditions are already affecting the community.	-	0
Existing conditions	Discusses existing social, economic, environmental, or built infrastructure conditions that could lead to enhanced vulnerability in the future.	-	0
Existing actions	Identifies actions and plans that are in progress or planned that have adaptation value. Actions do not need to be specifically designed to address climate change.	-	0
Historic changes weather/climate	Discusses how climate or weather trends in the area have changed to date.	-	0

<p>Primary economic base(s)</p>	<p>Identifies the major economic sectors associated with the park.</p>	<p>A study of the economic contributions of units of the national park system, based on visitor origin, length of stay, type of overnight accommodations, and typical spending of park visitors, estimated total annual visitor spending of \$136.5 million associated with recreation visits to the park in 2010 (Stynes 2011). The total includes entry fees collected by the park; outlays for accommodations, fuel, food and beverage purchases; boat, canoe, and other equipment rentals; and other miscellaneous expenditures. The latter include purchases made at the visitor center bookstores operated by the Everglades Association. The Everglades Association is a nonprofit cooperating association that supports education, interpretation, and research in the park and three nearby NPS units. (voll, p. 268)</p>	<p>1</p>
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<p>Primary cultural base(s)</p>	<p>Identifies the main cultural assets of the park.</p>	<p>In 1996, 196 archeological sites inside the park were listed in the National Register of Historic Places under a SEAC-prepared multiple property nomination. The nomination included four districts (the Bear Lake Mounds, Monroe Lake, Shark River Slough, and the Ten Thousand Islands districts), and three individual sites (the Anhinga Trail, Cane Patch, and Rookery Mound sites). Resources listed in the nomination commonly consist of middens, shell/earthen works, and other mound features with associated artifacts reflecting occupation from the Glades Tradition period, sometimes extending to historic and modern period Seminole and European American occupation. Although some of the sites have been disturbed, they retain overall good integrity with the potential to yield further information and expand the understanding of indigenous life ways and cultural adaptation/interaction in the Everglades (NPS, Schwadron 1996). (voll, p. 238)</p>	<p>1</p>
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Primary natural system(s)	Identifies the major natural systems that are part of the park.	Everglades National Park contains a wide diversity of plants and plant communities that are distinctive in the continental United States and on a global scale. Several environmental factors combine to produce this assemblage of plant communities (SFWMD 1999; NPS 2001). The park occupies the transition zone between tropical and temperate climates; The park includes large expanses where fresh and saltwater mix; Water in the park is naturally low in nutrients; Nearly flatter rain creates a complex mosaic of habitats and plant communities dependent on subtle changes in elevation; Distinct wet and dry season create natural cycles of fire, drought, and tropical storms. (vol1, p. 188)	1
Presidentially declared disaster	Indicates that the community has experienced a presidentially declared disaster.	-	0
Previous hazardous events	Includes information on previous occurrences of hazardous events.	-	0
Repetitive loss properties	Discusses areas or specific properties that have been repetitively damaged by hazardous events.	-	0
Projected changes	Identifies climate change exposure, which is the climate change effects a community expects to feel, e.g., warmer temperature, increased precipitation, rising sea level (CA APG 2012).	-	0
Prioritized exposure	Prioritizes climate change effects or hazards.	-	0
Non-climatic drivers	Mentions other factors that may impact future vulnerability or resilience. Non-climatic factors include a shifting economy,	-	0

	growing or depleting population, or changing land use patterns.		
Non-climatic drivers detailed	Explicitly discusses projections for non-climatic factors over time and how this could affect vulnerability or resilience. Non-climatic factors include a shifting economy, growing or depleting population, or changing land use patterns.	-	0
Vulnerability assessment	Clearly indicates that a vulnerability assessment was undertaken as part of the planning process. A vulnerability assessment includes an analysis of exposure, sensitivity, and adaptive capacity.	-	0
Adaptive capacity	Clearly indicates that an assessment of adaptive capacity was undertaken. Adaptive capacity is the community's current and future ability to address projected impacts (CA APG 2012).	-	0
Adaptive capacity detailed	Provides a detailed description of adaptive capacity, including a clear description of what factors were considered in assessing adaptive capacity.	-	0
Risk assessment	Clearly indicates that a risk assessment was undertaken as part of the planning process. A risk assessment includes an assessment of the likelihood and consequence of an event.	-	0

Water quality	Discusses impacts of changing climate conditions on the park's water quality.	Potential effects on water resources due to climate change include increases in flooding, saltwater intrusion, and loss of protective berms, leading to conversion of freshwater wetlands to brackish or saltwater habitats. (vol1, p. 186)	1
Water quality detailed	Provides a detailed description of the vulnerability of water quality to changing climate conditions. Must include a map of areas at risk of low water quality or a detailed text description of at-risk areas that includes the location of specific vulnerable areas.	-	0
Natural systems	Discusses impacts of changing climate conditions on natural systems.	Climate change may impact the landscape and soils in the Everglades as a result of increased storm intensity and duration. Soils subsidence and accretion could be affected by increased storm intensity (NPS 2008). Additionally, intrusion of saltwater inland could contribute to coastal erosion, inundation, and changes in wetlands and vegetation across vast areas of south Florida (NWF 2006). (vol1, p. 187)	1
Natural systems detailed	Provides a detailed description of the vulnerability of natural systems to changing climate conditions. Vulnerable natural systems must be mapped, or a detailed text description including the specific location of vulnerable natural systems must be provided.	-	0

