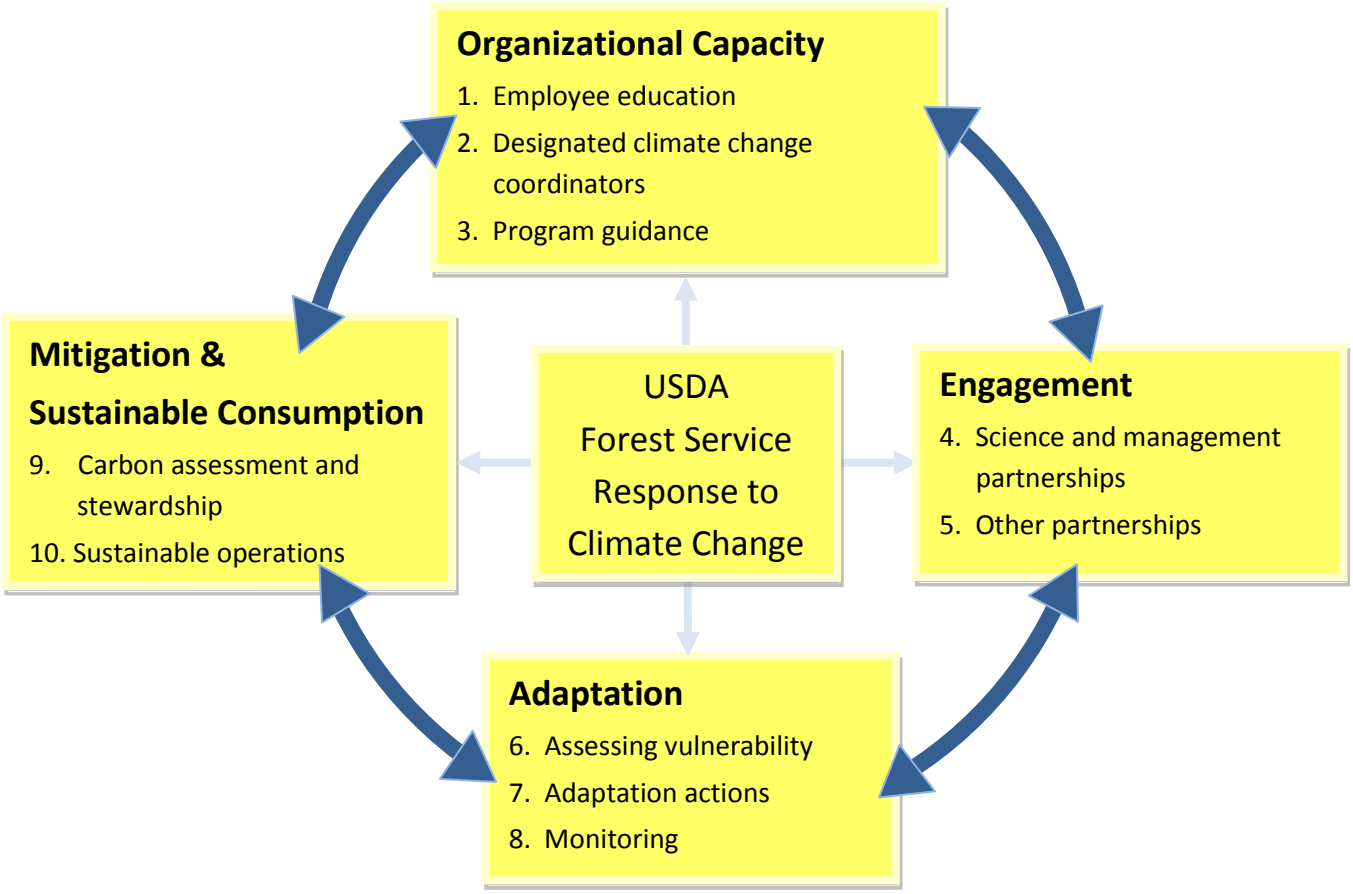
Navigating the Climate Change Performance Scorecard

A Guide for National Forests and Grasslands (Version 2, August 2011)



Version 2

Foreword

Climate change is one of the major challenges we face as we fulfill our mission to sustain the health, diversity, and productivity of the Nation's forests and grasslands for present and future generations. The future vitality of the lands we manage is at risk from climate change, which drives fire, insects, diseases, invasive species, drought, and other forces. It is not in our mission or our nature to just let things happen. We must manage forests and grasslands to adapt – that is, to accommodate the changes and new conditions imposed by climate shifts. But adaptation cannot be the single focus of our response to climate change and we cannot do it alone. That's why the Climate Change Roadmap and Performance Scorecard are so important – they direct us in creating a balanced approach that also includes mitigating climate change, building partnerships across boundaries, and preparing our employees to respond to climate-related issues by understanding and applying emerging science.

The Roadmap and Scorecard are about developing our organizational ability and readiness to adapt to a rapidly changing future and building climate change response into how we pursue our mission. They do not impose a one-size-fits-all approach because there is no one solution to the array of challenges that climate change creates. Given the diversity of our landscapes, our stakeholders, and our partners, we must maintain the flexibility to develop different approaches for different places. Furthermore, the Roadmap and Scorecard are designed to encourage innovation, experimentation, and adaptive management and improve our capabilities based on realistic assessments of our strengths and weaknesses. We already have many of the tools we need to respond to climate change, but we may need to develop new approaches to deal with new challenges by experimenting with our tried and true techniques. The Scorecard provides a way to share lessons learned so that we don't repeat mistakes or reinvent what's already out there.

I am confident that the Roadmap and Scorecard process will make us national leaders in assuring sustainability in a changing future.

Thank you for all that you do.

THOMAS L. TIDWELL
Chief

January 2011

Preface

This Guide was designed for you by you and your fellow Forest Service employees. This first official version of the Scorecard Guide is based on a lot of hard work and lessons learned in developing and using a prototype guide for the preliminary assessment this spring. During this process, we listened to you. Most of the feedback in the assessment validated that the Guide was on the right track; the general structure, approach, and tone remain. What you see in this version are refinements that help it work in the operational world of a large, dispersed organization. There are many people to thank for this, but my most fervent appreciation goes to Leslie Brandt who staffed the original framing team; Rob Harper who led that team; its team members: Mike Balboni, Tracy Beck, Bob Davis, Trey Schillie, and Paul Strong; and Cathy Dowd in our office who headed up the post-preliminary assessment revision. Thanks too to all the field and WO staff who dived in to make it a better product.

We hope this guide will develop your ability to deal with the ever more evident implications of a changing climate. We also hope that it will make us a more effective learning organization that will set new standards for applying adaptive management in turbulent times. This Guide is meant to help you start from where you honestly think you are now and develop a path on which to move forward. Work through the Guide to understand your options. Consider all the other things your unit is doing and plans to do and how climate change response can be woven together with those efforts. Don't try to do everything at once. This is a four-year push, not a 6-month panic. The FY 2011 Scorecard report is only our baseline. Our goal for achieving the target of 7/10 is FY 2015. In the meantime, Scorecard reporting will stimulate the development of materials and tools that will help us help you progress in your plan, maintain those changes, and take on progressively harder challenges with greater confidence.

A key partner in making this work is the Climate Change Coordinator (or coordination team) for your unit and their counterpart in the Regional and Station offices. They comprise a national network for communication among units, regions, stations, and the WO and can bring issues quickly to the attention of the entire network for resolution. Informed by this network, the national, regional, and station staffs are working to make sure program directions are harmonious and to identify ways to complete Scorecard tasks across multiple units or even larger scales. Work with your regional climate change coordinator to help you prioritize the Scorecard elements so you can take advantage of these developments as they occur.

We emphasized during the preliminary assessment, and we re-emphasize now, that this guide is meant to be molded, modified, and shared. We encourage you to give us – directly or through the climate change coordinators - suggestions for improving it. What is working? What is not? What are we missing? What new things should we be trying? We are looking forward to learning from you in the next and future rounds of Scorecard reporting.

DAVE CLEAVES
Climate Change Advisor

August 2011

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Introduction

About this guide

Navigating the Climate Change Performance Scorecard provides direction on completing the Scorecard to Forest and Grassland (hereafter referred to as Unit) Supervisors and their staff. Much of this guide will also be helpful for Research Stations, Regional Offices, and the Washington Office in identifying areas where they can or should lend support. The guide was designed to be flexible while still providing some basic requirements and helpful hints on how to develop and account for associated activities.

How this guide is organized

This introductory section provides an overview of the Scorecard, the annual reporting cycle, roles and responsibilities, and the relationship of the Scorecard to USDA and Forest Service strategic plans, policies, and initiatives.

The guide is organized around the four Scorecard dimensions and ten Scorecard elements (questions). Each element in the guide contains the following:

1. **Definitions** of terms that may be new to you, have more than one meaning, or require further clarification. The definitions in this document capture the intent of the Scorecard and the associated guide, and may differ from definitions found in a textbook or dictionary.
2. **Geographic Scale** specifies whether the activities listed on the Scorecard should be carried out by individual Units or at a larger scale.
3. **Getting to "yes"** sets minimum requirements for a "yes" answer on the Scorecard and describes what information will be collected in the narrative to support your answer.

If you're short on time, you can just read these three parts for each element for the main points.

Look for the "tool boxes" throughout the document. These boxes provide helpful hints about how you might accomplish some Scorecard activities on your Unit.

Technical guidance for some Scorecard elements is provided in the appendices. The technical guidance is more detailed and geared toward technical staff and researchers whose work will support the Agency's performance and learning under the Scorecard.

Scorecard Overview

What is the Scorecard?

The Scorecard is a way for the Forest Service to improve its organizational capacity and readiness to respond to climate change. Each National Forest and Grassland will measure its progress from 2011-15 by describing accomplishments and/or plans for improvement toward a "yes" answer to ten questions in four dimensions – organizational capacity, engagement, adaptation, and mitigation (see next page). After a preliminary assessment in early 2011, the scorecard will be completed annually in the fiscal years 2011-2015. **By 2015, each Unit is expected to answer yes to at least seven of the scorecard questions, with at least one yes in each dimension**. The replies to the scorecard questions are supported by narratives describing accomplishments and/or plans for improvement toward a "yes" answer.

What is the purpose of the Scorecard?

The Scorecard will better prepare us for the journey in accomplishing the Agency's mission in the face of a changing climate. It will help facilitate implementation of the Forest Service National Roadmap for Responding to Climate Change and comply with the USDA Strategic Plan (see policy section). Annual Scorecard reporting will prompt each Unit to take stock of its accomplishments and set goals for the following year. The Scorecard's multiple dimensions ensure that each Unit works toward a balanced response to climate change.

Who is responsible for scorecard reporting and activities?

The Unit Supervisor will report on Scorecard accomplishments each year, but all Forest Service employees have a role to play. Accountability ultimately rests on the Agency as a whole (see table on roles and responsibilities). The annual Scorecard reporting cycle will require evaluation of support and staff leadership at the Unit, Region, and national levels. Many of the activities listed on the Scorecard will be carried out by Regions or the Washington Office, or with the support of Research Stations and external partners. The Geographic Scale section provides direction about whether each element is best carried out at the unit, sub-regional, regional, or national scale. Region, Station, and Washington Office support will be assessed through annual SES performance evaluations.

How will annual Scorecard reports be used?

Results will be used to measure Agency progress in our ability to build climate change response into how we pursue our mission. The Scorecard will assess strengths and identify areas for greater investment in accomplishing particular elements at the Unit level. When the appropriate geographic scale is larger than the Unit, the narrative will be an opportunity for the Unit to let Regions, Research Stations, and the Washington Office know whether they are getting the support they need. The Regional Forester will use this information in annual performance reviews and to identify areas that require a greater investment for Units to succeed. The Climate Change Advisor's Office will use information from Units and Regions to refine guidance and Scorecard expectations, coordinate efforts to support areas of need identified in the evaluations, and communicate our Agency's progress and successes to the Administration, Congress, media, and key stakeholders.

The Forest Service Climate Change Performance Scorecard, 2011 (version 1.3) To be completed annually by each National Forest or Grassland (Unit).		
Scorecard Element	**Unit Name**	**Yes/No**
Organizational Capacity		
1. Employee Education	Are all employees provided with training on the basics of climate change, impacts on forests and grasslands, and the Forest Service response? Are resource specialists made aware of the potential contribution of their own work to climate change response?	
2. Designated Climate Change Coordinators	Is at least one employee assigned to coordinate climate change activities and be a resource for climate change questions and issues? Is this employee provided with the training, time, and resources to make his/her assignment successful?	
3. Program Guidance	Does the Unit have written guidance for progressively integrating climate change considerations and activities into Unit-level operations?	
Engagement		
4. Science and Management Partnerships	Does the Unit actively engage with scientists and scientific organizations to improve its ability to respond to climate change?	
5. Other Partnerships	Have climate change related considerations and activities been incorporated into existing or new partnerships (other than science partnerships)?	
Adaptation		
6. Assessing Vulnerability	Has the Unit engaged in developing relevant information about the vulnerability of key resources, such as human communities and ecosystem elements, to the impacts of climate change?	
7. Adaptation Actions	Does the Unit conduct management actions that reduce the vulnerability of resources and places to climate change?	
8. Monitoring	Is monitoring being conducted to track climate change impacts and the effectiveness of adaptation activities?	
Mitigation and Sustainable Consumption		
9. Carbon Assessment and Stewardship	Does the Unit have a baseline assessment of carbon stocks and an assessment of the influence of disturbance and management activities on these stocks? Is the Unit integrating carbon stewardship with the management of other benefits being provided by the Unit?	
10. Sustainable Operations	Is progress being made toward achieving sustainable operations requirements to reduce the environmental footprint of the Agency?	

The Scorecard. This form, along with supporting narratives for each element, will be completed annually by each Forest or Grassland.

Online reporting

Scorecard reports should be submitted using the online form that is available through the Climate Change Intranet site (http://fsweb.wo.fs.fed.us/chief/climatechange/), which asks the following questions. Bold questions are Scorecard questions that require a YES or NO response; sub questions are prompts that require a narrative response. Your answers to the prompts should help you determine whether you can answer the Scorecard questions yes or no. They will also allow you to show the efforts you have made in each element even if your answer to the Scorecard question is no.

1. **Employee education - Are all employees provided with training on the basics of climate change, impacts on forests and grasslands, and the Forest Service response? Are resource specialists made aware of the potential contribution of their own work to climate change response?**
    a. What climate change training is required of all employees on your Unit?
    b. What training have resource specialists had to increase awareness of the potential contribution of their own work to climate change response?

2. **CC coordinators - Is at least one employee assigned to coordinate climate change activities and be a resource for climate change questions and issues? Is this employee provided with the training, time, and resources to make his or her assignment successful?**
    a. What is the name and contact information for the climate change coordinator on your Unit?
    b. What training, time, and resources is he or she provided to fulfill his or her responsibilities?

3. **Program guidance – Does the Unit have written guidance for progressively integrating climate change considerations and activities into Unit-level operations?**
    a. In what ways have you integrated climate change considerations and activities into your overall annual operations?

4. **Science and Management Partnerships - Does the Unit actively engage with scientists and scientific organizations to improve its ability to respond to climate change?**
    a. How have your Unit and the science community collaborated and shared information to improve your ability to respond to climate change?
    b. Who are your main science partners?

5. **Other partnerships - Have climate change considerations and activities been incorporated into existing or new partnerships (other than science partnerships)?**
    a. In what ways have climate change activities been incorporated into your existing or new partnerships?

6. **Assessing vulnerability – Has the Unit engaged in developing relevant information about the vulnerability of key resources, such as human communities and ecosystem elements, to the impacts of climate change?**
    a. What key resources have you identified on your Unit?
    b. What scientific, social, and economic information about the exposure and sensitivity of those resources to climate change have you reviewed and considered?

c. What current stressors are you observing on your Unit? How do (or will) these stressors interact with a changing climate?
d. What historical climate data and climate projections have you examined? How might your key resources and their stressors be impacted by these climate changes?
e. Who have you consulted to help interpret the information you've collected?
f. How have you used this vulnerability information to prioritize possible management actions?

7. **Adaptation actions – Does the Unit conduct management actions that reduce the vulnerability of resources and places to climate change?**
    a. What adaptation activities are you doing on your Unit to reduce the vulnerability of your key resources to climate change?
    b. Are these activities aimed at increasing resilience to stressor impacts, promoting resistance to climate change, or facilitating transitions to respond adaptively to environmental change?

8. **Monitoring - Is monitoring being conducted to track climate change impacts and the effectiveness of adaptation activities?**
    a. What current monitoring activities can be or are being used to track climate change impacts and the effectiveness of adaptation activities on your Unit?
    b. What climate change related trends are you observing on your Unit?
    c. How are you using this information to adjust your management activities?
    d. What additional monitoring might need to be conducted?

9. **Carbon assessment and stewardship - Does the Unit have a baseline assessment of carbon stocks and an assessment of the influence of disturbance and management activities on these stocks? Is the Unit integrating carbon stewardship with the management of other benefits being provided by the Unit?**
    a. Does your Unit have a baseline assessment of carbon stocks?
    b. Does your Unit have an assessment of how disturbance and management activities are influencing carbon stocks or carbon sequestration and emissions? What is the basis for this assessment?
    c. How is your Unit integrating carbon stewardship with the management of other benefits being provided by the Unit?