Cultural assets	Identifies cultural assets that will be impacted by changing climate conditions. Includes things such as archeologically significant sites, recreational opportunities, events such as sports tournaments, museums, public art, and other culturally relevant places.	Increased storm frequency and intensity along with rising sea levels are anticipated consequences of climate change. Increasing storms and high winds have the potential to adversely impact historic structures, diminishing their architectural and historical integrity as character-defining structural and architectural features are damaged or irreparably lost. (voll, p. 245)	1
Cultural assets detailed	Provides a detailed description of cultural assets that are vulnerable to changing climate conditions. The location of vulnerable cultural assets must be mapped, or a detailed description of the cultural assets and their location must be provided.	-	0
Built environments / infrastructure	Identifies infrastructure that will be impacted by changing climate conditions.	-	0
Built environments / infrastructure detailed	Provides a detailed description of infrastructure vulnerable to changing climate conditions. Vulnerable locations are mapped, or a detailed description of the vulnerable built environments and their location is provided.	-	0
Public services	Identifies sensitive public services, including emergency services, that will be impacted by climate change.	-	0
Public services detailed	Provides a detailed description of public services vulnerable to changing climate conditions. Vulnerable public services must be mapped, or a detailed	-	0



	description, including a list of vulnerable services, must be included.		
Economic systems	Identifies economic impacts of changing climate conditions. This may be a general discussion of impacts to entire economic sectors such as agriculture, forestry, tourism, OR a more specific discussion of impacts such as reduced patronage during extreme heat, or business closure and damage during extreme events.	-	0
Economic systems detailed	Provides a detailed description of the economies vulnerable to changing climate conditions. Vulnerable economies must be mapped, or a detailed description, including a list of the vulnerable economic sectors, must be provided.	-	0
Prioritization of vulnerabilities or risks	Includes the results of a prioritization of identified vulnerabilities.	-	0
Prioritization of vulnerabilities or risks detailed	Prioritizes risks and clearly describes how risks were ranked.	-	0
Underlying Causes / Transformation	Mentions the need to address fundamental drivers of human vulnerability or "transformational" adaptation/change. "Fundamental drivers of vulnerability" refers to underlying causes of social vulnerability reinforced by existing institutions and social systems; "transformational" adaptation or change reassesses the way a	-	0

	system operates and may take the form of new rights claims and changes in political systems (PROVIA 2013). Transformational change affects how individuals and society make decisions and allocate resources to cope with climate change; it may alternatively include changes in institutional arrangements, priorities, and norms (Kates et al. 2012)		
<b>UNCERTAINTY</b>			
Acknowledgement of uncertainties	The plan acknowledges uncertainties involved in projection of climate change or estimation of vulnerabilities.	The timing and extent of the changes are uncertain, although climate change is likely to occur relatively gradually, whereas management actions or changes in capacity could occur more rapidly and be associated with discrete or definable actions or events. (voll, p. 307)	1
Acknowledgement of uncertainty detailed	Describes sources of uncertainty.	-	0
Multiple scenarios	Mentions that different climate scenarios were considered.	-	0
Multiple scenarios detailed	Provides a detailed description of scenarios. Description must include how scenarios were developed and how scenarios differ in terms of assumptions and impacts.	-	0
Adaptive management	Mentions adaptive management. Adaptive management is the process of incorporating new information from monitoring and science into decision-making with an emphasis on learning.	-	0
Adaptive management detailed	Emphasizes adaptive management and learning throughout the plan and establishes a process for	-	0

	incorporating new information from monitoring and science into decision-making.		
Multiple time frames	Includes both short-term (next 5 years) and long-term (5+ years) strategies.	-	0
Flexible strategies	Explicitly recognizes the need for flexible adaptation strategies.	-	0
Flexible strategies detailed	Includes flexible strategies and explicitly identifies strategies as being flexible.	-	0
Robust strategies	Discusses robust strategies as an option to address uncertainty. Robust strategies are those that produce positive outcomes across a range of different scenarios or future conditions.	-	0
Robust strategies detailed	Includes robust strategies. Robust strategies produce positive outcomes across a range of different scenarios or future conditions. Must identify the strategies as robust.	-	0
No- or low-regrets strategies	Discusses no- or low-regrets strategies as an option to address uncertainty. No-regrets strategies are those that can be justified under current climate conditions but also make even more sense with climate change (CCS 2011); these may also be called win-win strategies. Low-regret strategies are low-cost strategies with relatively large benefits, although those benefits are realized mainly under projected future climate change. Must	-	0

	explicitly discuss no- or low- regrets strategies.		
No- or low-regrets strategies detailed	Includes no- or low-regret strategies. No-regrets strategies are those that can be justified under current climate conditions but also make even more sense with climate change (CCS 2011); these may also be called win-win strategies. Low-regret strategies are low-cost strategies with relatively large benefits, although those benefits are realized mainly under projected future climate change. Must explicitly identify strategies as no- or low-regrets.	-	0
<b>STRATEGY IDENTIFICATION</b>			
Prioritized actions	Prioritizes adaptation strategies.	-	0
Prioritized strategies detailed	Prioritizes adaptation strategies and describes how strategies were ranked.	-	0
Specific adaptation strategies	Includes strategies that are linked to specific impacts.	-	0
Capacity building	Includes capacity-building strategies. Capacity building is developing human resources, institutions, and communities, equipping them with the capability to adapt.	Form partnerships with other resource management entities to maintain regional habitat connectivity and refugia that allow species dependent on national park resources to better adapt to changing conditions. (vol1, p. 30)	1
Advocacy	Includes advocacy strategies. Advocacy includes encouraging regional and state agencies to have	-	0

	adaptation-appropriate strategies.		
General strategies	Includes generic adaptation strategies, which are strategies not specific enough to be classified in another category.	Identify key natural and cultural resources and visitor amenities that are at risk from climate change. (voll, p. 30)	1
Information and awareness	Includes information and awareness strategies, which focus on increasing public knowledge.	Engage visitors and inspire them to take action through leadership and education. (voll, p. 30)	1
Research and monitoring	Includes research or monitoring strategies, which focus on gathering information and creating reports, maps, or models. Monitoring includes observation or repeated measurements over time.	Establish baseline resource conditions, identify thresholds, and monitor for change. Identify key resources in various management zones/areas (e.g., backcountry, seagrass protection, or NPS operations) that may require different management responses to climate change impacts. (voll, p. 30)	1
Planning	Includes planning-related strategies, including strategies that incorporate understanding of climate science, impacts, vulnerability and risk into government and institutional planning processes, efforts, or existing initiatives.	Undertake comprehensive climate change planning to anticipate, adapt to, and mitigate for climate change impacts on the national park. (voll, p. 30)	1
Practice and behavior	Includes strategies to change practice and behavior. Practice and behavior strategies revise or expand practices and on-the-ground behavior that affect resilience.	-	0
Policy and legislation	Includes policy and legislative strategies aimed at preparing for climate change.	-	0

Physical infrastructure	Includes physical infrastructure strategies to prepare for climate change.	Development would consider the potential impacts that could result from changes in intensity or frequency of tropical storm events (including hurricanes), sea level change, variations in precipitation (droughts or more extreme rain events), and changes in groundwater levels, etc. When Everglades considers development within the park, managers must consider changes to sea level, hardened construction, and mobility of structures in addition to best construction practices. (voll, p. 129)	1
Building codes and engineering design standards	Includes strategies to improve physical infrastructure's response to changing climate through improved standards or engineering.	Building codes provide guidance on how to appropriately deal with wind, flooding, and storm surge, but current codes do not provide guidance on sea level change. Any new construction at the park would be required to appropriately consider the finished floor elevation of structures using the formula below, which takes into account variables such as predicted sea level change and the wave effect due to sea level change. (voll, p. 129)	1
Green infrastructure	Includes green infrastructure strategies aimed at providing protection from climate hazards.	-	0
Land use	Includes land use strategies focused on preparing for climate change.	-	0
Conservation	Includes conservation strategies to preserve biodiversity and protect open space under a changing climate.	"Restore key ecosystem features and processes, and protect key cultural resources to increase their resiliency to climate change. By reducing other types of impacts on resources, the overall condition of the resources could more easily recover from or resist the impacts of climate change." (voll, p. 31)	1

Financing	Includes financing or insurance strategies to prepare for future climate changes.	Insurance Risk Adjustment (applies to V-zone construction): A height adjustment to the proposed finished floor elevation in V-zone construction designed to equalize the financial risk to that of construction in an A-zone. Obtain actuarially based flood insurance premiums from FEMA's flood insurance program for construction in flood-prone areas (A and V-zones). (voll, p. 129)	1
Technology	Includes technology strategies.	-	0
Cost	Estimates the cost of implementing specific adaptation actions.	-	0
Cost detailed	Identifies the cost of implementing each adaptation strategy.	-	0
Cost of inaction	States that taking action to adapt to climate change costs less than not acting.	-	0
Cost of inaction detailed	Provides specific dollar figures on the cost of inaction versus adaptation-related action.	-	0
Co-benefits	Identifies co-benefits associated with taking adaptation action.	-	0
<b>IMPLEMENTATION AND MONITORING</b>			
Timetable for implementation	Provides a timetable for when each action will be implemented.	-	0
Implementation responsibilities	Assigns responsibility for policies broadly to organizations or agencies.	-	0
Implementation responsibilities detailed	Assigns responsibility for the implementation of each strategy.	-	0
Funding (need for)	Describes the need for funding sources to implement the plan.	Summary of Cost Table (voll, p. 108)	1
Potential funding sources detailed	Clearly describes potential funding sources and associates them with particular strategies.	-	0