10. **Sustainable operations - Is progress being made toward achieving sustainable operations requirements to reduce the environmental footprint of the Agency?**
    a. What actions has your Unit taken to make progress towards the sustainable operations targets listed in the definitions for this element?
    b. What reductions in resource use were achieved as a result of these actions?
    c. What support does your Unit provide for Green Teams, sustainable operations training, recognition programs, and other activities that foster a culture of sustainable consumption?

Forest Service Role	Scorecard Responsibility
Climate Change Advisor & Staff	Develop and refine guidance.
	Submit annual reminders to the field.
	Evaluate annual Scorecard reports.
	Report on Agency-wide Scorecard performance to the Chief, budget office, Department, and Congress.
	Track and evaluate overall national progress.
	Provide guidance and support to national programs, Regions, and Stations.
Regional Forester	Designate a regional climate change coordinator.
	Evaluate and report on Scorecard accomplishments for the Region.
	Organize and implement regional programs to support performance improvement.
Regional Climate Change Coordinator	Provide guidance and support for Forests and Grasslands in completing the Scorecard.
	Coordinate with other Regions, Stations, Washington Office, and Unit-level climate change coordinators.
	Assist the Regional Forester in annual evaluation of regional scorecard accomplishments.
	Serve as liaison with the Climate Change Advisor's Office.
	Advocate for performance improvement and climate change integration.
Washington Office, Regional Office Staff, and Research Stations	Develop national or regional support for the Scorecard such as educational programs (Element 1), assessments (Elements 6, 9), adaptation actions (Element 7), monitoring (Element 8), and partnerships (Elements 4 & 5).
	Assist in the development and refinement of regional and national Scorecard guidance.
Unit Supervisor	Report annually on Scorecard accomplishments.
	Designate a climate change coordinator.
	Build climate change considerations into appropriate operational activities.
Unit Climate Change Coordinator	Assist the Unit Supervisor in annual Scorecard reporting.
	Coordinate Scorecard activities.
	Serve as liaison with regional climate change coordinator.
Unit Staff	Participate in and support Unit-level scorecard activities.

Scorecard roles and responsibilities. Although the Unit Supervisor is responsible for reporting, all Agency employees have a role to play.

The Scorecard reporting cycle

Annual reporting on the Scorecard is designed to align with the fiscal year calendar (see figure on next page).

1. A request describing Scorecard reporting procedures will be sent from the Chief's Office (Climate Change Advisor) to Regional Foresters and Unit Supervisors in August 2011 and in July of each fiscal year 2012-2015.
2. Each Unit will complete the Scorecard online. Both the Climate Change Advisor's Office and the regional climate change coordinators will be able to access the online responses.
3. Regional climate change coordinators will evaluate responses to ensure consistency with this guide. The Climate Change Advisor's Office will forward Scorecard responses to the office of Strategic Planning, Budget, and Accountability for inclusion into the Performance Accountability System.
4. The Regional Forester, with the support of the regional climate change coordinator, will evaluate Scorecard performance Region-wide, and the level of support being provided by the Regional Office. The assessment, which is submitted to the Chief's Office, should include a summary of all Scorecard reports in the Region, how Regions, Research Stations, and the Washington Office lent support to activities listed on the Scorecard, and goals for improving regional support in the coming years. Any specific barriers to reaching compliance or recommended changes to the guidance document should also be communicated in the summary.
5. The Climate Change Advisor's Office will summarize and evaluate nation-wide responses to the Scorecard and the trends by Region and element toward 100% compliance by 2015. The Climate Change Advisor's Office will also make any recommended changes to the Scorecard guide for the following year.
6. The Climate Change Advisor's Office will send this summary to the Regions, Stations, and the Washington Office within the first quarter of each fiscal year. The Climate Change Advisor's Office will keep the Chief and the Department updated on annual progress of National Forests and Grasslands and Region, Station, and national support.

Getting help and sharing successes

Unit-level climate change coordinators should contact their regional climate change coordinators with any questions or concerns they have pertaining to the Scorecard, the guide, or Scorecard-related activities. The Climate Change Advisor's Office maintains an up-to-date list of regional climate change coordinators. Regional coordinators should contact the Climate Change Advisor's office with questions or concerns they are unable to answer. Questions specific to Element 10 can be posed directly to National_Sustainable_Operations@fs.fed.us. Units, Regions, Stations, and national programs are encouraged to share their successes with the Climate Change Advisor's Office throughout the year. The Climate Change Advisor's Office may wish to contact Units to follow up on particular programs or actions described in the narratives. Please contact the Climate Change Advisor's Office with Scorecard-related questions or stories.

Overview of the 2011 Scorecard reporting cycle. Specific dates may differ by Region or from year to year.

Policy: *relationship to strategic initiatives and policies*

USDA Strategic Plan (2010-2015)

The Scorecard was designed to link to the USDA Strategic Plan Goal 2 to "ensure our national forests and private working lands are conserved, restored, and made more resilient to climate change, while enhancing our water resources" and performance measure 2.2.3, "percent of National Forests in compliance with a climate change adaptation and mitigation strategy." The Forest Service is being tasked by the Department to lead the way to success in this measure. The Scorecard will help Units develop these strategies using a balanced and flexible approach.

Forest Service Strategic Plan (2007-2012)

The Scorecard aligns with several goals, objectives, and strategies in the Forest Service Strategic Plan. The Scorecard is particularly aligned with Goal 1: to Restore, Sustain, and Enhance the Nation's Forests and Grasslands. Working to reduce the impacts of invasive species, pests, and diseases and to restore and maintain healthy watersheds and diverse habitats will certainly be part of adaptation actions (Element 7). By assessing vulnerability in Scorecard Element 6, we will help achieve this goal by assessing the probable ecological and socioeconomic impacts of climate change on our forests and grasslands.

Accomplishing the activities on the Scorecard will help us achieve other goals and objectives as well. For example, we can help meet energy resource needs (Objective 2.3) through the production of energy from woody biomass. This objective is aligned with dimension 4: Mitigation and Sustainable Consumption (Elements 9 & 10). Strategies for Goal 5 of the FS Strategic Plan focus on partnerships and training to meet new challenges (Elements 1-5), and objectives focus on improving our facilities (Element 10) and information systems (Element 8). Finally, Goal 7 focuses on providing science-based applications and tools and increasing the transfer of scientific information, which aligns with almost every Scorecard element (in particular Elements 4 & 6-9).

National Roadmap for Responding to Climate Change

The National Roadmap for Responding to Climate Change (hereafter referred to as the Roadmap) is the companion document to the Scorecard. The Roadmap lays out the vision and rationale for the Agency-wide climate change response and identifies short-term and long-term actions that the Agency should take. The Scorecard provides a means of tracking implementation of the Roadmap on the level of individual Forests and Grasslands and for holding the Agency accountable for its climate change response. The table at the end of this section lays out the alignment between the Roadmap actions and each element of the Scorecard.

2011 Planning Rule

The Agency is in the process of planning rule revision for 2011. Although it has not been finalized, the planning rule is being designed to complement the Agency's climate change response. The new planning rule is being designed to address topics such as ecosystem resilience, collaboration, science-management integration, local and broad-scale monitoring, and an "all-lands approach" to land management. These concepts are supported by the same principles highlighted in the Roadmap and Scorecard.

Executive Order 13514

Executive Order 13514 – Federal Leadership in Environmental, Energy, and Economic Performance – directs each agency to not only develop a sustainability strategy and reduce greenhouse gas emissions but to develop policies and practices to support the Federal Adaptation Strategy. The Scorecard will simplify accomplishment reporting for this order.

Sustainable Operations Targets and Strategies

Government-wide and Forest Service-specific sustainable operation requirements (Element 10) have been set under Executive Order (EO) 13423, EO 13514, the Energy Independence and Security Act of 2007, and other sustainable operations related laws, regulations, and guidance. These requirements are further detailed in the USDA Strategic Sustainability Performance Plan. The Agency must also lead public response by example, as directed by the President in Executive Order 13514, Federal Leadership in Environmental, Energy, and Economic Performance. This requires an Agency-level commitment to: (1) Incorporate and maintain long term programs, practices, tools, and policies that integrate environmental footprint principles throughout the organization by removing barriers and promoting the use of efficient technologies; (2) Institute a culture that emphasizes education, rewards positive actions, and recognizes achievements that reduce our environmental footprint in long lasting ways; (3) Integrate environmental footprint activities into daily decisions, habits, planning and operations; and (4) Increase capacity and capabilities to implement sustainable operations throughout all levels of the organization.

Restoration Initiatives and Multi-Party Monitoring (CFLRP, PWJSI, WCF)

Restoration initiatives, such as the Collaborative Forest Landscape Restoration Program (CLFRP) and the Priority Watersheds and Jobs Stabilization Initiative (PWJSI), complement several elements on the Scorecard. These initiatives are designed to engage partners, make ecosystems more resilient, and incorporate multi-party monitoring. The Watershed Condition Framework (WCF) is currently being implemented by the field. Many of the indicators used in the WCF can help assess vulnerability (Element 6) and track climate change impacts if monitored (Element 8).

Resources Planning Act Assessments

The Resources Planning Act (RPA) Assessment reports on the status and trends of the Nation's renewable resources on all forests and rangelands, as required by the Forest and Rangeland Renewable Resources Planning Act of 1974. Since 1990, the effects of climate change on forest resources have been an additional focus of assessment research. The 2010 RPA Assessment will incorporate climate change effects into analyses of forest conditions, wildlife habitat, and water supply. These assessments can provide a potential launching point for Unit-level vulnerability assessments (Element 6) by helping to set the context for national and regional factors affecting Units (population growth, economic drivers, land use), providing scenario information (climate, population, economic), and by identifying resource areas of focus. RPA Assessments are also pertinent to Element 8 (Monitoring) and Element 9 (Carbon Assessments).

Roadmap Actions and Initiatives			
Scorecard Element	**Ongoing Activities**	**Immediate Initiatives**	**Longer Term Initiatives**
1 Employee Education	Providing basic and applied science		
	Conducting workshops for scientists and managers		
2 Climate Change Coordinators	Building management capacity for addressing climate change		
3 Program Guidance	Building management capacity for addressing climate change	Align Forest Service policy and direction	
4 Science and Management Partnerships	Providing basic and applied science	Develop vulnerability assessments through partnerships	Fortify internal climate change partnerships
	Conducting workshops for scientists and managers		Expand capacity for assessing the social impacts of climate change.
5 Other Partnerships	Building public awareness of climate change	Build public support for a strong, well-coordinated climate change response	Engage youth in climate change response
		Use collaborative approaches to support multiparty climate change responses	Build interagency coordination
		Develop vulnerability assessments through partnerships	Expand capacity for assessing the social impacts of climate change.
			Support community and regional collaboration.
6 Assessing Vulnerability	Providing basic and applied science	Furnish more predictive information on climate change and variability	Expand capacity for assessing the social impacts of climate change.
		Develop vulnerability assessments through partnerships	

7 Adaptation Actions	Restoring healthy, resilient forest and grassland ecosystems	Refine management practices using risk management and adaptive management	Develop a longer term restoration capacity
	Protecting infrastructure	Set priorities for management actions	Develop transition strategies
	Addressing climate change in planning and analysis	Connect habitats to improve adaptive capacity	Implement a genetic resources conservation strategy
	Protecting rare and sensitive species	Develop decision support tools for adaptation and mitigation	Develop comprehensive strategies for maintaining and restoring habitat connectivity
	Providing basic and applied science		
8 Monitoring	Playing a leadership role in carbon assessments and climate change monitoring	Tailor monitoring to facilitate adaptive responses	Implement monitoring systems to evaluate the effectiveness of management actions designed to facilitate adaptation and mitigation
	Utilizing national monitoring networks		
	Providing basic and applied science		
9 Carbon Assessment and Stewardship	Actively managing carbon stocks	Develop decision support tools for adaptation and mitigation	
	Facilitating demonstration projects leading to the development of markets for ecosystem services		
	Promoting woody biomass utilization		
	Playing a leadership role in carbon assessments and climate change monitoring		
	Providing basic and applied science		
10 Sustainable Operations	Reducing the Forest Service's environmental footprint	Develop a web-based sustainable operations information system	Take sustainable consumption to the next level

Dimension 1: Organizational Capacity — *engage employees through training and integrate climate change into program of work.*

The Forest Service's climate change response will be more successful if employees are informed and climate change is integrated into existing programs. As highlighted in the Roadmap, the Agency is already building management capacity for addressing climate change by working with partners to develop education and information resources for land managers and natural resource practitioners. Scorecard Element 1 makes sure these resources are available to employees and are used in employee professional development. The Roadmap highlights that the Agency is establishing climate change technology transfer contacts at the Region, Station, and Area levels. The Scorecard challenges Units to develop a similar role on each national forest or grassland, which will be designated as "climate change coordinators" (Element 2) to be part of a national learning network for climate change response. An immediate initiative identified in the Roadmap is to align the Agency's policy and direction with climate change strategies. Element 3 addresses whether Units are integrating climate change considerations and activities into operations.

1. Employee Education

To be prepared to respond to climate change, we need an informed workforce. Misconceptions about climate change lead to misunderstandings of climate change causes and impacts and, therefore, the risks that we face. Since all Forest Service employees contribute to our mission, all employees need to understand the basics climate change and how it impacts forests and grasslands. This will help them explain our climate change response to the public. Resource specialists need additional discipline-specific training to understand how their work can contribute to climate change response.

Here are just a few situations where climate change knowledge fits into the things we do every day:

- ✓ Natural resource managers need to understand how to incorporate adaptation and mitigation into their management activities.
- ✓ Planners need to understand how climate change considerations may alter decision-making processes and monitoring plans.
- ✓ Public affairs and education specialists need to know how to communicate our climate change response to the public.
- ✓ Engineering staff need to consider climate change impacts when designing new infrastructure or potential energy savings when designing new office space.
- ✓ Any employee may be asked what the Forest Service is doing to respond to climate change.

Scorecard Question

- **Are all employees provided with training on the basics of climate change, impacts on forests and grasslands, and the Forest Service response?**
- **Are resource specialists made aware of the potential contribution of their own work to climate change response?**

Definitions

- **All employees** are all permanent employees and term employees of the USDA Forest Service that have at least a 6-month appointment.
- **Training** includes formal and informal learning opportunities such as distance learning, workshops, seminars, formal classes, and educational webinars and videos.
- **Resource specialists** include line officers, staff officers, and employees that have technical expertise in natural resource management.

Geographic Scale

Educational programs can be developed locally, regionally, or nationally. Units are encouraged to take advantage of educational programs that have been developed within and outside of the Agency. Units should consult their regional climate change coordinators for information on suitable training opportunities and resources.

Getting to YES

To answer “yes,” your Unit should require all employees to participate in introductory-level climate change training and resource specialists should have additional training that is specific to their discipline. At this time, there is not a national curriculum so Units should choose the type of training (see box) that

best fits their needs and resources. The narrative for this element asks you to answer the following questions:

a) What climate change training is required of all employees on your Unit?
b) What training have resource specialists had to increase awareness of the potential contribution of their own work to climate change response?

What types of training could you offer your employees?

Depending on employee's level of specialization and link to climate change response, consider:

For all employees

- ✓ **Distance learning:** All employees can access online reputable climate change information developed by the Forest Service and other federal agencies. Your climate change coordinator could identify information that is specific to your geographic area and appropriate for different disciplines.

  *Tip: Check out the **Climate Change Resource Center**, an FS website designed for land managers (http://www.fs.fed.us/ccrc/); **Climate.gov**, a multi-agency website for a range of audiences (http://www.climate.gov/#education); the **Climate Literacy Guide**, which covers the essential principles of climate science (http://www.globalchange.gov/resources/educators/climate-literacy); and **Climate Change Wildlife and Wildlands**, a toolkit for formal and informal educators (http://www.globalchange.gov/resources/educators/toolkit).*

- ✓ **Basic educational seminars:** Live seminars about climate change, either in-person or through video, consist of presentations and discussion.

  Tip: Take advantage of times you are already gathered together, such as family and safety meetings, or utilize VTC and webinar technology for dispersed employees.

For resource specialists

- ✓ **Intensive training:** Weeklong, in-person courses that provide in-depth information about climate change, ecosystem response, and adaptation may be appropriate for climate change coordinators, line officers, staff officers, and employees that have technical expertise in natural resource management.

  Tip: Some Regions and Stations are starting to offer these courses: talk to your regional climate change coordinator for more information.

- ✓ **Discipline-specific training:** In-person workshops provide in-depth information and discussion about the interaction of climate change with specific discipline areas (e.g., silviculture, fish biology, and hydrology).

  Tip: Some regional and national training programs, such as the National Advanced Silviculture Program and NEPA, are beginning to offer climate change training as part of existing courses. Contact your regional climate change coordinators for more information.

- ✓ **Targeted workshops:** Encourage your resource managers to work closely with researchers through combined in-person and video-linked workshops to address specific issues, resources, and locations.