Reporting requirements	Includes requirements for the regular reporting of implementation progress.	-	0
Monitoring responsibility	Mentions assignment of responsibility for monitoring.	-	0
Evaluation method	Establishes a process to evaluate the plan.	-	0
Evaluation method detailed	Describes when analyses of progress toward objectives will take place and how results will be used.	-	0
Evaluation metrics	Mentions how to measure progress towards implementing strategies.	-	0
Evaluation metrics detailed	Mentions how to measure progress towards implementing each strategy identified in the plan.	-	0
Mainstreaming	Discusses mainstreaming climate change adaptation. Mainstreaming refers to the integration of climate adaptation into other sector policies or plans (Rauken et al. 2014).	-	0
Mainstreaming detailed	Identifies specific plans and programs as opportunities for mainstreaming. Mainstreaming refers to the integration of climate adaptation into other sector policies or plans (Rauken et al. 2014).	-	0
Plan updates	Mentions need for updates.	-	0
Plan updates detailed	Includes timetable for updating plan.	-	0
Barriers	Mentions barriers to climate adaptation.	-	0



9- Fire Island Draft General Management Plan / Environmental Impact Statement  
Codebook

Criterion	Description	Code	Score
<b>ARTICULATION OF PURPOSE, GOALS, AND OBJECTIVES</b>			
Plan purpose	States the purpose of the plan.	A general management plan (GMP) is a comprehensive plan that defines a national park's purpose and management direction and provides the overarching guidance necessary to coordinate all subsequent planning and management. (p. 3)	1
Vision statement	Includes a vision statement, which establishes an overall image of a desired future (Berke et al. 2006).	-	0
Define resilience, adaptation, or preparedness	Defines resilience, adaptation or preparedness.	-	0
Goals	Includes goals, which are outcomes that the community aspires towards. Goals are usually expressed in adjectives and nouns (not verbs) and are not quantified (Berke et al. 2006). Goals reflect public values and express future desired conditions (Berke and Godschalk 2009).	The planning team developed two action alternatives in response to public input and an analysis of the Seashore's legislation, purpose and significance, fundamental resources and values, and goals. (p. 37)	1

Objectives	Includes objectives, which are tangible, measurable outcomes leading to the achievement of a goal (Berke et al. 2006).	The objectives of sustainability are to design structures to minimize adverse impacts on natural and cultural values; to reflect their environmental setting; to maintain and encourage biodiversity; to construct and retrofit facilities using energy efficient materials and building techniques; to operate and maintain facilities to promote their sustainability; and to illustrate and promote conservation principles and practices through sustainable design and ecologically sensitive use. (p. 34)	1
Objectives detailed	Includes quantifiable objectives for each goal (e.g., increase the use of alternative energy sources to 70% by 2030; there should be targets for each goal).	-	0
<b>PUBLIC PARTICIPATION</b>			
Planning process	Describes the process undertaken to create the plan.	The National Park Service takes an interdisciplinary approach to planning. The planning team for the Fire Island National Seashore was composed of individuals skilled in the areas of natural resource management, coastal geology, cultural resource management, land-use planning, community planning, landscape architecture, law enforcement, visitor services, park operations and facility management. The planning team also consulted with technical staff from within the NPS and from other agencies in the areas of climate change and sea-level rise, marine resources, coastal processes, and historic resources. (p. 313)	1

Plan preparation involvement	Describes the stakeholders involved in plan preparation.	The planning process was initiated in May 2006 with an internal scoping meeting held for the Seashore staff. On June 13, 2006 a Notice of Intent to Prepare a GMP/EIS was published in the Federal Register (Volume 71, Number 113). Notification of public meetings was accomplished through local media through the use of press releases, paid public notices and paid advertising. The public was also made aware of public meetings through postings on the Seashore's website and through its e-newsletter. (p. 313)	1
Plan preparation involvement detailed	Includes detailed description of organizations and individuals involved in plan preparation. Description must include number of stakeholders and the general categories of stakeholders (e.g. residents, companies, non-profits, governmental agencies).	Three public meetings were held in association with the release of Newsletter # 2. The first was a formal public meeting at the Seashore's Ferry Terminal in Patchogue in June 2010; an open house was held at the Fire Island Pines community center in August 2010; and finally, a formal public meeting was held at the Woodhull School on Fire Island in October 2010. Each of these meetings was well attended, with between 20 and 80 participants. The planning team also received approximately 300 sets of written comments. (p. 314)	1
Representative stakeholders	Mentions how stakeholders who were involved represent all the groups affected by proposed policies or how the planning process sought to engage disadvantaged populations. Disadvantaged populations are those that may not traditionally be included in the planning	-	0

	process and may be adversely affected by climate change, such as the poor, elderly, or those for whom English is a second language.		
Participation techniques	Mentions participation techniques used to create the plan, such as meetings, surveys, charettes, public comments on drafts, etc.	The planning process was initiated in May 2006 with an internal scoping meeting held for the Seashore staff. On June 13, 2006 a Notice of Intent to Prepare a GMP/EIS was published in the Federal Register (Volume 71, Number 113). Notification of public meetings was accomplished through local media through the use of press releases, paid public notices and paid advertising. The public was also made aware of public meetings through postings on the Seashore's website and through its e-newsletter. (p. 313)	1
Participation techniques detailed	Describes participation techniques with details about each method including number of participants, main topics covered, and activities used to elicit input.	Three public meetings were held in association with the release of Newsletter # 2. The first was a formal public meeting at the Seashore's Ferry Terminal in Patchogue in June 2010; an open house was held at the Fire Island Pines community center in August 2010; and finally, a formal public meeting was held at the Woodhull School on Fire Island in October 2010. Each of these meetings was well attended, with between 20 and 80 participants. The planning team also received approximately 300 sets of written comments. (p. 314)	1

Public meetings	States that meetings were used to engage stakeholders and that these meetings were open to the public.	Three public meetings were held in association with the release of Newsletter # 2. The first was a formal public meeting at the Seashore's Ferry Terminal in Patchogue in June 2010; an open house was held at the Fire Island Pines community center in August 2010; and finally, a formal public meeting was held at the Woodhull School on Fire Island in October 2010. Each of these meetings was well attended, with between 20 and 80 participants. The planning team also received approximately 300 sets of written comments. (p. 314)	1
Planning or steering committee	States that a steering committee or advisory committee was used to guide plan creation.	-	0
Public participation maintenance	Discusses how public engagement will continue in plan maintenance/evaluation.	-	0
<b>COORDINATION</b>			
Local university	States that local universities were engaged in the planning process.	-	0

Federal agencies	States that federal agencies were engaged in the planning process.	The remaining five meetings were organized around specific stakeholder groups, including members of the Fire Island Association, seasonal community residents, the scientific community, environmental organizations, and other government agencies. At each session, participants were also offered the opportunity to submit additional comments via U.S. post, electronic mail, or on the NPS Planning, Environment and Public Comment (PEPC) site. The formal public scoping period ended on January 12, 2007. (p. 313 - 314)	1
State agencies	States that state agencies were engaged in the planning process.	The remaining five meetings were organized around specific stakeholder groups, including members of the Fire Island Association, seasonal community residents, the scientific community, environmental organizations, and other government agencies. At each session, participants were also offered the opportunity to submit additional comments via U.S. post, electronic mail, or on the NPS Planning, Environment and Public Comment (PEPC) site. The formal public scoping period ended on January 12, 2007. (p. 313 - 314)	1

Nonprofits	States that nonprofits were engaged in the planning process.	The remaining five meetings were organized around specific stakeholder groups, including members of the Fire Island Association, seasonal community residents, the scientific community, environmental organizations, and other government agencies. At each session, participants were also offered the opportunity to submit additional comments via U.S. post, electronic mail, or on the NPS Planning, Environment and Public Comment (PEPC) site. The formal public scoping period ended on January 12, 2007. (p. 313 - 314)	1
Businesses	States that businesses were engaged in the planning process.	-	0
Neighboring jurisdictions	States that neighboring jurisdictions were given the opportunity to participate in the planning process. Neighboring jurisdictions include regional planning organizations and counties as well as other cities, towns, or villages.	-	0
Elected official engagement	Mentions involvement of elected official(s) in the planning process.	-	0
<b>FACT BASE</b>			

Data collection	Provides information about the type of data collected and analyzed in order to make the plan.	<p>The economic, ethnic, and geographic diversity of the Seashore’s audience has remained limited, particularly given its location in the metropolitan New York region. Visitor use survey respondents at park facilities were overwhelmingly white (97%) and non-Hispanic (95%). This contrasts with 2010 census data for Long Island, which is only 77% white and 84 % non-Hispanic. Water-based access to Fire Island National Seashore can be cost-prohibitive for some families – the round trip ferry fare (including parking) for a family of four can range between \$50 to \$60 depending on date of travel, point of origin, and destination. Visitors may park for a fee at either Robert Moses State Park on the west end or Smith Point County Park on the east end and enter the Seashore on foot. Daily parking rates range from \$8 to \$15. (p. 22)</p>	1
National studies	States that national studies were used to inform the plan. Studies may include climate, demographics, economic projections, etc.	<p>National park tourism is a significant driver in the national economy returning \$10 for every \$1 invested in the National Park Service. These findings are the result of a peer-reviewed visitor spending analysis conducted by U.S.G.S. economists for the National Park Service. The report shows \$14.7 billion of direct spending by 283 million park visitors in communities within 60 miles of a national park unit. This supported 243,000 jobs nationally, with 201,000 jobs found in the gateway communities, and had a cumulative benefit to the U.S. economy of \$26.75 billion (Cullinane Thomas et al, 2014). (p. 182)</p>	1