  Tip: Utilize your science-manager partnerships you developed in Scorecard Element 4.

More detailed information about these training approaches can be found in Appendix A.

2. Designated Climate Change Coordinators

Developing a climate change response requires a coordinated effort: within and among Units, and between the Unit, Regional Office, Research Stations, and Washington Office. Having someone assigned as a climate change coordinator can help ensure that the work is getting done, and that you're sharing your challenges and successes with others. Although the work may be divided up among several staff members, the coordinator serves as a single point of contact.

What can a climate change coordinator do for you?

Below are just a few things a climate change coordinator can do for your Unit:

- ✓ **Coordinate** activities listed on the Scorecard, such as:
  - Organizing educational seminars for employees.
  - Assisting with the planning of adaptation actions.
  - Starting up a Unit-level "green team."
  - Working with Unit leadership to set annual goals for climate change-related activities.
  - Assisting the Unit in working with external climate change partnerships in your area.
  - Discussing opportunities for joint studies with a Forest Service Research Station or local university.
- ✓ **Assist the Unit Supervisor** in annual Scorecard reporting and integrating climate change into work planning.
- ✓ **Serve as a resource** for the Unit's leadership team on climate change issues.
- ✓ **Communicate** with the regional climate change coordinator about accomplishments and challenges.
- ✓ **Share lessons learned and successes** related to climate change activities with other Units, the Regional Office, and the Washington Office.

Scorecard Question

- **Is at least one employee assigned to coordinate climate change activities and be a resource for climate change questions and issues?**
- **Is this employee provided with the training, time, and resources to make his or her assignment successful?**

Definitions

- A **climate change coordinator** is a permanent staff member with a program of work that includes assisting with climate change-related activities at the Unit level, and coordinating with the Regional Office and other Units on climate change activities. The climate change coordinator should have leadership and communication skills, enough of a technical or scientific background to learn and adopt new concepts related to climate change response, and time for climate change activities and training. The coordinator should also have a role in activities related to one or more Scorecard elements.

Who should be your climate change coordinator?

There's no one right answer to this question. Some forests and grasslands have assigned forest ecologists, ecosystem management staff officers, NEPA coordinators, soil scientists, air and water specialists, and silviculturists.

Geographic Scale

Each Unit should have one assigned coordinator. If more than one National Forest or Grassland is managed by the same Supervisor (e.g. Green Mountain and Finger Lakes), one coordinator can serve all Units managed by that Supervisor.

Getting to YES

To answer "yes," your Unit should have a climate change coordinator with the ability to serve as a resource for climate change questions and issues and training and time to fulfill his or her responsibilities. Let the Regional Office and other Units in your Region know who your coordinator is. Discuss with the coordinator your expectations of fulfilling his or her roles and responsibilities. The narrative for this element asks you to answer the following questions:

a) What is the name and contact information for the climate change coordinator on your Unit?
b) What training, time, and resources is he or she provided to fulfill his or her responsibilities?

3. Program Guidance

Climate change response is not about adding on an entirely new climate change program, but rather about building climate change considerations and activities into our existing programs. This will require guidance in setting priorities and to give direction for integrating climate change into existing programs.

Scorecard Question

- **Does the Unit have written guidance for progressively integrating climate change considerations and activities into Unit-level operations?**

Definitions

- **Guidance** is a written document that provides the Unit with specific direction on how it may integrate climate change considerations and activities into its current programs and activities.
- **Climate change activities** are actions we take to respond to climate changes such as assessing current risks, vulnerabilities, policies, and gaps in knowledge; engaging employees and stakeholders to seek solutions; and managing for resilience in ecosystems and human communities through adaptation, mitigation, and sustainable consumption.
- **Operations** are any activities carried out by the Unit, including training, partnerships, land management activities, planning, or business operations.

Geographic Scale

Guidance should be applicable to operations at the Unit level. Regional Offices, National programs, or Research Stations can provide guidance or assist in developing guidance.

Getting to YES

To answer "yes," your Unit should have an up-to-date written document that identifies how you plan to integrate climate change considerations and activities into your overall annual operations. Each year, show how your Unit has made progress in integrating climate change considerations and activities into your operations. The narrative for this element asks you: In what ways have you integrated climate change considerations and activities into your overall annual operations?

What counts as guidance?

You and your leadership team will be the best judges of what the right approach is for your particular Unit. There are many activities you might consider, including:

- ✓ Develop a 1-5 year climate change action plan for your Unit.
- ✓ Develop a joint action plan with other Units or partners in your geographic area.
- ✓ Develop amendments and appendices to ongoing program guidance.
- ✓ Develop a statement of climate change priorities for program goals, program delivery, and performance expectations.
- ✓ Develop a climate change team program of work.
- ✓ Incorporate consideration of climate change into the Unit's Strategic Goals document.

Dimension 2: Engagement — *develop partnerships and transfer knowledge*

The global nature of climate change means successful responses will require working across boundaries to accomplish common goals. Research-management partnerships are key to the rapid and successful adoption of new information needed to address emerging management problems and define relevant research and development objectives. While much expertise lies within the Agency, many experts, advisors, and initiatives are outside the Agency, and oftentimes the most effective action can be to participate in ongoing local or regional efforts.

The Roadmap highlights the need for engagement with our internal and external partners. While the Forest Service is already integrating science and management through workshops and building public awareness, there are opportunities to strengthen existing relationships and build new ones. In the near term, our Units will need to engage with their scientific partners to assess the vulnerability of human and ecological systems and look for potential ways our lands can be used to reduce atmospheric greenhouse gas concentrations. Through partnerships we can build environmental awareness, knowledge, and skills for employees, private landowners, Tribes, youth groups, and visitors so that we can all be better prepared to participate in decisions about the Nation's forests and grasslands. We will also need to work with the general public, local stakeholders, youth, tribes, and other agencies for an all lands approach to dealing with climate change and other large-scale threats to the broad array of benefits we receive from our forest and grassland landscapes.

4. Science and Management Partnerships

Many of our climate change activities will require assistance from technical experts in areas such as climate change education, vulnerability assessments, adaptation planning, carbon assessments, or sustainable business operations. Having established relationships with experts in the social and natural sciences can help you make better decisions and ensure that science and technology is being developed to fill management needs.

Scorecard Question

- **Does the Unit actively engage with scientists and scientific organizations to improve its ability to respond to climate change?**

What can a science-management partnership do for you?

Science-management partnership can help to expand expertise and capabilities at the Unit level. Below are just a few activities that you may consider:

- ✓ Work together to develop a science seminar series on the relevance of climate change to particular program areas (Element 1).
- ✓ Work with scientists, land and community managers, educators, and communicators to translate climate change science into accurate, audience-appropriate, and easily accessible tools and information (Elements 1, 3, 5, 6, 7, and 9).
- ✓ Work with social scientists to develop place-based educational materials that more effectively communicate climate change issues (Element 1).
- ✓ Discuss with scientists your need for research that will inform forest plan revisions, programmatic or project level planning, effects analyses, or monitoring related to climate change (Elements 3, 7, and 8).
- ✓ Develop adaptation actions and assess vulnerability or carbon (Elements 6, 7, and 9).
- ✓ Work with local experts on renewable energy and sustainability science to develop a joint "green team" (Element 10).
- ✓ Discuss with scientists your needs for research and technical support to improve your ability to manage climate-related issues (Elements 6, 7, 8, and 9).
- ✓ Exchange ideas and provide input into the development of tools that integrate climate change science and management, such as TACCIMO, the Template for Assessing Climate Change Impacts and Management Options: http://www.sgcp.ncsu.edu:8090/

Definitions

- **Scientists and scientific organizations** include Forest Service Research Stations, universities, other research agencies and programs, and other entities with a role in applied science development or delivery including science specialists and programs within the National Forest System and State and Private Forestry.

- **Partnerships** are any formal or informal relationship where two or more entities work together to achieve mutually beneficial goals.

Geographic Scale

Science-manager partnerships may exist on the Unit, with a coalition of Units across a particular geography or ecosystem, or at a larger state or regional scale. Units are encouraged to scale up and aggregate based on shared social and political interests as well as partner and scientific geography. However, larger-scale partnerships must have a direct benefit to the Unit level.

Getting to YES

To answer "yes," your Unit should have an ongoing partnership with scientists or scientific organizations that is helping you to improve your ability to respond to climate change. The narrative for this element asks you to answer the following questions:

a) How have your Unit and the science community collaborated and shared information to improve your ability to respond to climate change?
b) Who are your main science partners?

Where can you get engaged with the science community?

You may already have established relationships with scientists that you could expand upon to include climate change activities. Here are some ideas you may consider:

- ✓ Utilize your regional program managers such as ecologists, geneticists, wildlife biologists, hydrologists, and botanists and Forest Health Protection entomologists and pathologists as dedicated science application and delivery specialists.
- ✓ Work with scientists on your local experimental forest.
- ✓ Develop partnerships with science delivery and technology transfer specialists at the Research Station closest to your Unit.
- ✓ Work with local organizations that specialize in climate change science delivery.
- ✓ Work with scientists outside of the agency that do research in your geographic area.
- ✓ Engage with the science committees of regional science-management integration efforts convened by other agencies, such as the Department of Interior's Landscape Conservation Cooperatives, Climate Science Centers, or Joint Ventures.
- ✓ Take advantage of national level service centers such as the Threat Assessment Centers, the Ecosystem Management Service Center, the Forest Management Service Centers, the Forest Health Technology Enterprise Team, the Stream Systems Technology Center ("Stream Team").

For a list of existing programs that focus on science-management integration, see Appendix B.

5. Other Partnerships

Responding to climate change, and other large-scale challenges, lends itself to an all lands approach. We can increase our capability to respond to climate change by working with partners at a landscape scale, framing problems and solutions at the level of watersheds, ecoregions, or broad geographic areas. A functional landscape in this context is defined not by its acreage or jurisdictions, but by interdependencies of ecological, social, and economic processes and functions.

Scorecard Question

- **Have climate change considerations and activities been incorporated into existing or new partnerships (other than science partnerships)?**

Definitions

- **Climate change activities** are actions we take to respond to climate changes such as assessing current risks, vulnerabilities, policies, and gaps in knowledge; engaging employees and stakeholders to seek solutions; and managing for resilience in ecosystems and human communities through adaptation, mitigation, and sustainable consumption.
- **Partnerships** are any formal or informal relationship where two or more entities work together to achieve mutually beneficial goals.

How do you incorporate climate change into partnerships?

- ✓ Design and deliver place-based climate change education events for employees, youth, volunteers, or the general public (Element 1).
- ✓ Incorporate climate change adaptation and mitigation concepts into community-level or grass-roots collaborative planning processes, such as watershed assessments (Elements 7 and 9).
- ✓ Develop state-level or regional climate impact assessments for the forest sector (Element 6).
- ✓ Engage in joint ecosystem restoration projects as part of your adaptation strategy (Element 7).
- ✓ Set up a local division of a citizen science climate change monitoring program (Element 8).
- ✓ Increase understanding of climate change impacts using the traditional ecological knowledge of American Indian and Alaska Native Tribal communities (Elements 5 and 6).

Geographic Scale

Partnerships may exist at the Unit level, with a coalition of Units, or at sub-regional/regional scales. Units are encouraged to scale up and aggregate based on shared social and political interests as well as partner geography. However, larger-scale alliances must be beneficial to the Unit level.

Getting to YES

To answer “yes,” your Unit should include climate change-related considerations and activities in one or more existing or new partnerships to expand your capacity to respond to climate change. The narrative for this element asks you: In what ways have climate change considerations and activities been incorporated into your existing or new partnerships?

Which partnerships might involve climate change considerations and activities?

The partner landscape is diverse, and mutually beneficial goals may vary from place to place. Think about partners and organizations you are already involved with or new organizations that are being developed specifically to respond to climate change. Below are just a few you may consider:

- ✓ State-level climate change impact groups, such as the Wisconsin Initiative on Climate Change Impacts (http://www.wicci.wisc.edu/).
- ✓ Climate change groups convened by other federal agencies, such as the Department of Interior's Landscape Conservation Cooperatives (http://www.fws.gov/science/shc/lcc.html).
- ✓ State-level forest resource groups, forest advisory councils, or forest health councils.
- ✓ American Indian and Alaska Native Tribal governments and communities.
- ✓ Landscape-scale groups convened by non-governmental organizations, such as The Nature Conservancy's Central Appalachians Integrated Landscape project or Southwest Climate Change Initiative, and the U.S. Fire Learning Network (http://tncfire.org/training_usfln.htm).
- ✓ State Foresters.
- ✓ Community-based forestry coalitions.
- ✓ Watershed councils.
- ✓ Resource conservation districts.
- ✓ Grazing associations.
- ✓ Utilities and utility commissions.

More resources on partnerships and engagement can be found at the Partnership Resource Center: http://www.partnershipresourcecenter.org

Dimension 3: Adaptation — *assess impacts of climate change and manage change*

In order to manage forests in a changing climate, we will need to assess the current and expected impacts of climate change, assess which resources are most vulnerable to these impacts, adjust our management strategies when necessary, and monitor impacts and effectiveness of our strategies over time. The Roadmap identifies a need to develop climate change vulnerability assessments for our National Forests and Grasslands and for those assessments to include social impacts. Element 6 provides an approach to developing these assessments at the Unit-level to inform decision-making. The Roadmap also identifies an immediate need to improve adaptive capacity on the lands we manage. Element 7 asks whether this process is underway at the Unit level, and is based on information from the vulnerability assessments. Finally, both vulnerability assessments and adaptation actions will require some form of monitoring. Monitoring changes in impacts and stressors helps us understand what resources are or will be most vulnerable. Part of a robust adaptation strategy is the appropriate use of monitoring to inform whether the strategy is effective. Element 8 asks whether monitoring is being used to track both climate change impacts and the effectiveness of adaptation actions.

6. Assessing Vulnerability

Developing a climate response requires us to understand how climate change may affect the resources we manage and the benefits they provide. Resource and social vulnerability intertwine. A vulnerable community around a forest puts more demands on the resource and the Agency and offers less potential and fewer resources for partnering. A more vulnerable forest threatens adjacent resources and puts more ecosystem services at risk. As with any threat we face, understanding which resources are most vulnerable and how the threat interacts with other stressors can help us develop and prioritize management activities in response. This understanding can also help us identify our monitoring needs.

Scorecard Question

- **Has the Unit engaged in developing relevant information about the vulnerability of key resources, such as human communities and ecosystem elements, to the impacts of climate change?**

Definitions

- **Vulnerability** is the degree to which a system is susceptible to, and unable to cope with, adverse effects of stressors, including climate variability and extremes. Vulnerability to climate change is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity.
- **Key resources** are economic, ecological, and social resources of particular importance to Unit-level decisions and actions. They can also include resources of regional or national importance, interest, or concern, if the Unit contributes to or affects these.
- **Stressors** are any physical, chemical, or biological entity that can induce an adverse response. Stressors can arise from physical and biological alterations of natural disturbances, increased demand for ecosystem services (such as recreation), alterations of the surrounding landscape, chemical alterations in regional air quality, or from past management actions.

Geographic Scale

Vulnerability can be assessed at a Unit, state, multi-unit, or Regional scale, but must be at a spatial resolution relevant to management actions at the Unit level and include the geographic area of the Unit. Units are encouraged to take advantage of and be actively engaged in state and regional assessments that are being conducted by Forest Service Research Stations and Regional Offices, state or other federal agencies, non-governmental organizations, or other research groups. Units should seek assistance from Regions and partners when evaluating whether published assessments are appropriate for their needs and geographic location. If no vulnerability assessments are available or in development in the Unit's geographic area, Units should consult their regional climate change coordinator or partners for assistance in assessing vulnerability of their key resources to climate change.

Getting to YES

To answer "yes," vulnerability of key resources to climate change should be assessed for a geographic area that includes your Unit and be used in Unit-level management decisions. Consult your regional climate change coordinator for assistance as many Regions have already begun work on this element.

Vulnerability assessments can vary in approach, scope, level of detail, and geographic scale. We recommend that they include the following components (described in more detail in Appendix C):

a. **Key resources:** Identify the key resources on the Unit. You may have already completed this step in your forest planning process.
b. **Review of existing information:** Review relevant scientific, social, and economic information to identify the sensitivity of key resources to climate change. Check with your Regional Office to see if they have already created such a document or have gathered this information.
c. **Current stressors:** Determine the influences and stressors on the existing landscape, and identify current stressors which may interact with climate change and social and economic factors.
d. **Local climate change and impacts:** Look at historical climate data and available climate model projections for your area to determine the potential exposure of key resources to climate change.
e. **Professional judgment:** Consult with scientists, regional program managers, tribes, or other partners who have place-based experience to help interpret the information you've collected.

The narrative for this element asks you to answer the following questions:

a) What key resources have you identified on your Unit?
b) What scientific, social, and economic information about the exposure and sensitivity of those resources to climate change have you reviewed and considered?
c) What current stressors are you observing on your Unit? How do (or will) these stressors interact with a changing climate?
d) What historical climate data and climate projections have you examined? How might your key resources and their stressors be impacted by these climate changes?
e) Who have you consulted to help interpret the information you've collected?
f) How have you used this vulnerability information to prioritize possible management actions?