Regional studies	States that regional studies were used to inform the plan. Studies may include climate, demographics, economic projections, etc.	Total annual visitation to NPS facilities at the Seashore since 2001 has hovered around an average of 646,000 visitors, with a high of 819,000 in 2004 and a low of 483,000 in 2012. Annual visitation to Fire Island as a whole is believed to be considerably higher, with estimates approaching 2.5 million. Visitation to some NPS facilities at Fire Island occurs year round, but much of the activity is seasonal. Annually, visitation peaks during the months of July and August; however, several times since 2001, substantial visitation (> 20,000) occurred up to 10 months out of the year. (p. 21)	1
International studies	States that international studies were used to inform the plan. Studies may include climate, demographics, economic projections, etc.	Increase in average annual temperature (increase of 3 to 5 degrees in the 2050s) would also contribute to the physical and chemical changes to water resources (Rosenzweig et al, 2011. See Appendix B). (p. 207)	1
Local knowledge	States that local, indigenous, or traditional knowledge was used to inform the plan.	-	0
Existing impacts	Identifies ways that climate change or changing weather conditions are already affecting the community.	-	0
Existing conditions	Discusses existing social, economic, environmental, or built infrastructure conditions that could lead to enhanced vulnerability in the future.	-	0
Existing actions	Identifies actions and plans that are in progress or planned that have adaptation value.	-	0

	Actions do not need to be specifically designed to address climate change.		
Historic changes weather/climate	Discusses how climate or weather trends in the area have changed to date.	-	0
Primary economic base(s)	Identifies the major economic sectors associated with the park.	In 2012, Fire Island National Seashore had about 483,000 recreational visitors resulting in an estimated \$19 million spent within the Seashore or surrounding communities. It is estimated that the monetary impacts from visitor spending supported 206 jobs (Cullinane Thomas et al, 2014). (p. 182)	1
Primary cultural base(s)	Identifies the main cultural assets of the park.	There are 41 structures and features listed on the Seashore's List of Classified Structures (LCS): 26 are LCS records for the William Floyd Estate and 15 are for the Fire Island Light Station. The LCS is an evaluated inventory of all historic and prehistoric structures that have historical, architectural and/or engineering significance within the parks of the National Park System. At this time, the structures associated with the Carrington Estate are not included on the LCS. These structures will be included in the next LCS update. (p. 151)	1
Primary natural system(s)	Identifies the major natural systems that are part of the park.	"The natural resources at Fire Island National Seashore are unique to its barrier island environment. Many of these resources are in a constant state of flux, due to the dynamic nature of the barrier island." (p. 123)	1
Presidentially declared disaster	Indicates that the community has experienced a presidentially declared disaster.	-	0

Previous hazardous events	Includes information on previous occurrences of hazardous events.	-	0
Repetitive loss properties	Discusses areas or specific properties that have been repetitively damaged by hazardous events.	-	0
Projected changes	Identifies climate change exposure, which is the climate change effects a community expects to feel, e.g., warmer temperature, increased precipitation, rising sea level (CA APG 2012).	Climate change is expected to result in many changes to the Atlantic coast, including the northeastern coast of the United States. Both historical trends and future projections suggest increases in temperature, precipitation levels, accelerated rates of sea-level rise and intensity of weather events, such as storms, should be expected. (p. 39)	1
Prioritized exposure	Prioritizes climate change effects or hazards.	-	0
Non-climatic drivers	Mentions other factors that may impact future vulnerability or resilience. Non-climatic factors include a shifting economy, growing or depleting population, or changing land use patterns.	-	0
Non-climatic drivers detailed	Explicitly discusses projections for non-climatic factors over time and how this could affect vulnerability or resilience. Non-climatic factors include a shifting economy, growing or depleting population, or changing land use patterns.	-	0

Vulnerability assessment	Clearly indicates that a vulnerability assessment was undertaken as part of the planning process. A vulnerability assessment includes an analysis of exposure, sensitivity, and adaptive capacity.	Specific options to protect Fire Island's resources include integrating long-term planning into Seashore operations, monitoring observed and projected climate trends, conducting climate-related vulnerability assessments for fundamental resources and values, monitoring climate sensitive species, and implementing a range of adaptive management actions. (p. 39)	1
Adaptive capacity	Clearly indicates that an assessment of adaptive capacity was undertaken. Adaptive capacity is the community's current and future ability to address projected impacts (CA APG 2012).	-	0
Adaptive capacity detailed	Provides a detailed description of adaptive capacity, including a clear description of what factors were considered in assessing adaptive capacity.	-	0
Risk assessment	Clearly indicates that a risk assessment was undertaken as part of the planning process. A risk assessment includes an assessment of the likelihood and consequence of an event.	-	0
Water quality	Discusses impacts of changing climate conditions on the park's water quality.	-	0
Water quality detailed	Provides a detailed description of the vulnerability of water quality to changing climate conditions. Must include a map of areas at risk of low water quality or a detailed text description	-	0

	of at-risk areas that includes the location of specific vulnerable areas.		
Natural systems	Discusses impacts of changing climate conditions on natural systems.	Natural drivers of coastal change include but are not limited to periodic storms and floods, climate change, and sea-level rise. Human activities, such as continued development and efforts to protect existing development, also influence the geomorphology of Fire Island. (p. 4)	1
Natural systems detailed	Provides a detailed description of the vulnerability of natural systems to changing climate conditions. Vulnerable natural systems must be mapped, or a detailed text description including the specific location of vulnerable natural systems must be provided.	-	0
Cultural assets	Identifies cultural assets that will be impacted by changing climate conditions. Includes things such as archeologically significant sites, recreational opportunities, events such as sports tournaments, museums, public art, and other culturally relevant places.	Fire Island National Seashore would use and promote innovation, best practices, and partnerships to respond to the challenges of climate change and its effects on park resources. (p. 41)	1
Cultural assets detailed	Provides a detailed description of cultural assets that are vulnerable to changing climate conditions. The location of vulnerable cultural assets must be mapped, or a detailed description of the cultural assets and their	-	0

	location must be provided.		
Built environments / infrastructure	Identifies infrastructure that will be impacted by changing climate conditions.	-	0
Built environments / infrastructure detailed	Provides a detailed description of infrastructure vulnerable to changing climate conditions. Vulnerable locations are mapped, or a detailed description of the vulnerable built environments and their location is provided.	-	0
Public services	Identifies sensitive public services, including emergency services, that will be impacted by climate change.	-	0
Public services detailed	Provides a detailed description of public services vulnerable to changing climate conditions. Vulnerable public services must be mapped, or a detailed description, including a list of vulnerable services, must be included.	-	0
Economic systems	Identifies economic impacts of changing climate conditions. This may be a general discussion of impacts to entire economic sectors such as agriculture, forestry, tourism, OR a more specific discussion of impacts such as reduced patronage during extreme heat, or business closure and damage during extreme events.	-	0

Economic systems detailed	Provides a detailed description of the economies vulnerable to changing climate conditions. Vulnerable economies must be mapped, or a detailed description, including a list of the vulnerable economic sectors, must be provided.	-	0
Prioritization of vulnerabilities or risks	Includes the results of a prioritization of identified vulnerabilities.	-	0
Prioritization of vulnerabilities or risks detailed	Prioritizes risks and clearly describes how risks were ranked.	-	0
Underlying Causes / Transformation	Mentions the need to address fundamental drivers of human vulnerability or "transformational" adaptation/change. "Fundamental drivers of vulnerability" refers to underlying causes of social vulnerability reinforced by existing institutions and social systems; "transformational" adaptation or change reassesses the way a system operates and may take the form of new rights claims and changes in political systems (PROVIA 2013). Transformational change affects how individuals and society make decisions and allocate resources to cope with climate change; it may alternatively include changes in institutional arrangements, priorities, and norms (Kates et al. 2012)	-	0
<b>UNCERTAINTY</b>			

Acknowledgement of uncertainties	The plan acknowledges uncertainties involved in projection of climate change or estimation of vulnerabilities.	-	0
Acknowledgement of uncertainty detailed	Describes sources of uncertainty.	-	0
Multiple scenarios	Mentions that different climate scenarios were considered.	-	0
Multiple scenarios detailed	Provides a detailed description of scenarios. Description must include how scenarios were developed and how scenarios differ in terms of assumptions and impacts.	-	0
Adaptive management	Mentions adaptive management. Adaptive management is the process of incorporating new information from monitoring and science into decision-making with an emphasis on learning.	-	0
Adaptive management detailed	Emphasizes adaptive management and learning throughout the plan and establishes a process for incorporating new information from monitoring and science into decision-making.	-	0
Multiple time frames	Includes both short-term (next 5 years) and long-term (5+ years) strategies.	-	0
Flexible strategies	Explicitly recognizes the need for flexible adaptation strategies.	-	0
Flexible strategies detailed	Includes flexible strategies and explicitly identifies strategies as being flexible.	-	0
Robust strategies	Discusses robust strategies as an option to address uncertainty. Robust strategies are those that produce positive outcomes across a range of	-	0



	different scenarios or future conditions.		
Robust strategies detailed	Includes robust strategies. Robust strategies produce positive outcomes across a range of different scenarios or future conditions. Must identify the strategies as robust.	-	0
No- or low-regrets strategies	Discusses no- or low-regrets strategies as an option to address uncertainty. No-regrets strategies are those that can be justified under current climate conditions but also make even more sense with climate change (CCS 2011); these may also be called win-win strategies. Low-regret strategies are low-cost strategies with relatively large benefits, although those benefits are realized mainly under projected future climate change. Must explicitly discuss no- or low- regrets strategies.	-	0
No- or low-regrets strategies detailed	Includes no- or low-regret strategies. No-regrets strategies are those that can be justified under current climate conditions but also make even more sense with climate change (CCS 2011); these may also be called win-win strategies. Low-regret strategies are low-cost strategies with relatively large benefits, although those benefits are realized mainly under projected future climate change. Must explicitly identify	-	0

	strategies as no- or low-regrets.		
<b>STRATEGY IDENTIFICATION</b>			
Prioritized actions	Prioritizes adaptation strategies.	-	0
Prioritized strategies detailed	Prioritizes adaptation strategies and describes how strategies were ranked.	-	0
Specific adaptation strategies	Includes strategies that are linked to specific impacts.	-	0
Capacity building	Includes capacity-building strategies. Capacity building is developing human resources, institutions, and communities, equipping them with the capability to adapt.	Fire Island National Seashore would continue to collaborate with a variety of academic and scientific institutions, non-profit organizations and agencies on research and projects to find creative solutions for the long-term preservation of natural and cultural resources. (p. 42)	1
Advocacy	Includes advocacy strategies. Advocacy includes encouraging regional and state agencies to have adaptation-appropriate strategies.	-	0
General strategies	Includes generic adaptation strategies, which are strategies not specific enough to be classified in another category.	Reduce current and future stressors to the resource and the environment; this would improve the condition of the resource and build resiliency in the ecosystem that would help to minimize future adverse effects of climate change. (p. 42)	1