How do you identify your key resources?

The most valued benefits that a Unit provides to its surrounding community vary from place to place. To identify your key resources, consult your land management plan, scientific experts, tribes with traditional ecological knowledge, and other stakeholders. Consider:

- ✓ Trees and their associated products such as paper, building materials, and biofuels
- ✓ Availability of grazing resources for domestic and wild herbivores
- ✓ Clean and abundant drinking water
- ✓ Winter recreation opportunities such as ice fishing, skiing, and snowmobiling
- ✓ Ecological communities and ecosystems
- ✓ Wilderness character
- ✓ Habitat for fish, wildlife, and rare and endangered species
- ✓ Infrastructure for socioeconomic benefits, including energy and transportation

Where can you find a vulnerability assessment?

Many federal agencies, state governments, non-governmental organizations, and scientific research groups have developed or are in the process of developing climate change vulnerability assessments or similar products. Your Unit vulnerability assessment need not be as formal as these products, but here are some assessments you may want to consider* or review:

- ✓ Unit-level vulnerability assessments
  - Examples: Watershed vulnerability assessments in development for several national forests; The Ecosystem Vulnerability Assessment and Synthesis for the Chequamegon-Nicolet National Forest (http://treesearch.fs.fed.us/pubs/38255)
- ✓ State-level climate impact assessments for the forest sector
  - Example: The Washington Climate Change Impacts Assessment
- ✓ State-level action plans and assessments that include climate change
  - Examples: State Wildlife Action Plans and State Forest Resource Assessments and Strategies
- ✓ Regional assessments developed by the Forest Service
  - Example: A Vulnerability Assessment and Action Plan for National Forests in Western Washington (http://ecoshare.info/wp-content/uploads/2011/05/CCFB.pdf)
- ✓ Regional assessments developed by other federal agencies or groups of agencies
  - Examples: BLM Rapid Ecoregional Assessments; Regional assessments for the US Global Change Research Program's National Climate Assessment; National Park Service Resource Condition Assessments.
- ✓ Regional assessments developed by non-governmental organizations
  - Examples: vulnerability assessments developed by the Nature Conservancy and the National Wildlife Federation.

*Note: Some of these assessments may not have sufficient detail at the local level to be used in unit-level decisions or may only address impacts but not sensitivity of resources or adaptive capacity. You will need to evaluate them on a case-by-case basis. More information is available in Appendix C.

7. Adaptation Actions

New information about the potential vulnerabilities of key resources to climate change may cause us to reconsider whether our current goals and objectives can be met using our current management activities. Treatments may need to be adjusted in time and place, or different treatments may be needed to achieve the same goals. In some cases, goals and objectives themselves may need to be re-evaluated. Adjusting our activities and decision-making processes to reduce the vulnerability of key resources to climate change is called adaptation, an essential step in ensuring that our lands continue to provide benefits under a changing climate. Adaptation actions aim to promote resilience or resistance to climate change or facilitate transitions when an altered climate regime can no longer sustain our current systems.

Scorecard Question

- **Does the Unit conduct management actions that reduce the vulnerability of resources and places to climate change?**

Definitions

- A**daptation actions** facilitate long-term (decades to centuries) Unit-level resilience and/or resistance to potentially adverse effects of climate change or facilitates transitions to future states by minimizing disruptive outcomes. Adaptation actions are supported by scientific principles and documented in the scientific literature.
    - Examples: maintaining and enhancing biological diversity, reducing terrestrial or aquatic exotic species, modifying genetic guidelines for planting nursery stock, or investing in infrastructure that can withstand a disaster.
- **Resilience** is the degree to which systems (e.g., a forest ecosystem, aquatic system, or human community) can recover from one or more disturbances without a major (and perhaps irreversible) shift in composition or function.
    - Example of managing for resilience: periodic reduction in stem densities and surface fuels to reduce fire severity in dry forest or use of distributed energy systems that are locally self-sufficient.
- **Resistance** is the ability of an organism, population, community, or ecosystem (terrestrial, aquatic, human) to withstand perturbations without significant loss of structure or function. From a management perspective, resistance includes 1) the concept of taking advantage of and boosting the inherent (biological) degree to which species are able to resist change, and 2) manipulation of the physical environment to counteract and resist physical and biological change.
    - Example of managing for resistance: placement of fire breaks on the perimeter of climatically sensitive wildlife habitat to reduce fire spread or constructing levees to avoid flooding.
- Approaches that **facilitate transitions (also called response and realignment)** are strategic actions that work directly with the changes that climate is provoking and ease transitions to future states by mitigating and minimizing undesired and disruptive outcomes while maintaining essential functions.
    - Example of managing to facilitate transitions: planting species or genotype mixes that may be more suited to altered climate conditions in restoration projects.

How do you incorporate adaptation actions in to your decisions and management activities?

Below is one approach that has been used on other Units that may work for you:

1. **Connect adaptation actions to vulnerability assessments:** Development of adaptation actions will generally be focused on those resources and locations that have been judged to be most sensitive to climate change in interaction with multiple stressors.
2. **Review synthesized information on adaptation strategies:** Documentation of adaptation strategies includes the scientific basis for how various general approaches to management and planning can maintain or enhance resilience and resistance of key resources or facilitate transitions.
3. **Review planned projects:** Review planned projects (see list on next page for ideas) to determine if management actions are consistent with adapting to a changing climate, then revise as needed in the context of objectives for sustainable resource management.
4. **Develop adaptation actions:** Management plans and projects may require the development of specific on-the-ground actions that can maintain or enhance resilience and resistance of key resources to a changing climate or facilitate transitions.
5. **Evaluate feasibility and probability of success:** Consider if the potential benefit of a proposed adaptation action is worth the investment of cost and human resources. Generally, only those actions that have a high probability of achieving a positive outcome should be pursued.
6. **Identify monitoring options:** Monitoring is critical for determining the success of adaptation actions over a period of decades. Periodic evaluation of monitoring data will allow for adjustments of management if necessary.

For more information about this approach, see Appendix D.

Geographic Scale

Adaptation actions will usually take place at the Unit level, but some might encompass larger scales that include the Unit. Support should be provided by Regional Offices, Research Stations, and the Washington Office. Units are encouraged to consult their regional climate change coordinator or partners for assistance.

Getting to YES:

To answer "yes," your Unit should identify and incorporate relevant adaptation actions based on the vulnerability of key resources (identified in Element 6) into priority setting and management actions. The narrative for this element asks you to answer the following questions:

a) What adaptation activities are you doing on your Unit to reduce the vulnerability of your key resources to climate change?
b) Are these activities aimed at increasing resilience to stressor impacts, promoting resistance to climate change, or facilitating transitions to respond adaptively to environmental change?

Where should you add adaptation actions?

Adaptation actions should be added into existing plans to aid in decision-making. As you move forward in developing new projects and plans, you should consider including actions for climate change adaptation. Below are some types of plans and strategies where adaptation considerations are appropriate:

- ✓ A conservation strategy.
- ✓ Your Unit's Land Management (Forest) Plan.
- ✓ Landscape plans such as Collaborative Forest Landscape Restoration Projects.
- ✓ Community Wildfire Protection Plans.
- ✓ Suite of essential actions under the Watershed Condition Framework.
- ✓ Project plans.
- ✓ Travel Management plans.
- ✓ Your Unit's annual program of work.

8. Monitoring

Monitoring paves the way for vulnerability (Element 6) and carbon assessments (Element 9) to be updated and validated, revealing critical new issues. Just as monitoring visitor use can help make better decisions about managing your recreation program, so too can monitoring help you develop and adjust adaptation actions to respond to climate change. There is a wide variety of national monitoring programs already in place that are organized by the Forest Service, other agencies, and non-governmental organizations. Many of these programs, as well as your local monitoring programs, may have data that will help you assess trends in climate change, associated stressors, and the viability of your most vulnerable resources.

Scorecard Question

- **Is monitoring being conducted to track climate change impacts and the effectiveness of adaptation actions?**

Definitions

- **Monitoring** is both (1) the collection and analysis of resource data to measure the direction, pace, and magnitude of changes over time in the amounts, spatial distribution, or condition of resources; and (2) the systematic collection, analysis, and interpretation of resource data to evaluate progress toward meeting management objectives. See Appendix E for descriptions of three types of monitoring that are important to consider in the context of climate change.
- **Effectiveness monitoring** is focused on evaluating resilience and adaptation outcomes that result from on-the-ground activities. The aim is to determine the effectiveness of management actions taken to reduce stressors, enhance resilience, or conserve species.

Geographic Scale

Monitoring may take place at the Unit level or larger scale. Discuss with your Regional climate change coordinator how data from your Unit level monitoring programs may relate to climate change issues. Many types of monitoring relevant to climate change are coordinated at regional or national scales. Work with Regional Offices and science partners to interpret data from monitoring programs and examine local, regional, and larger-scale long-term (multi-decade in most cases) trends and how these trends may differ across spatial and temporal scales. These trends should then be interpreted for the Unit level.

Getting to YES

To answer "yes," your Unit should evaluate current monitoring programs to determine how they can be used to track changes in the most highly vulnerable resources and most critical stressors and provide a summary of important trends. There are two ways to approach this:

1. If a vulnerability assessment has been completed, focus monitoring on the conditions of highly vulnerable resources and critical stressors identified in the assessment. Try to avoid a single emphasis approach (single species for example), but rather focus on systems and major system components. In addition, stressors whose effects are expected to be exacerbated by climate change should also be monitored (e.g. burn severity, insect or disease outbreaks).

2. If a vulnerability assessment is not yet available, work with scientific and technical experts to identify potentially important, highly vulnerable resources and critical stressors based on current scientific data and publications.

You should work with your Regional Office to ensure that any new monitoring is consistent with regional and national programs.

The narrative for this element asks you to answer the following questions:

a) What current monitoring programs can be or are being used to track climate change impacts and the effectiveness of adaptation activities on your Unit?
b) What climate change related trends are you observing on your Unit?
c) How are you using this information to adjust your management activities?
d) What additional monitoring might need to be conducted?

What monitoring programs address climate change?

Monitoring programs that were designed for other purposes can provide helpful information on trends in climate-related stressors and changes in vulnerable resources. Below are some monitoring programs that you may want to consider:

- ✓ Unit-level land management plan monitoring.
- ✓ Unit-level monitoring of wildlife, phenology, visitor use, growth response, etc.
- ✓ The Forest Service's Forest Inventory and Analysis (FIA) program.
- ✓ The Forest Service's Watershed Condition Framework monitoring.
- ✓ The U.S. Geological Survey (USGS) National Stream Gauging Network.
- ✓ The USGS National Atmospheric Deposition Program's National Trends Network.
- ✓ The Natural Resources Conservation Service's Natural Resource Inventory.
- ✓ The Environmental Protection Agency's Ambient Air Quality Monitoring Program.
- ✓ The Forest Health Monitoring program.
- ✓ Department of Interior Landscape Conservation Cooperative monitoring programs.
- ✓ Other appropriate federal, state, university, and non-governmental organization monitoring programs, such as the Breeding Bird Survey.
- ✓ Experimental forests.
- ✓ The Forest Service "Climate Tower Network."
- ✓ The Ten-Year Wilderness Stewardship Challenge (www.wilderness.net).

See Appendix E for examples of how to use national monitoring programs to address questions at the Unit level.

Dimension 4: Mitigation and Sustainable Consumption — *assess carbon stocks and reduce our Agency footprint*

In addition to adapting to climate change, the Forest Service is contributing to worldwide efforts to mitigate climate change and reducing greenhouse gas emissions from its land management activities and business operations where possible. As mentioned in the Roadmap, the Agency as a whole is already actively managing carbon stocks, playing a leadership role in carbon assessments, and working to reduce its environmental footprint. Elements 9 and 10 ask how these activities are being translated down to the Unit level. Element 9 addresses Unit-level understanding of the land management aspect of greenhouse gas mitigation, while Element 10 addresses the business operations aspect.

9. Carbon Assessment and Stewardship

Our nation's forests and grasslands play a critical role in storing carbon and helping to reduce the amount of greenhouse gases that are released into the atmosphere. We as an Agency continue to play a strong role in helping to mitigate greenhouse gas emissions by conserving and restoring forest and grassland ecosystems, and may also play a role in other greenhouse gas mitigation activities such as energy infrastructure development. Being a "carbon literate" Agency means understanding how carbon storage varies across the landscape and how disturbances and management actions have affected carbon stocks in the past and may affect them in the future. This understanding is even more critical when climate change may exacerbate stressors, creating even more carbon losses in some ecosystems. Understanding and communicating the temporal dynamics of carbon is particularly challenging. Carbon assessments can help you understand how much carbon is currently stored in your forest and grasslands and how the potential to reduce atmospheric greenhouse gases may be influenced by management activities and disturbance regimes.

Scorecard Question

- **Does the Unit have a baseline assessment of carbon stocks and an assessment of the influence of disturbance and management activities on these stocks? Is the Unit integrating carbon stewardship with the management of other benefits being provided by the Unit?**

Definitions

- A **baseline assessment** is a compilation of data about current carbon stocks and recent changes in carbon stocks on the land and in harvested wood products. The data may be presented by land use and cover categories within National Forest or Grassland boundaries that support analysis and assessment: forest, shrubland, grassland, wetland, other non-forest land, and meaningful subdivisions of these (Note: These cover types may not be significant everywhere, or may be too small in area to justify separate analysis).
- **Carbon stocks** are the quantity of carbon stored in terrestrial components ("pools") of the forest or grassland at a given point in time. Pools include aboveground living trees or other vegetation, dead wood, leaf litter, roots and soil. For the purposes of reporting on this element, we are not including carbon in fossil fuel resources, wood products, lakes or rivers, emissions from agency operations (included in Element 10), or the impacts of socioeconomic infrastructure on emissions. However, decisions about such resources may still have implications for Unit level decisions related to greenhouse gas mitigation more broadly.
- An **assessment of the influence of disturbance and management activities on carbon stocks** is an analysis of the main factors affecting changes in carbon stocks, the opportunities to increase sequestration or reduce emissions of greenhouse gases through changes in land management where appropriate, and the interactions with other services provided by the land. Consideration of the needs and potential impacts of energy and other socioeconomic infrastructure may be appropriate for such analysis, particularly if conducted at larger geographic scales than the Unit level, but is not required for the purposes of this scorecard.

Geographic Scale

The baseline assessment may be prepared at the Unit, state, landscape, or regional level as long as it breaks out information for individual Units (see Appendix E). The most appropriate scale for conducting the assessment of disturbance and management activities on carbon stocks may be either the individual Unit or a larger scale (landscape, state, region) depending on the availability of existing analyses and whether Units have been explicitly included as part of a larger-scale assessment, such that the prospective role of federal lands can be determined. The assessment may also draw on information from life cycle analysis of the effect of forest management alternatives done at a multi-region, national, or international scale.

Getting to YES

To answer "yes," your Unit should have a baseline assessment of carbon stocks and an assessment of the influence of disturbance and management activities on these stocks and should use these assessments to integrate carbon stewardship with the management of other benefits being provided by the Unit. Assessments can be separate documents, a combined document, or part of a larger regional or state assessment. However, the information should be presented in a way that is easily understood by and relevant to those making Unit-level decisions. The previous sections on definitions and geographic scale provide some guidance about what information may be minimally required, and the technical information in Appendix F provides additional guidance about approaches.

The narrative for this element asks you to answer the following questions:

a) Does your Unit have a baseline assessment of carbon stocks?
b) Does your Unit have an assessment of how disturbance and management activities are influencing carbon stocks or carbon sequestration and emissions? What is the basis for this assessment?
c) How is your Unit integrating carbon stewardship with the management of other benefits being provided by the Unit?

What tools are available for estimating carbon?

Links to tools developed by Forest Service researchers and other groups for estimating carbon are at the Climate Change Resource Center (CCRC) Tools at http://www.fs.fed.us/ccrc/tools/. You will find:

- ✓ **COLEv2.0** enables the user to examine forest carbon characteristics of any area of the continental United States.
- ✓ The **Carbon Calculation Tool 2007, CCT2007.exe** reads Forest Inventory and Analysis (FIA) data and generates state-level annualized estimates of carbon stocks on forest land.
- ✓ The **Forest Vegetation Simulator (FVS)** is the USDA Forest Service's nationally supported framework for forest growth and yield modeling.

More details about these tools and other carbon estimation methods are in Appendix F.

10. Sustainable Operations

The direct relationship between healthy forests and our faucets, our clean air, our heating systems, our modes of transportation, and many other goods and services has never been more apparent or important. Several laws, regulations, and Executive Orders have established requirements for reducing our environmental footprint. To fulfill the Forest Service's obligation to present and future generations, our land stewardship mission must be strategically integrated with practices that reduce our resource consumption. Instituting a culture of sustainable consumption by integrating environmental footprint reduction principles into all our programs, practices, and policies will help us to reach our goals.

Scorecard Question

- **Is progress being made toward achieving sustainable operations requirements to reduce the environmental footprint of Agency operations?**

Definitions

- **Environmental footprint** is a measure of human demand on an ecosystem. For the Forest Service, footprint areas include energy, water, waste, fleet/transportation, and purchasing.
- **Sustainable operations as defined by EO 13514** are operations conducted in such a way as to create and maintain conditions under which humans and nature can exist in productive harmony, and that permit fulfilling the social, economic, and other requirements of present and future generations.
- **Applicable** means cost effective, practicable, and appropriate and feasible within the Unit's geographic area. For example, a Unit in a remote area may not be able to meet the requirement to use non-petroleum fuels if such fuels are not commercially available in their area.
- **Sustainable operations requirements** are the legal requirements of EO 13423, EO 13514, Energy Policy Act of 2005, and the Energy Independence and Security Act of 2007, summarized as follows (full list at http://www.fs.fed.us/sustainableoperations/documents/crosswalk-sus-goals-eo.pdf):
    - **Energy:** Reduce energy intensity (BTU/GSF) by 3 percent per year or 30 percent total by FY 2015 (2003 baseline). Increase use of renewable energy to not less than 5 percent of total electric energy in FY2011-12 and not less than 7.5 percent of total electric energy in FY2013 and beyond. Renewable energy requirements are doubled if the energy is produced at a federal facility, on federal lands, or on Indian land.
    - **Water:** Reduce potable water intensity (gal/GSF) by 2 percent per year or 16 percent total by FY2015 (2007 baseline). Reduce industrial, landscaping, and agricultural water consumption by 2 percent per year or 20 percent total by FY2020 (2010 baseline).
    - **Fleet and Transportation:** Reduce fuel consumption by 2 percent per year or 20 percent total by FY2020 (2005 baseline), increase use of non-petroleum fuels by 10 percent per year by 2015 (2005 baseline), right-size fleet, and increase use of low emission and high fuel economy vehicles.
    - **Greenhouse Gas Emissions:** Reduce greenhouse gas emissions from direct sources (Scopes 1 and 2) by 21 percent and from indirect sources (Scope 3) by 7 percent by 2020 (baseline 2008).
    - **Waste Prevention and Recycling:** Divert 55 percent of non-hazardous solid waste in buildings by FY2015 (FY2005 baseline); by FY2015, divert 50 percent of construction and demolition debris

each year; increase recycling; and divert compostable and organic materials. Employ environmentally sound disposition of electronics.

- **Green Purchasing:** By FY2015, ensure that 95% of all new purchases/contract actions, including task and delivery orders, comply with at least 1 of the 6 categories of green products: energy efficient (Energy Star-qualified, FEMP-designated, and low standby power), water efficient, environmentally preferable, EPEAT, biobased, recycled content, and non-ozone depleting. Purchase uncoated paper containing at least 30 percent post-consumer fiber.

Do facilities data calls overlap with Element 10?

Actions taken and reported in national Engineering data calls, such as those from Green Purchasing and Fleet, sometimes overlap with requirements in Element 10. Examples include:

- ✓ **Building Sustainability Assessments - Federal Real Property Profile Element #25** – Requires building specific measurement against the *Guiding Principles* in the areas of integrated design, energy performance, water conservation, indoor air quality, and environmental impact of materials. This data call only applies to buildings larger than 5,000 GSF.
  - Required under EO 13423 and EO 13514
  - Reported at the end of each FY (September 30)
- ✓ **Energy and Water Evaluations of Covered Facilities** – This data call is facility (i.e., building or site) specific. There are currently 102 Covered Facilities in the Forest Service.
  - Required under EISA
  - Ongoing reporting, with DOE "snapshot" taken on June 30th
- ✓ **FY Greenhouse Gas (GHG) and Annual Energy Report** – These national-level reports contain compiled information on Agency GHG emissions by scope, renewable energy installations, energy and water intensity, metering of buildings, and training expenditures.
  - Required under EO 13514 and EISA
  - Reported annually in early January for the last FY

Tip: Collaborate with unit engineers, energy managers, and subject specialists to ensure coordination of these requirements.

Geographic Scale

To reach Agency-level sustainable operations requirements, significant efforts must be made at the Unit level, with assistance, guidance, and leadership from the Regions, Stations, Area, and national level. Place-based solutions are the most effective for making operations more sustainable and implementing a culture of sustainable consumption over the long run.

Getting to YES

To answer "yes," your Unit should either:

- demonstrate in the narrative that it has made progress towards the applicable sustainable operations requirements listed in the definitions OR
- complete the Sustainable Operations Checklist (Appendix G) annually (use the narrative to provide a justification for any items deemed not applicable).

The narrative for this element asks you to answer the following questions:

a) What actions has your Unit taken to make progress towards the sustainable operations targets listed in the definitions for this element?
b) What reductions in resource use were achieved as a result of these actions?
c) What support does your Unit provide for Green Teams, sustainable operations training, recognition programs, and other activities that foster a culture of sustainable consumption?

How do you start a "green team"?

A green team is a group of employees, regardless of discipline or organizational level, that facilitates the pragmatic implementation of sustainable operations principles at their work site. Having a green team can help your Unit reduce its environmental footprint while providing leadership development opportunities and promoting collaboration within and among Units.

To get started on your own green team, check out the online "Green Team Toolkit" at http://www.fs.fed.us/sustainableoperations/greenteam-toolkit/index.shtml. You will find:

- ✓ How to Start a Green Team
- ✓ Resources by Footprint Area
- ✓ Success Stories by Region/Station/Area
- ✓ Green Team Contacts
- ✓ Green Factoids
- ✓ National Footprint and Sustainability Strategies

…and more!

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Appendix A: Education Technical Guidance

A comprehensive program to educate the workforce may incorporate several elements, including basic education, intensive training, and discipline-specific workshops (Figure 1). Although information is conveyed to different audiences at different levels of complexity, three fundamental components are common to each educational element: climate change science, ecosystem response to climate change, and management strategies and approaches for adaptation and mitigation. The education goes in both directions, with scientists providing the latest high-quality information, and practitioners discussing important Unit-level considerations and realistic management responses to ecosystem change.

The degree to which different sectors of the workforce engage in climate change education is best decided by Unit-level Supervisors. The components below are some suggested approaches for a Forest Service educational program for responding to climate change:

- ✓ **Distance learning:** All employees would benefit from access to climate change information through interactive internet and video courses and resources. Encourage your employees to take advantage of information and education at the appropriate level of complexity.

  Effective education and knowledge management requires integrating a wide range of tools and communications modes. This component of Element 1 can make extensive use of the Forest Service's flagship climate change website, the Climate Change Resource Center (CCRC; http://www.fs.fed.us/ccrc/), and video teleconferencing technology available to most Units. The CCRC provides remote access to information that is usable to individuals in multiple geographical areas, of different disciplines and of varying levels of specialization. Employees involved in informal and formal education with k-12 students and the general public may also want to make use of the Climate Change Wildlife and Wildlands Toolkit, developed jointly by the Forest Service and other federal agencies (http://www.globalchange.gov/resources/educators/toolkit).

  The effectiveness of live meetings can be also be improved by strategically using distance learning resources. Viewing online lectures and electronic presentations prior to live workshops will provide participants with a knowledge base, allowing in-person workshops to focus on interactive exercises. Follow-up activities available online will help to cement skills learned during live training.

  As a resource center, the CCRC is also expanding to include interactive tools that provide managers with information on climate change, forest change and adaptation, and carbon sequestration. Training packages for practitioners have already been prepared for delivery via web, including an online short course entitled "Adapting to Climate Change" that includes information about climate change, forest response, and adaptation. A second online video short course about carbon is currently being prepared.

- ✓ **Basic educational seminars:** You may consider providing your employees with live seminars about climate change, either in-person or through video.

  Basic educational seminars are intended to convey fundamental principles of climate change and the effects of climate change on forested ecosystems and to generate discussion of how Forest or

resource areas can adapt to projected changes. This component is characterized by one- to two-day seminars in which the first half day is largely comprised of presentations on climate change, forest response, and management strategies. The remainder is tailored specifically to the needs of the host Forest. Needs range from general brainstorming and discussion to creating lists of potential activities that can take place at the Forest and project level. The role of the seminar facilitators is largely to answer specific questions where possible, provide continuity by sharing ideas from previous seminars from other Forests, and maintain a dialogue focused on climate change activities. These seminars may be used to set the stage for "next steps", in which plans for further training, activities, or intra-Unit discussion are initiated.

- ✓ **Intensive training:** Weeklong, in-person courses that provide in-depth information about climate change, ecosystem response, and adaptation may be appropriate for climate change coordinators, line officers, staff officers, and employees that have technical expertise in natural resource management.

Intensive training includes weeklong courses providing much more in-depth information than that provided in seminars. Some Regions and Stations are already developing these courses for Unit-level staff, and these courses may be particularly beneficial to climate change coordinators. Courses typically include both pre-work and a final project to be concluded within the participants' Forests or Grasslands. The intensive training moves beyond a simple overview of climate change, providing participants with a detailed explanation of fundamental climate processes and interactions and how human impacts affect them. Additionally, much greater detail on ecosystem response to climate stressors is typically presented and discussed. Tools and applications relevant to carbon and climate are often presented in a computer lab setting in the presence of experienced instructors. Participants are given the opportunity to evaluate issues or resources in their own Forests using these tools. An emphasis is placed on the strengths and limitations of the tools for management-related decision-making. Final projects may vary in nature according to participant needs.

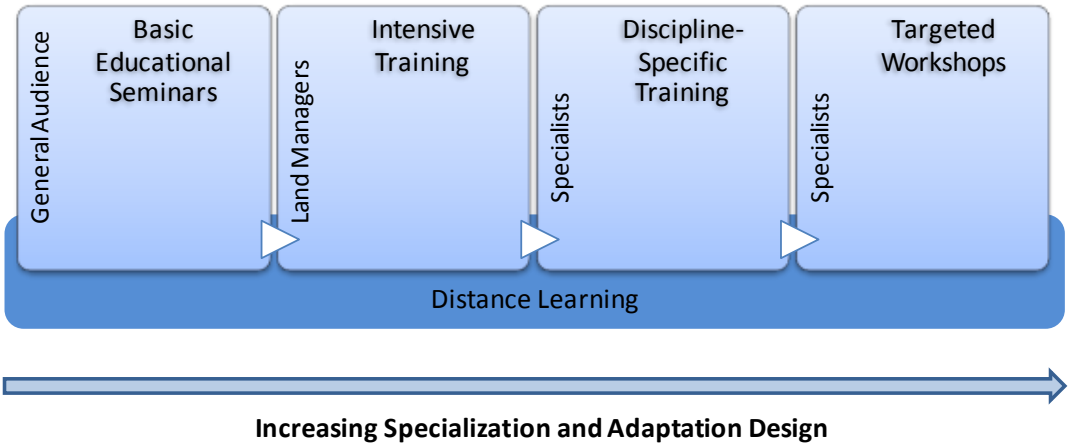

Figure 1. Conceptual diagram of educational and training efforts leading to increased complexity of adaptation planning and activities. These elements are integrated, but need not be taken consecutively. Distance learning can be incorporated into all activities.

- ✓ **Discipline-specific training:** Encourage resource managers and other technical experts to attend in-person workshops that provide in-depth information and discussion about the interaction of climate change with specific discipline areas (e.g., silviculture, fish biology, and hydrology).

  Discipline-specific trainings allow for focused presentation and discussion of climate change implications for specific resource areas. Although much of the information on climate change science, forest response, and management strategies described for the above educational approaches is also included in these trainings, the information most relevant to particular resource areas is emphasized. Additionally, this type of training is comprised of activities designed to draw upon participant expertise and interest. Examples of discipline-specific trainings include two-day regional silvicultural workshops given by NRS/R9 and PNW/R6, and an aquatic tools workshop hosted by RMRS for western Regions. These workshops incorporated scientific presentations on climate change impacts on forest ecosystems, brainstorming sessions on discipline-specific considerations for climate change, and breakout sessions to discuss strategies and local approaches and tools.

- ✓ **Targeted workshops:** Encourage your resource managers to work closely with researchers through combined in-person and video-linked workshops to address specific issues, resources, and locations.

  Targeted workshops will most heavily draw upon the skills of land managers with the intent of designing or altering techniques and programs to incorporate climate change considerations. These workshops will also likely involve the closest collaboration between researchers and managers, as the basic questions addressed require both mission areas: “What do we know now that requires us to change our actions?”, and “How can we practically change our actions to meet the changing needs?” As climate change challenges become more clearly identified, targeted workshops will be critical tools in pooling expertise to meet very specific needs of land managers and focus on specific issues, resources, and locations. The structure of individual workshops will depend upon management objectives and desired outcomes; they will likely include little focus on traditional educational models, and much greater focus on shared learning through detailed technical discussion within the context of a range of climate projections and impacts.

Appendix B: Existing U.S. Forest Service Programs with a Focus on Science Delivery.

These programs listed below can be a great starting point for thinking about how to integrate science and management and connect with the science community.

National Forest System	
Ecosystem Management Coordination	
Planning and Analysis Group Technical Assistance (WO Detached)	http://www.fs.fed.us/institute/
NRIS (FS Veg) (Ft. Collins)	http://fsweb.nris.fs.fed.us/
Forest Management	
Forest Management Service Center (Ft. Collins)	http://fsweb.ftcol.wo.fs.fed.us/frs/fmsc/
Engineering	
Remote Sensing Applications Center (Salt Lake City)	http://rsac.gsc.wo.fs.fed.us/
San Dimas Tech and Development Center	http://fsweb.sdtdc.wo.fs.fed.us/
Missoula Tech and Development Center	http://fsweb.mtdc.wo.fs.fed.us/
Geospatial Service and Tech Center (Salt Lake City)	http://fsweb.gsc.wo.fs.fed.us/
Wildlife, Fish, Water, Air & Rare Plants	
National Stream System Tech Center (Stream Team) (Ft. Collins)	http://www.stream.fs.fed.us/
Fish Aquatic & Ecology Unit	http://www.fs.fed.us/biology/fishecology/index.html
Wildlife Ecology Unit	http://www.fs.fed.us/biology/wildecology/
Range	
National Riparian Service Team (Prineville OR)	http://www.fs.fed.us/rangelands/ecology/riparian_serviceteam.shtml
Enterprise Program	http://fsweb.wo.fs.fed.us/enterprise-program/ep-contacts.php

State and Private Forestry	
Forest Health Protection	
Forest Health Technology Enterprise Team (Ft. Collins)	http://www.fs.fed.us/foresthealth/technology/
Fire & Aviation Management	
Wildland Fire Management RD&A Program (Boise)	http://www.fs.fed.us/rm/boise/rmrs_sai/rda_wildland-fire.shtml
LANDFIRE	http://www.landfire.gov/
Fire Modeling Institute (Missoula)	http://www.fs.fed.us/fmi/
Joint Fire Sciences Program (JFSP) (Interagency)	http://www.firescience.gov/
Fire Research and Management Exchange System (FRAMES)(Moscow, ID)	http://frames.nbii.gov/portal/server.pt
Co-op Forestry	
Urban and Community Forestry Technology Transfer Team	http://www.fs.fed.us/ucf/contact_ttteam.html
Urban and Community Forestry Technology Tech Transfer Centers	http://www.fs.fed.us/ucf/contact_ttcenters.html
Research and Development	
Western Wildland Environmental Threat Assessment Center (Prineville, OR)	http://www.fs.fed.us/wwetac/
Eastern Forest Environmental Threat Assessment Center (Asheville, NC)	http://www.forestthreats.org/
Focused Science Delivery Program (PNW Station)	http://www.fs.fed.us/pnw/about/programs/fsd/index.shtml
Science Application and Integration Program (RMRS)	http://fsweb.rmrs.fs.fed.us/science-application-integration/
Human Factors and Risk RD&A (RMRS)	http://fsweb.rmrs.fs.fed.us/docs/science-application-integration/human-factor-risk.pdf
Fire and Environmental Research	http://www.fs.fed.us/pnw/fera/

Applications Team (PNW Station/U. of Wash.)	
Forest Products Laboratory Technology Marketing Unit (FPL/S&PF)	http://www.fpl.fs.fed.us/tmu/index.html
National Agroforestry Center (FS/NRCS)(Lincoln, NB)	http://www.unl.edu/nac/
Northern Science, Technology, and Applied Results NorthSTAR (NRS)	http://www.nrs.fs.fed.us/units/northstar/
Northern Institute of Applied Climate Science (NRS)	http://nrs.fs.fed.us/niacs/
Forest Inventory and Analysis Program	http://www.fia.fs.fed.us/

Source: USDA Forest Service, Science-Management Integration Team, Final Report, September 22, 2009. Updated, January 2011.

Appendix C: Vulnerability Assessment Technical Guidance

Assessing vulnerability requires the synthesis and integration of existing scientific information, quantitative analyses, and expert opinion in order to determine the degree to which specific key resources are susceptible to the effects of climate change, including climate variability and extremes. Interactions of ecosystems, humans, and climate are not uniform, but vary greatly across the landscape. Climate projections and ecosystem and human response should be considered accordingly. The geographic scale and location needs to be chosen so that adequate detail is available in the vulnerability assessment for use in decisions on the Unit.