Information and awareness	Includes information and awareness strategies, which focus on increasing public knowledge.	Education and interpretive programs help visitors understand climate change impacts at Fire Island and beyond, and how they can respond to climate change. NPS and its partners would engage visitors on the topic of climate change, provide the latest research and monitoring data and trends, inform the public about what response is being taken at the Seashore, and inspire visitors to aid in that response. (p. 42)	1
Research and monitoring	Includes research or monitoring strategies, which focus on gathering information and creating reports, maps, or models. Monitoring includes observation or repeated measurements over time.	Inventory, monitor and assess vulnerability of key attributes of the natural systems, cultural resources, and visitor experiences likely to be affected by climate change. (p. 41)	1
Planning	Includes planning-related strategies, including strategies that incorporate understanding of climate science, impacts, vulnerability and risk into government and institutional planning processes, efforts, or existing initiatives.	In most cases, the Seashore would allow natural processes to continue unimpeded, except when public health and safety or the Seashore's fundamental resources and values are threatened. Scenario planning would likely play a pivotal role in developing the Seashore's responses to climate change. (p. 41)	1
Practice and behavior	Includes strategies to change practice and behavior. Practice and behavior strategies revise or expand practices and on-the-ground behavior that affect resilience.	-	0
Policy and legislation	Includes policy and legislative strategies aimed at preparing for climate change.	-	0

Physical infrastructure	Includes physical infrastructure strategies to prepare for climate change.	Avoid or minimize additions of new infrastructure, construction of high value assets or major investments in facility renovations within coastal flood or storm surge zones. (p. 41)	1
Building codes and engineering design standards	Includes strategies to improve physical infrastructure's response to changing climate through improved standards or engineering.	-	0
Green infrastructure	Includes green infrastructure strategies aimed at providing protection from climate hazards.	-	0
Land use	Includes land use strategies focused on preparing for climate change.	-	0
Conservation	Includes conservation strategies to preserve biodiversity and protect open space under a changing climate.	Restore key ecosystem features and processes, and protect key cultural resources to increase their resiliency to climate change. By reducing other types of impacts on resources, the overall condition of the resources could more easily recover from or resist the impacts of climate change. (p. 42)	1
Financing	Includes financing or insurance strategies to prepare for future climate changes.	-	0
Technology	Includes technology strategies.	-	0
Cost	Estimates the cost of implementing specific adaptation actions.	-	0
Cost detailed	Identifies the cost of implementing each adaptation strategy.	-	0
Cost of inaction	States that taking action to adapt to climate change costs less than not acting.	-	0
Cost of inaction detailed	Provides specific dollar figures on the cost of inaction versus	-	0

	adaptation-related action.		
Co-benefits	Identifies co-benefits associated with taking adaptation action.	-	0
<b>IMPLEMENTATION AND MONITORING</b>			
Timetable for implementation	Provides a timetable for when each action will be implemented.	-	0
Implementation responsibilities	Assigns responsibility for policies broadly to organizations or agencies.	-	0
Implementation responsibilities detailed	Assigns responsibility for the implementation of each strategy.	-	0
Funding (need for)	Describes the need for funding sources to implement the plan.	Summary of Cost Table (p. 108)	1
Potential funding sources detailed	Clearly describes potential funding sources and associates them with particular strategies.	-	0
Reporting requirements	Includes requirements for the regular reporting of implementation progress.	-	0
Monitoring responsibility	Mentions assignment of responsibility for monitoring.	-	0
Evaluation method	Establishes a process to evaluate the plan.	-	0
Evaluation method detailed	Describes when analyses of progress toward objectives will take place and how results will be used.	-	0
Evaluation metrics	Mentions how to measure progress towards implementing strategies.	-	0
Evaluation metrics detailed	Mentions how to measure progress towards implementing each strategy identified in the plan.	-	0
Mainstreaming	Discusses mainstreaming climate change adaptation. Mainstreaming refers to the integration of	-	0

	climate adaptation into other sector policies or plans (Rauken et al. 2014).		
Mainstreaming detailed	Identifies specific plans and programs as opportunities for mainstreaming. Mainstreaming refers to the integration of climate adaptation into other sector policies or plans (Rauken et al. 2014).	-	0
Plan updates	Mentions need for updates.	-	0
Plan updates detailed	Includes timetable for updating plan.	-	0
Barriers	Mentions barriers to climate adaptation.	-	0