While vulnerability assessments will vary in their approach, below is a list of components that must be included in all vulnerability assessments to qualify for a "yes answer." It is recommended that assessment follows steps a-f below, beginning by identifying key resources and ending with the identification of monitoring options.

a. **Key resources:** The assessment must identify the key resources within the area whose vulnerabilities will be assessed.

   There will be an enormous number of resources and ecosystem elements that can be identified even in a limited geographic area; assessing all of these will be beyond the capacity of most Units. However, Forest Plans will often identify key resources and ecosystem elements in the Unit, and the human communities that interact with them. Working with partners in the science community to identify others is recommended. Finally, the synthesis and development of information may bring still others to light.

b. **Synthesis of existing information:** The assessment must include a synthesis of existing information on the sensitivity of key resources to climate change, emphasizing available scientific, social, and economic information about the area.

   The vulnerability assessment must include a synthesis of what is currently known about the sensitivity of key resources in the analysis area and their interaction with the social characteristics, status and trends of the surrounding landscape. This synthesis would draw from the existing literature to describe the degree to which the key resources are affected (adversely or beneficially) by the variability of current climate or the potential changes in climate. The effect may be direct (e.g., a change in regeneration in response to a change in the mean, range or variability of temperature) or indirect (e.g., damages caused by an increase in the frequency of wildfire or drought). The amount of information on climate change effects is constantly increasing so that this synthesis can be developed using a number of existing resources, including impact assessments (e.g., Kling et al. 2003, Ray et al. 2008, Karl et al. 2009, Littell, et al. 2009), peer-reviewed research papers, and other reports and resources. TACCIMO, the Template for Assessing Climate Change Impacts and Management Options, is a tool developed for Regions 8 and 9 that can provide a starting point for finding existing information on climate change impacts http://www.sgcp.ncsu.edu:8090/.

c. **Current stressors:** The assessment should assess the influences and stressors on the existing landscape, and identify current stressors which may interact with climate change.

Many of the current stressors on the existing landscape will be exacerbated by a changing climate, but some may be diminished. For example, a number of stressors that are not directly linked to climate can have substantial effects on the key resources that were identified, including demographic shifts, land use change, and fragmentation. Describing the interactions of current stressors with ecosystem dynamics and the associated human communities will help establish the context in which the changes may take place, although the exact nature and degree of the future impacts of many stressors may not be able to be predicted.

d. Local climate change and impacts: The assessment must include an area-specific analysis of the potential exposure of key resources to climate change using the most up-to-date scientific information available.

The assessment must focus on specific key resources that have been identified by the Forest or the Region for the geographic area of interest. The existing literature may describe what is *generally* known about their potential sensitivity, but may not describe the vulnerability of the specific area of focus. The assessment should include an area-specific analysis of vulnerability that includes quantitative approaches such as simulation models of climate change and associated impacts. Different quantitative and qualitative approaches may be taken for key resources, ecosystem elements, and human communities (economic or demographic analyses).

The assessment must identify the sensitivity of resources of interest to changes in climate, the potential exposure (how much climate might change and the impact on the landscape), and the adaptive capacity of the systems to respond to those changes. When examining future climate change, the use of multiple scenarios and climate models can facilitate the exploration of a range of possible futures and help to determine the range of sensitivity and exposure of key resources. Consideration of changes in the mean of climate versus potential changes in the extremes (annual precipitation versus rainfall intensity or drought) may reveal critical vulnerabilities.

Given the range of ecosystem considerations, it is unlikely that any single (or integrated) quantitative model will provide all of the required information at appropriate temporal and spatial scales. Hence, a suite of ecological and resource models will be crucial tools in simulating the response of ecosystems to changes in climate. Published and ongoing work on the larger geographic and temporal trends (such as **the RPA Assessment**) can help establish the context for more specific work at local scales. The biological, ecological, and landscape models used in the assessment should be based on the same climate change models and emissions scenarios whenever possible (e.g., Swanston et al. *In press*). As with the use of multiple climate models and emission scenarios, the use of multiple biological and ecological models will help to determine the range of sensitivity and exposure of key resources.

On-going examples where managers and the science community are collaborating to quantify vulnerability to climate change include the Watershed Vulnerability Assessment pilot (contact

Michael Furniss, PNW), the San Juan Public Lands and Mountain Studies Institute project (contact Marcie Bidwell, MSI, 970-382-6908), Shoshone National Forest case study (contact Linda Joyce), and the Climate Change Response Framework project at the Chequamegon-Nicolet National Forest (contact Chris Swanston, NRS).

e. **Expert judgment:** The assessment must filter the output of the analyses and its uncertainties through the place-based experience and expert judgment of scientists, managers, tribes, and other stakeholders.

   There will be multiple types and sources of information used in vulnerability assessments. This information will need to be integrated across the resources and the landscape of interest. Output from various models must be integrated using expert judgment and place-based experience. Further, any model output is at best a very limited simulation of reality and should always be considered in the proper context. A 'common sense' approach could be developed using a panel of experts (scientists, managers, tribes, and other local experts) to synthesize the information and identify the vulnerabilities within the area of interest. A key component of this is the place-based knowledge and experience of the panel, which allows them to appropriately interpret and modify model output. Expert opinions are most valuable when explanations regarding the certainty, evidence, and underlying assumptions and reasoning of the opinion are also provided (Glick and Stein 2010).

f. **Monitoring options:** The assessment should identify where monitoring might be valuable to assess the conditions of the most vulnerable resources or critical stressors.

   The assessment will indentify the vulnerabilities within the landscape of interest and will identify where monitoring might be valuable. As part of that evaluation, the current monitoring plan should be reviewed to determine if these vulnerabilities are currently addressed (see Scorecard Element 8).

Glossary of Terms

Adaptive capacity (in relation to climate change impacts) -- The ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences.

Climate (change) scenario – A plausible and often simplified representation of the future climate, based on a consistent set of known principles about the climate system used as input to climate change impact models. A 'climate change scenario' is the difference between a climate scenario and the current climate.

Exposure -- The nature and degree to which a system is exposed to significant climate variations (Glick and Stein 2010).

Impact assessment -- The practice of identifying and evaluating, in monetary and/or non-monetary terms, the effects of climate change on natural and human systems.

Scenario -- A plausible and often simplified description of how the future may develop based on a set of assumptions about driving forces and key relationships. Scenarios may be derived from projections, but are often based on additional information from other sources, sometimes combined with a 'narrative storyline'.

Sensitivity -- Sensitivity is the degree to which a system is affected, either adversely or beneficially, by climate variability or change. The effect may be direct (e.g., a change in crop yield in response to a change in the mean, range or variability of temperature) or indirect (e.g., damages caused by an increase in the frequency of coastal flooding due to sea-level rise).

Stressors — any physical, chemical, or biological entity that can induce an adverse response. Stressors can arise from physical and biological alterations of natural disturbances, increased unmanaged demand for ecosystem services (such as recreation), alterations of the surrounding landscape, chemical alterations in regional air quality, or from a legacy of past management actions (Joyce et al. 2008).

Uncertainty -- An expression of the degree to which a value (e.g., the future state of the climate system) is unknown. Uncertainty can result from lack of information or from disagreement about what is known or even knowable. It may have many types of sources, from quantifiable errors in the data to ambiguously defined concepts or terminology, or uncertain projections of human behavior. Uncertainty can therefore be represented by quantitative measures (e.g., a range of values calculated by various models) or by qualitative statements (e.g., reflecting the judgment of a team of experts).

Vulnerability - Vulnerability is the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity.

(Unless noted, all of the above definitions are from the Glossary from IPCC 2007)

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Appendix D: Adaptation Technical Guidance

Scorecard Element 7 asks whether information about adaptation is being implemented within management and planning to ensure sustainability of key resources, ecosystem elements, and human communities. The scientific basis for adaptation has developed rapidly in recent years (IPCC 2007, Millar et al. 2007, Joyce et al. 2008, Seppälä et al. 2009, Halofsky et al. in press), providing Regions and national forests with sufficient documentation to develop adaptation strategies and tactics (e.g., Peterson et al. *in press*). Focused science-management partnerships provide a means for developing adaptation approaches that are closely linked with vulnerability assessments.

An adaptation strategy for a given Unit should describe a clear path toward practically integrating climate change adaptation into Unit-level decisions. The strategy is not meant to replace planning processes, but instead to describe how climate change information will be acquired and integrated into existing planning and management processes at the Unit level. Most Units will not immediately have the necessary information to develop a comprehensive strategy, and the strategy development should be considered iterative. An initial strategy could include a description of how the Unit intends to address each of the components listed below. It could include an initial list of partners, a general time line for major milestones, and descriptions of successful products and outcomes for each component. The adaptation strategy should describe how it will be integrated into Unit-level decision making.

Below are some steps you can take for incorporating adaptation into your current management activities and plans:

1. **Connect adaptation activities to vulnerability assessments:** Vulnerability assessment will generally occur before the development of adaptation strategies and tactics. This improves the efficiency of adaptation by focusing on those resources and locations that are most sensitive to a changing climate. Linking adaptation to vulnerability assessments can be done for resource disciplines (e.g., vegetation, hydrology), ecosystems (e.g., alpine, mixed conifer forest), or geographic locations (e.g., administrative Units, ecological subregions). The spatial and temporal scales of system structure, function, and processes need to be considered with respect to how a potential effect of climate change (vulnerability) can be matched with a specific adaptation tactic. In addition, landscapes beyond Unit boundaries should be included in adaptation approaches that address resource issues that are inherently cross-boundary in nature (e.g., ungulate migration, fire).

2. **Review synthesized information on adaptation strategies:** Documentation of adaptation strategies is the normal process of generating options for management and the scientific basis for those options. This provides credibility for including climate change as a component of sustainable resource management and reduces the potential for appeals and legal challenges. The scientific literature in this area is rapidly expanding, but the citations below provide a good starting point. It is ultimately the responsibility of Unit-level staff to identify the strategies that are most relevant for their location and management objectives. It can be helpful to link adaptation strategies with other general strategies for managing resources (e.g., animal

populations, road networks) to ensure compatibility and consistency. Adaptation strategies can be initially compiled by others, such as Regional staff, and subsequently referenced and refined by Unit-level staff.

3. **Review planned projects:** As you develop new projects or re-evaluate ongoing projects, you should also integrate climate change adaptation within your management and planning. At the most basic level, a Unit can simply make a list and for each project ask "How can potentially adverse effects of climate change be reduced through specific management actions?" This does not imply that all these actions must be taken, only that they be considered. Decision support tools are available for doing this type of review.

4. **Develop adaptation tactics:** Adaptation tactics are a set of potential on-the-ground actions that fall under specific general adaptation strategies. Adaptation tactics are generally consistent with principles of sustainable resource management, and it may be possible to simply modify existing activities that are ongoing or planned (e.g., remove more surface fuels than has been done in previous fuel treatments). It is helpful to link each tactic with a specific outcome in terms of general system function (e.g., tree growth) or a more quantifiable ecosystem service (e.g., water supply) at relevant spatial and temporal scales. Adaptation tactics should have a scientific basis and be adequately documented to reduce appeals and legal challenges.

5. **Evaluate feasibility and probability of success**: For any given ecosystem or location, a wide range of adaptation strategies and tactics can be considered. However, the *feasibility* – economic costs, staff time, regulations, and logistics – must be considered prior to implementation. Also, the *probability of success* for a specific adaptation tactic, based on scientific principles and previous applications, will often be the ultimate criterion for implementation. In considering feasibility and probability of success, the priority of specific projects must be balanced against the urgency of enhancing the adaptive capacity of various systems. Seemingly hopeless causes and situations requiring heroic and expensive actions are poor candidates for adaptation. Situations with highly uncertain outcomes or methods are not appropriate for single actions, but might be appropriate for experimentation with multiple actions.

6. **Identify monitoring options:** Monitoring plans for evaluating the effectiveness of adaptation approaches should be developed concurrently with the initial implementation of adaptation strategies and tactics. While this may be viewed as an expensive burden, it is the only way to confirm if specific approaches are working and if they are not, to allow enough time to make revisions. For some systems, relatively infrequent monitoring may be sufficient for evaluating effectiveness. In addition, monitoring of adaptation effectiveness can be combined with existing monitoring programs to improve efficiency.

Glossary of Terms *(from IPCC 2007)*

Adaptive capacity– The ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences.

Adaptation tactic – A specific action described in management and planning documents that supports adaptation strategies and is implemented on the ground (e.g. reducing stem density and surface fuels in a dry mixed conifer forest, increasing culvert size on roads along a stream that is expected to have higher flood volumes).

Climate change adaptation – An adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. Adaptation is often referred to as preparedness, and is based on scientifically supported strategic and tactical activities that support sustainable resource management. Adaptation addresses specific aspects of the sensitivity of resources to an altered climate.

Resilience -- The degree to which systems (e.g., a forest ecosystem) can recover from one or more disturbances without a major (and perhaps irreversible) shift in composition or function. Example of managing for resilience: periodic reduction in stem densities and surface fuels to reduce fire severity in dry forest.

Resistance -- The ability of an organism, population, community, or ecosystem to withstand perturbations without significant loss of structure or function. From a management perspective, resistance includes both 1) the concept of taking advantage of and boosting the inherent (biological) degree to which species are able to resist change, and 2) manipulation of the physical environment to counteract and resist physical and biological change. Example of managing for resistance: placement of fire breaks on the perimeter of climatically sensitive wildlife habitat to reduce fire spread.

Sensitivity –The degree to which a system is affected, either adversely or beneficially, by climatic variability or change. The effect may be direct (e.g., a change in tree growth in response to a change in the mean, range, or variability of temperature) or indirect (e.g., damage caused by an increase in the frequency of river flooding).

Uncertainty – An expression of the degree to which a value (e.g., the future state of the climate system) is unknown. Uncertainty can result from lack of information or from disagreement about what is known or even knowable. It may have many types of sources, from quantifiable errors in the data to ambiguously defined concepts or terminology, or uncertain projections of human behavior. Uncertainty can be represented by quantitative measures (e.g., a range of values calculated by various models) or by qualitative statements (e.g., reflecting the judgment of a team of experts).

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Appendix E (8/1/2011): Monitoring Technical Guidance

Types of monitoring to consider

The type of monitoring used and the appropriate spatial scale and resolution will be determined by the resources of interest and the particular questions asked. Below are three types of monitoring described in the Roadmap that are important to consider in the context of climate change:

- ✓ **Systematic monitoring** establishes monitoring locations across large areas, with monitoring stations often located in an established grid of various resolutions.
  - Example: The Forest Inventory and Analysis (FIA) program.
- ✓ **Targeted monitoring** assesses particular areas based on specific objectives, using measurements or indicators related to those objectives. It obtains quantitative or qualitative population density and trend estimates in areas where a given species or community has been identified as potentially vulnerable.
  - Example: monitoring outbreaks of insects and diseases or invasive species in areas that have been identified as vulnerable to infestation due to climate change.
- ✓ **Effectiveness monitoring** is focused on evaluating resilience and adaptation outcomes that result from on-the-ground activities. The aim is to determine the effectiveness of management actions taken to reduce stressors, enhance resilience, or conserve species.

In addition to those mentioned above, you may also want to consider the following in your adaptation activities:

- ✓ **Implementation monitoring** is designed to determine if plans, prescriptions, projects, and other resource management activities are implemented as designed and in compliance with land management plan objectives, requirements, and standards and guidelines. In relation to climate change, implementation monitoring is most valuable when it records what, where, when, how, and why adaptation activities are implemented.

Monitoring programs that were designed for other purposes can provide helpful information on trends in climate-related stressors and changes in vulnerable resources. Below are a few illustrative examples of how you can use data from current national monitoring programs to assess climate change-related questions at multiple scales, including the Unit level. **Many more examples are included in the Unified Multi-Scale Monitoring Approach: Summary Report for Agency Leadership (Monitoring Team for Climate Change, 2009).**

Example 1: Burn Severity

The Monitoring Trends in Burn Severity (MTBS) project (http://www.mtbs.gov/) has mapped severity, size, and other attributes of wildland fires nationwide from 1984 to the present using Landsat data (Eidenshink et al., 2007). The MTBS project was initiated to provide better information for monitoring the effectiveness and effects of the National Fire Plan (National Fire Plan 2004) and the Healthy Forests Restoration Act. MTBS data were specifically designed to assess the environmental impacts of large wildland fires and identify the trends of burn severity on all lands across the U.S. These data have been validated using pre-fire and post-fire measurements from FIA and related field plots to estimate and quantify fire effects on vegetation, biomass, and carbon stocks. MTBS is jointly implemented by the Forest Service's Remote Sensing Applications Center (RSAC) and the USGS Earth Resources Observation and Science Center.

As an ongoing activity (systematic monitoring) these data can be summarized by Unit or Region for monitoring trends in fire disturbance by year. They can also be summarized by watersheds to provide disturbance information for watershed assessment activities (Note: RSAC has completed some of these national summaries and could provide these data to Forests and Regions as needed).

Let's say your vulnerability assessment identified that there may be an increase in burn severity and associated impacts on invasive species and/or post-fire regeneration. These data can be used to develop a targeted monitoring plan to sample some burned areas to characterize and develop estimates of the attributes of interest across all burned areas. In our example, some fires in one region could be sampled (sample design will likely be based on time since disturbance, burn severity, biophysical setting, etc.). The attributes of interest include the regeneration status of these burned areas and the presence and abundance of invasive species in the floristic community. These attributes can then be monitored through time for trend information as needed. If the analysis of the sampling data suggests a need for management action such as a reforestation activity or invasive species treatment, site specific effectiveness monitoring would be conducted by the Unit implementing the activity.

Example 2: Forest Inventory and Analysis

The Forest Inventory and Analysis (FIA) program (http://fia.fs.fed.us/) provides the information needed to assess America's forests. FIA is the nation's continuous forest inventory on all land ownerships. These data are well suited for characterizing land cover change agents and estimating the associated area. FIA reports on status and trends in forest area and location; in the species, size, and health of trees; in total tree growth, mortality, and removals by harvest; in wood production and utilization rates by various products; and in forest land ownership. The FIA program includes data on soil, under story vegetation, tree crown conditions, coarse woody debris, and lichen community composition on a subsample of field plots. FIA is managed by the Research and Development organization within the USDA Forest Service in cooperation with State and Private Forestry and the National Forest System.

These data will be critical to vulnerability assessments given their design–based sample and long program history. A number of objectives related to climate change have been identified resulting in increased sampling intensity on Experimental Forests and Ranges. Some NFS Regions have also

intensified the FIA sample to enhance their ability to detect change, and improve the precision of their estimates. Based on the results of the vulnerability assessments, some species ecosystems, or communities may be identified for targeted monitoring. The FIA program is uniquely positioned to implement such a strategy across ownership boundaries and provide both context and statistical inference to all forested lands. Site specific management activities for adaptation and genetic conservation would remain the implementation monitoring responsibility of the Unit implementing the activity.

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Appendix F: Carbon Assessment Technical Guidance

Existing standards, processes, and programs that apply

The Forest Service and USDA have several relevant programs that can help guide the baseline assessment and some aspects of a strategic carbon management assessment.

- ✓ Forest Inventory and Analysis (FIA) provides the core monitoring data and analysis for U.S. forests, and compiles the annual carbon inventory for U.S. forests and wood products (http://www.fia.fs.fed.us/Forest%20Carbon/default.asp)
- ✓ The FS Global Change Research Program (FSGCRP) conducts research that is relevant to management of forest carbon, and provides technical support for monitoring, reporting, and analysis methods (http://www.fs.fed.us/research/climate/)
- ✓ The National Resources Inventory (NRI) conducts inventories and assessments of non-Federal lands – the methods and data may be relevant to carbon management assessment especially for grasslands (http://www.nrcs.usda.gov/technical/NRI/)
- ✓ Carbon tools and accounting rules and guidelines established under previous Congressional and Executive office direction, e.g., the voluntary greenhouse reporting program (http://nrs.fs.fed.us/carbon/tools/)

For some areas of the U.S. there may be state or regional guidelines for monitoring, estimating, and reporting project-level greenhouse gas reductions. These may be relevant if the reporting Unit is involved in existing regional or local management strategies.

The Intergovernmental Panel on Climate Change (IPCC) has established guidance for countries to use in monitoring, estimating, and reporting inventories of greenhouse gases at the country level and for some kinds of activities.

Recommendations in this document are consistent but less detailed than may be contained in the guidelines mentioned above. In developing assessments, reporting entities may need to consult the more detailed guidelines or an expert in their application.

Approaches to baseline assessment

For the baseline assessment, the reporting entity should estimate current (within last 5 years) carbon stocks and recent changes (within last 15 years) in carbon stocks for all lands. It is highly desirable to develop separate estimates for forest and grasslands, and for meaningful subdivisions of these land classes, such as forest type or an equivalent classification for grasslands or other cover types. It is also useful to compile estimates for each of the main ecosystem carbon pools (live biomass, dead wood, litter, and soils), and if timber harvesting takes place, the amount of carbon sequestered in harvested wood products. Finally, it is useful to identify the main causes of changes in carbon stocks, which may include growth, mortality (and mortality agents), timber removals, and grazing.

Estimates for Forests

The different recommended approaches are arranged by tiers following the IPCC approach, with higher tiers providing more accurate estimates but also being more complex and demanding of forest-specific data. Regardless of the tier selected, it is recommended that the calculations use the "stock-

change" method to calculate rates of change: estimate carbon stocks at time 1 (past date) and time 2 (current date), and divide the difference by the number of years to estimate average annual change in carbon stocks. If possible, it is desirable to have estimates of carbon stocks for three successive times, to calculate the changes over two time periods for trend analysis. The size of the Unit or area within a Unit may influence the choice of tier or method especially with respect to use of FIA data. Larger Units will typically have more FIA sample plots to use, which will generally reduce uncertainty, unless there has been intensified sampling compared with the standard.

- ✓ **Tier 1 – Use Unit-specific area data and "default" or regional carbon density estimates.** Multiply the area of the Unit times the average carbon density (quantity of carbon per Unit area) for the specified vegetation condition. This approach will not provide sufficient accuracy unless the area of appropriate vegetation conditions can be specified, such as age class, time since disturbance, or volume class. Carbon density estimates are available from the suggested references (especially Smith et al., 2006), or there may be local or regional estimates available in the literature. The **Carbon On Line Estimator (COLE)** may also be used to estimate local/regional carbon density for various user-defined vegetation classes (see carbon tools website for information about COLE and related guides).
- ✓ **Tier 2 – Use forest-specific FIA data from repeated surveys as a basis for estimating carbon stocks for two or more time periods**. For most Eastern National Forests, two or more FIA surveys are available, though access to the older data may require consultation with the appropriate FIA Unit. For many Western National Forests, only the most current inventory data may be available, though older inventory data not collected by FIA may be available. In all cases, care must be taken in implementing the tier 2 approach to be sure that methods and data are sufficiently consistent to provide a logical basis for estimating changes. There are several ways to access the FIA data – it is recommended to refer to the "carbon tools" web site for information about COLE and the **Carbon Calculation Tool (CCT)**, which may provide ready access to pre-compiled FIA data that may be used for carbon assessment, though individual National Forests may not be separated in all cases. COLE provides only data for the most recent inventory. CCT can provide trend analysis of carbon stocks, but only at the State level (though ownership class may allow for identification of forest-specific trends). Direct access to FIA data is provided through FIA data retrieval tools such as FIDO and EVALIDATOR, though this approach requires a higher level of familiarity with FIA data collection and analysis methods than either COLE or CCT. In the future, FIA may develop a version of the CCT that is specific to National Forests, which could greatly simplify the data retrieval and analysis process for carbon assessment.
- ✓ **Tier 3 – Use an existing vegetation monitoring/analysis system specific to the forest, or establish a new one.** Some forests may have their own land monitoring systems or be collaborating with other organizations to estimate carbon stocks and changes in carbon stocks. There are many different approaches to use, involving unique combinations of remote sensing, modeling, and inventory data. It is important to keep in mind that the standards and definitions used with this approach should be consistent with FIA and other standards referenced here, and that guidelines for using models should be followed (see reference by Prisley et al.).

- ✓ **Hybrid approaches – combinations of approaches described in the different tiers may be the most efficient and provide reasonable estimates**. For example, the reporting entity may use FIA data following the tier 2 approach for the current inventory, and use a simple model of carbon density change as described under tier 1.

Harvested wood products

Estimates of changes in carbon stored in harvested wood products should be included in the inventory if there is a significant amount of timber harvest from the reporting entity. Estimates of carbon remaining sequestered from harvested wood in products in use and landfills over time are contained in Smith et al. (2006) although there are currently no direct spreadsheet or other tools to make calculations. Tables from Smith et al. have been used to make local estimates of carbon stored in HWP (Healey et al. 2009). A simpler but less accurate approach is to consult estimates of annual changes in harvested wood products at a larger analysis scale such as a state (see USDA 2008) and scale down to the smaller area of interest for reporting purposes.

Estimates for Grasslands

Compared with information about forests, there is little information available about carbon stocks on Federal grasslands, though this may be important in some regions. Methods of evaluating carbon stocks are different between forests and non-forest lands. Non-forest lands are uniquely challenging as much of the sequestered carbon in these systems is found below ground. Methods currently used for estimating carbon stocks on non-forest lands include ecosystem simulation models (e.g. Century and derivatives and Biome-BGC, Hibbard et al. 2003), remote sensing (ground-based, Reeves 2009; airborne, and satellite, Hunt et al. 2004), flux towers (Svejcar et al. 2008) and chamber measurements (Jawson et al. 2005) or combinations of these techniques. Generally speaking, all these techniques will be limited by a lack of supporting field data on critical facets of shrub-and grasslands such as species composition and stand structure on federal lands. Since the process of estimating carbon stocks on non-forest lands under federal jurisdiction has not been undertaken, appropriate data collection on non-forest lands must be considered. Units are encouraged to consult regional climate change coordinators and science partners for guidance on how to address Grassland carbon estimates.

Approaches to strategic carbon management analysis

Overview of approaches

The objectives of the strategic carbon management assessment are to identify activities that may be undertaken to reduce emissions or increase sequestration, to quantify the expected emissions reductions, to prioritize future actions, and to analyze how carbon benefits might interact with other goods and services produced by the Unit. A good strategic carbon management assessment will also put management in the context of other factors that can affect carbon storage, such as disturbances by pests or fire, changes in vegetation composition, or changes in climate.

The strategic assessment should logically follow the baseline carbon assessment, from which a historical baseline can be derived. If models are available and robust enough to produce credible projections of future carbon stocks (taking factors such as climate change into account), then a future (or dynamic) baseline may be established. As a general principle, the analysis should compare each proposed

management strategy (or a scenario of actions) with the baseline management scenario to estimate "additionality," which is the additional carbon reduction expected from implementing a given strategy.

The strategic carbon management assessment should start with a common accounting framework for the carbon storage and emission types that will be considered by the assessment. But which elements of the framework are estimated and the estimation methods used will depend in part on local circumstances.

The accounting framework should include all categories of carbon sinks or emissions that could change as a result of the treatments being evaluated. Life cycle analysis methods help determine the categories for a common accounting framework (see below). Evaluation would determine which categories may have a change that is significant enough to make estimates. The estimation methods used would consider whether there is an existing mitigation analysis and/or climate change action plan that includes the reporting entity, what models or analysis techniques have been developed for the area or region, and what are the skills and time availability of the analysts. Models are often involved in strategic analysis – appropriate use of models should take account of the guidelines provided in Prisley and Mortimer (2004).

The **Forest Vegetation Simulator (FVS**) is often used in strategic analysis of vegetation management. FVS includes a carbon calculator embedded in the fire and fuels extension, which facilitates analysis of the impacts of alternative stand management practices on forest and harvested wood product carbon stocks. Stand-level projections need to be scaled up to the whole forest area to support the strategic assessment of carbon management. There are many other models available for projecting growth and yield of vegetation, some of which may include carbon variables such as biomass. Such models are not reviewed here, though they may be entirely appropriate to use for individual Units depending on local circumstances.

Life cycle analysis

If harvested wood products are an important activity on the forest, or there is interest in evaluating additional use of harvested wood products (e.g. for biofuel), it is recommended to use a life cycle analysis approach. Comparing the carbon consequences (impact) of changing from baseline management to alternate management is termed a "consequential" life cycle assessment (Brander et al. 2008). If wood harvest changes from the baseline to alternate management cases, carbon storage emissions could be altered over time and should be considered (and possibly estimated) (Perez-Garcia et al. 2005; Sathre and O'Connor 2008). These could potentially include changes not only in carbon storage in wood products or fossil energy emissions, but market induced changes – e.g. changes in emissions to make steel and concrete if wood replaces them or differences in land use change if higher revenue for wood/biomass keeps more land in forests.

Life cycle analysis has been used to specifically evaluate increasing wood use for energy and past studies indicate that carbon offset benefits vary over time and by wood source (among other factors) (Marland and Schlamadinger 1997, Marland et al. 1997, Zanchi et al. 2010). Life cycle analysis provides the most complete accounting of the effects of management alternatives, but can be complex to implement and

may be more suitable on a larger scale than the Unit level. In the future, life-cycle analysis tools will become more available to facilitate widespread use of this approach.

Greenhouse gas management activities

Strategic management options for reducing greenhouse gases fall into several general categories, which should be considered for including in the management assessment.

- ✓ **Changes in land management** -- Land management has long-term effects on carbon stocks and therefore may be modified to reduce emissions or increase storage in forest ecosystems and harvested wood products. Forests recover in a predictable pattern after management or natural disturbance that varies with site, forest type, and other factors. Alteration in management that changes harvest of wood for products has a significant effect on the overall C balance of a forest. Long-lived wood products produce the most positive C balance (compared to short-lived products) and, in addition to storing carbon, they have the potential to offset emissions from fossil fuel to the degree that they substitute for steel and concrete that emits more GHGs in manufacturing and transport. Managing at the landscape scale facilitates application of appropriate treatments to diverse individual stand conditions.
- ✓ **Afforestation (and other land use changes)** – Some areas of the U.S. have significant non-forest land that could be afforested or agricultural lands that could be converted to forests or perennial grasslands. Areas of marginal grassland that could be converted to forest, areas needing restoration, and old agricultural fields that could be converted to forest or grassland may be available on specific Units. Afforestation and conversion from agricultural lands to perennial grassland usually results in significant increases in carbon stock in biomass, and occasionally may increase soil carbon.
- ✓ **Avoiding loss of forest land** -- Forest loss causes significant loss of carbon stocks, so reducing the rate of forest loss would avoid emissions of stored carbon. This option is often associated with private land, but there may be some opportunities to reduce conversion on National Forests that occurs from various activities.
- ✓ **Bioenergy** -- Biomass in the forest or grassland or at a facility could be used for energy, and some carbon credit gained from substitution for fossil fuel. The amount of carbon "offset" depends on many factors such as sources and energy needed for transportation. The actual amount of biomass that is available for fuel is likely less than the total inventory of biomass available because of other owner objectives or the economics of transporting and converting the biomass to fuel.

Uncertainty analysis

It is recommended that both the assessment of carbon stocks and the carbon management analysis include some quantitative assessment of the uncertainty, and a discussion of the main causes of uncertainty. Estimates must be sufficiently accurate to assess differences among management actions with some confidence. Additional guidance will be provided on how to conduct uncertainty analysis and what standards may be useful.

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Appendix G (8/1/2011): Sustainable Operations Checklist

This Checklist is based, in part, on concurrent Executive Orders and statutory requirements to reduce the environmental footprint for all federal agencies, and offers the opportunity to not only meet these existing legal requirements but also take "duplicate credit" for these accomplishments via the Scorecard. The Checklist looks imposing at first, yet it tracks specific identifiable and implementable activities that collectively can make significant reductions in our environmental footprint and help us meet Federal targets. By utilizing the Checklist, Units can prioritize and focus on the implementation of specific consumption reduction actions instead of tracking numbers. Units can also take credit for many actions that are reported through other deputy areas (such as WO Engineering) and even use this exercise to prepare information for those data calls. The Checklist is not a one size fits all – units can select activities that make sense at its unique location. And while specific reduction goals have been set at the national level and are highlighted by footprint area, overall target reductions will be calculated collectively. This Checklist, in large part, will help you identify, track and implement activities already required.

The Checklist is divided into the following footprint areas:

1. Energy
2. Water
3. Fleet and Transportation
4. Waste Prevention and Recycling
5. Green Purchasing
6. Sustainability Leadership

How to Use this Checklist

First, review the Checklist and identify all items that apply to your location. Applicable action items are actions that are feasible within the geographic context of your Unit. For example, E85 fuel may not be available in remote areas. If you have a question regarding the feasibility of an action item, would like to determine if an action item is applicable, or would like to request the addition of a new action item, please submit your request with rationale to the Element 10 Review Team in an email with the subject line of Climate Change Scorecard to: National_Sustainable_Operations@fs.fed.us**.** The Checklist will be reviewed and updated as needed at a national level to accommodate new information and technology.

Each year, you must review action items and evaluate progress to date by filling out the Checklist. Answer "Yes" or "No" to each question in the Checklist and total your "Yes" answers. By FY2015, you must have completed 75% of all applicable items on the list. It is advisable to develop a Unit-wide approach to making progress in order to complete 75% of all applicable items on the list by 2015. Documenting this approach using the table format shown below is one method to complete the "Plans for Next Year" section of the narrative template.

As an example, the table below represents one approach of how a Unit could plan to achieve full compliance by FY2015 via incremental steps:

Assessment Year	% of Items with "Yes"	# of Items with "Yes" (out of total 66)

1	12.5	8
2	25	16
3	37.5	25
4	50	33
5	62.5	41
6	75	50

When filling out the checklist, use these guidelines to determine whether something counts as a "Yes":

- Responses should reflect activities completed within the current reporting year.
- **Items that require annual action may only be counted toward the cumulative total if they are being completed each year**. For example, under Green Purchasing #2, if the Unit is no longer using 100% recycled-content paper, then that item may no longer be counted in the cumulative total.
- Units may also acknowledge work completed prior to FY 2010, as long as that work is still applicable and being implemented on the Unit.

Units using Appendix G on Element 10 should submit a completed Checklist in place of documenting "Accomplishments to Date" in the narrative template. Units may also submit a table similar to that above in place of documenting "Plans for Next Year". Units completing Appendix G are still responsible for documenting "Barriers to Completion/Improvement" and "Plans to Overcome Barriers". The specifics in the Checklist are requested to quantify cumulative progress nationally and to help identify opportunities for clarification and support.

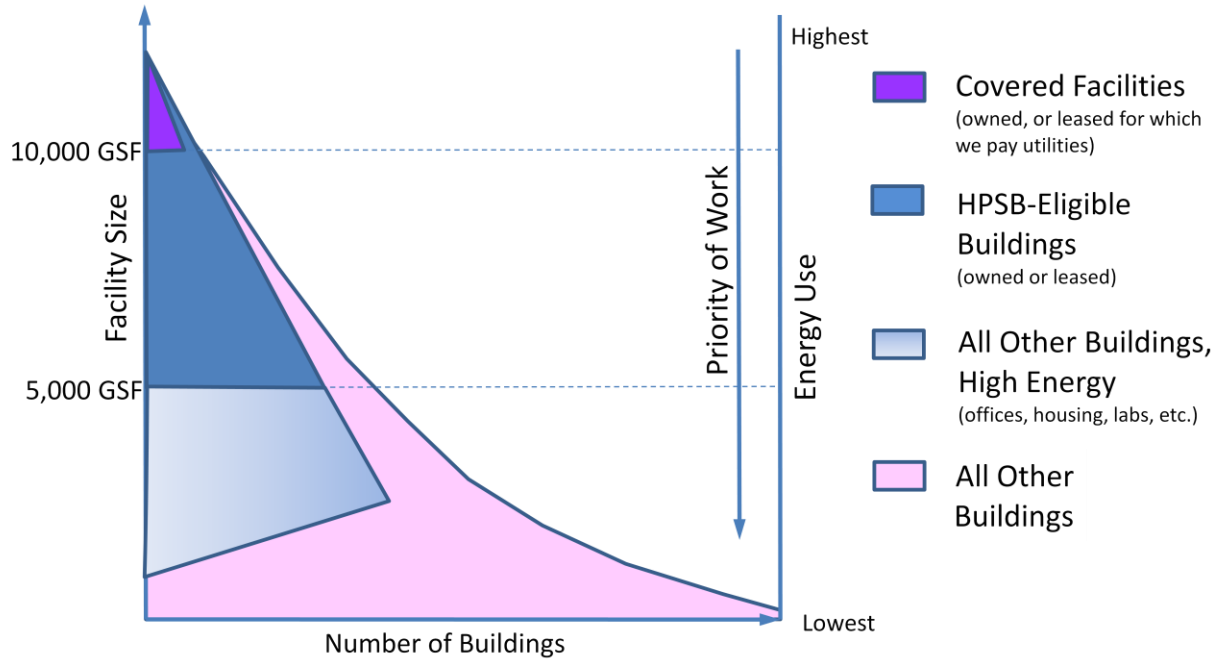
In the table below, the regulations in the right hand column apply to the goals and action items for each footprint area. Some actions, such as energy audits, are mandated. Some actions, like waste stream analyses are not mandated, but they support a Unit's effort to reach mandated waste stream reduction requirements. The intent is to help units avoid duplication of effort by highlighting where specific actions are aligned existing required accomplishment reporting.

Under some action items, you'll find tips to help you complete the action in *italics*, as well as links to relevant resources.

Did You Know?
While all action items in this Checklist will help your Unit work toward federally-mandated requirements, many are ***directly aligned*** with USDA and Forest Service requirements. Even if you do not choose to use the Checklist as your narrative for Element 10, these items are ***still required*** to ensure compliance with USDA and Forest Service policies.

When putting together a work plan for getting to "Yes," the graphic below illustrating the Engineering Facilities terms (defined in the Core Guidance of Element 10) may be used to help prioritize work in energy and water footprint areas.

Figure 1. Forest Service Facilities



Coordinate – Don't Duplicate!
Sustainable Operations efforts cut across many of our existing organizational silos. Work on action items in the following Checklist must be coordinated with the subject matter experts (Fleet Managers, Facilities Engineers, Regional Energy Managers, Unit Acquisition Specialists, etc.) in order to avoid duplication of—or inappropriate—effort. It is possible that many of these action items are already being worked on by others on your Unit or at your Regional Office.

Definitions

- **Sustainable consumption** is an operations ethic paralleling the Agency's land management ethic, which focuses on the consumption of resources. Sustainable consumption results from Sustainable Operations.
- **Covered Facilities** are the portion of Forest Service facilities included in the US Department of Agriculture (USDA) list of facilities that account for 75% of the USDA's facility energy and water

consumption. Consult with your Regional Energy Manager to obtain the most recent list of Covered Facilities.

- Buildings eligible to be **High Performance and Sustainable Buildings (HPSB)** in the Forest Service must first meet all of the following criteria:
    - Are owned or leased by the Forest Service, AND
    - Are fully enclosed structures at least 5,000 GSF in size, AND
    - Are **High Energy** buildings;

    OR
    - The energy intensity of the buildings is greater than 45,000 BTU/GSF per year. (Do not use renewable energy generated at the building or building site to reduce the total building energy consumption.)
- A **High Energy** building is one that provides occupied space (of no minimum percentage of building), such as office, work space, or living space, that is conditioned to provide for personal comfort. This definition does not apply to any specific size building.

The **list of eligible Forest Service HPSBs** can be found on the Forest Service Engineering Sustainable/Green Building website: http://fsweb.wo.fs.fed.us/eng/programs/facilities/sus_green/
(See Figure 1 in Appendix G for more information.)

Energy

Goals: Reduce energy intensity (BTU/GSF) by 3% per year (or 30% total) by FY2015 (2003 baseline). Increase use of renewable energy by 3% in FY07-FY09, increasing to 5% in FY10-FY12, and 7.5% in FY13 and beyond.

Action Item	Yes/ No	Completion Year	Project Scope[1]	Specific Action (please quantify where possible)	Regulation
1. Has the initial Utility Bill Clean Up been completed and has your Unit identified the top energy-using facilities? http://www.fs.fed.us/sustainableoperations/focus-area-energy.shtml#utility					EO 13423§2(a), EO13514§2(a)(i), EISA§431
2. Has your Unit conducted comprehensive energy evaluations of "covered" facilities? *See Engineering Guide. For a list of covered facilities, contact your Regional Energy Manager.* *If your Unit has no covered facilities on the list, please answer N/A to this question.*	*(e.g. Yes)*	*(e.g. 2011)*	*(e.g. Smokey Bear District)*	*(e.g. Smokey Bear Ranger District is on the covered facilities list and a contractor completed the energy evaluation).*	EO 13423§2(a), EO13514§2(a)(i), EISA§432, Guiding *Principles*

[1] Specifically define the scope of the action item. For example, if the Sustainability Ranking System was completed for certain facilities, list which facilities (ex. 'Hood River Ranger District- all buildings' or 'Each office building on all districts')

Action Item	Yes/ No	Completion Year	Project Scope[1]	Specific Action (please quantify where possible)	Regulation
3. Has your Unit used the results of the energy evaluations conducted on "covered" facilities to implement energy conservation measures? *This question refers to evaluations conducted in Energy Q2 above.* *Coordinate this work with Engineering*. *If your Unit has no covered facilities on the list, please answer N/A to this question.* *See Engineering Guide.* FSH – Chapter 70 Sustainable Buildings.					EO 13423§2(a), EO13514§2(a)(i), EISA§432
4. Has your Unit identified energy conservation measures on each "high energy" building? *Coordinate this work with Engineering.* *This question refers to "high energy" buildings not on the "covered "facilities list, which are addressed in Energy Q2. "High energy" buildings are defined in the Core Guidance.*					EO 13423§2(a), EO13514§2(a)(i), EISA§431

Action Item	Yes/ No	Completion Year	Project Scope[1]	Specific Action (please quantify where possible)	Regulation
Examples of energy conservation measures include retrofits such as upgrading lighting fixtures, replacing old HVAC systems, upgrading insulation, etc.					
5. Has your Unit implemented energy conservation measures on each "high energy" building? *This question refers to energy conservation measures identified Energy Q4 above.* *Coordinate this work with Engineering*. *Examples of energy conservation measures include retrofits such as upgrading lighting fixtures, replacing old HVAC systems, upgrading insulation, etc.* *See Engineering Guide.* FSH – Chapter 70 Sustainable Buildings.					EO 13423§2(a), EO13514§2(a)(i), EISA§432
6. Has your Unit installed two energy-efficient technologies in at least 75% of all buildings? *Examples of energy efficient*					EO 13423§2(a), EO13514§2(a)(i), EISA§431

Action Item	Yes/ No	Completion Year	Project Scope[1]	Specific Action (please quantify where possible)	Regulation
technologies include occupancy sensors, LED exit signs, vending misers, smart strips, and programmable thermostats. http://fsweb.mtdc.wo.fs.fed.us/toolbox/sus/page13.htm					
7. Have you inventoried the total % of energy consumed on your Unit produced with on-site renewable energy?					
8. Does at least 10% of the total energy consumed on your Unit come from on-site renewable sources?					
9. Does your Unit host energy awareness activities annually and share energy savings progress and opportunities with employees? *Examples of energy awareness activities include designing an energy conservation booth for a local Earth Day festival, organizing a brown bag lunch to educate employees about the building's energy footprint, etc* http://www.fs.fed.us/sustainableoperations/documents/Top10%20FreeThingsYouCanDoToReduceEnergyCosts.pdf					EO 13423§2(a), EO13514§2(a)(i), EISA§431

Action Item	Yes/ No	Completion Year	Project Scope[1]	Specific Action (please quantify where possible)	Regulation
http://www.fs.fed.us/sustainableoperations/documents/TopTenCheapThingsYouCanDoToReduceEnergyCosts.pdf					
10. Are all appliances at your facilities (e.g., bunkhouses, district offices, warehouses) Energy Star qualified? *Note: Item also covered in HPSB assessment for those qualified buildings*. List of Energy Star Qualified Products: http://www.energystar.gov/index.cfm?c=products.pr_find_es_products					EO 13423§2(a), EO13514§2(a)(i), EISA§431
11. Does your Unit have a "shut off lights and computers at night" policy with a designated person to monitor Unit compliance? http://fsweb.wo.fs.fed.us/irm/faq/desktop-restart-faq.php					EO13514§2(i)(ii)

Water

Goals: Reduce potable water intensity (gal/GSF) by 2% per year (or 16% total) by FY2015 (2007 baseline). Reduce industrial, landscaping, and agricultural water consumption by 2% annually (or 20% total) by FY2020 (2010 baseline).

Action Item	Yes/ No	Completion Year	Project Scope	Specific Action (please quantify where possible)	Regulation
1. Has the initial Utility Bill Clean Up been completed and has your Unit identified the top water-consuming facilities? http://www.fs.fed.us/sustainableoperations/focus-area-energy.shtml#utility					EO13423§2(c), EO13514§2(d)(i)
2. Have you performed leak detection on all water consuming facilities on your Unit?					
3. Have you fixed or repaired most leaks identified in Water Q2 above?					

Action Item	Yes/ No	Completion Year	Project Scope	Specific Action (please quantify where possible)	Regulation
4. Has your Unit conducted comprehensive water evaluations of "covered" facilities? *For a list of covered facilities, please contact your Regional Energy Manager.* *If your Unit has no covered facilities on the list, please answer N/A to this question*.					EO13423§2(c), EO13514§2(d)(i, EISA§432
5. Has your Unit used the results from the water evaluations conducted on "covered" facilities to implement water conservation measures? *Refers to evaluations conducted in Water Q4 above. Coordinate this work with Engineering.* *Examples of water conservation measures include upgrading to low-flow toilets, drip or no irrigation, greywater use, etc.* *If your Unit has no covered facilities on the list, please answer N/A to this question.* *See Engineering Guide.*					

Action Item	Yes/ No	Completion Year	Project Scope	Specific Action (please quantify where possible)	Regulation
FSH – Chapter 70 Sustainable Buildings.					
6. Has your Unit identified water conservation measures on each water-consuming facility at least once in the last 5 years? *Coordinate this work with Engineering.*					EO13423§2(c), EO13514§2(d)(i)
7. Has your Unit implemented water conservation measures on each water-consuming facility? *Refers to water conservation measures identified Water Q6 above.* *Coordinate this work with Engineering.* *Examples of water conservation*					EO13423§2(c), EO13514§2(d)(i)

Action Item	Yes/ No	Completion Year	Project Scope	Specific Action (please quantify where possible)	Regulation
measures include upgrading to low-flow toilets, drip or no irrigation, recirculation outdoor washwater where applicable, etc. *See Engineering Guide.* FSH – Chapter 70 Sustainable Buildings.					
8. Has your Unit installed two water-saving technologies in at least 75% of all buildings? *Examples of water-saving technologies include low flow showerheads, automatic shut-off switches on outdoor hoses, water displacers for toilet tanks, aerators on faucets, etc.*					
9. Does your Unit hold water awareness activities annually and share the water savings progress and opportunities with employees? *Examples of water awareness activities include brown bag lunches on topics such as the building's water use, the connection between water use and watershed health, and water conservation measures employees can*					EO13423§2(c), EO13514§2(d)(i)

Action Item	Yes/ No	Completion Year	Project Scope	Specific Action (please quantify where possible)	Regulation
apply. http://www.fs.fed.us/sustainableoperations/documents/WaterConservationHabits.rtf					
10. Has your Unit included a water use analysis during the conceptual phase of at least one renovation project?					EO13423§2(c), EO13514§2(d)(i)
11. Does your Unit use environmentally-friendly landscaping around most offices? *Environmentally-friendly landscaping can include native plants, xeriscaping (drought-resistant), rain gardens, etc.* *Note: Item also covered in HPSB assessment for those qualified buildings*. http://www.epa.gov/greenkit/landscap.htm					EO13423§2(c), EO13514§2(d)(ii)

Fleet and Transportation

Goals: Reduce fuel consumption by 2% per year through FY2020 and by 20% total by FY2015 (2005 baseline). Increase use of non-petroleum fuels by 10% annually by FY2015 (2005 baseline), right-size fleet, and increase use of low emission and high fuel economy vehicles.

Action Item	Yes/ No	Completion Year	Project Scope	Specific Action (please quantify where possible)	Regulation
1. Does your unit complete the Vehicle Allocation Methodology on every vehicle replacement considering lifecycle cost, fuel efficiency, and greenhouse gas emissions associated with the replacement vehicle? *Include links to the VAM form and the FLEET tool:* *http://fleet.dv.r5.fs.fed.us:8080/fleet/*					EO13423§2(g), EO13514§2(a)(iii)(A), (B),&(C), EISA§142
2. Does your Unit annually post the fuel economy for each vehicle and provide that information to employees so that they can use the most fuel efficient vehicle for the job? www.fueleconomy.gov					EO13423§2(g), EO13514§2(a)(iii)(A), (B),&(C), EISA§142

Action Item	Yes/ No	Completion Year	Project Scope	Specific Action (please quantify where possible)	Regulation
3. Are employees on your unit required to maintain their vehicles to maximize fuel efficiency? *This can be done by using manufacturer-recommended oil change frequency, checking tire pressure monthly, considering use of synthetic oil, etc.*					EO13423§2(g), EO13514§2(a)(iii)(A), (B),&(C), EISA§142
4. Has your unit purchased alternative fuel vehicles and placed them in locations that best maximize alternative fuel use? *Definition: alternative fuel vehicles examples: E85 compatible, CNG, LPG, bio-diesel, and plug-in electric vehicles*					
5. Does your Unit offer carpool options for employee work travel and annually reward or recognize employees for carpooling to meetings and trainings?					EO13514§2(b)(ii)
6. Does your Unit regularly share eco-driving tips with all employees, including volunteers, seasonal and new employees??					EO13423§2(g), EO13514§2(a)(iii)(A), (B),&(C), EISA§142

Action Item	Yes/ No	Completion Year	Project Scope	Specific Action (please quantify where possible)	Regulation
http://www.fs.fed.us/sustainableoperations/documents/TheEcoDriversManual.pdf					
7. Does your Unit have a shut down and no or limited idling policy, including during winter operations?					EO13423§2(g), EO13514§2(a)(iii)(A), (B),&(C), EISA§142
8. Does your Unit promote alternative forms of commuting and provide adequate bicycle parking for employees and visitors? *Alternative forms of commuting include: telecommuting, cycling, walking, bus, train, carpool, vanpool, etc.* http://www.vpsi.org/mysitecaddy/site3/					EO13514§2(b)(ii)&(iv)
9. Does your Unit offer financial incentives to encourage use of alternative commuting methods? *Financial incentives include: transit and bike subsidy programs and carpool/vanpool options*. http://fsweb.wo.fs.fed.us/aqm/propert					

Action Item	Yes/ No	Completion Year	Project Scope	Specific Action (please quantify where possible)	Regulation
y/commuter-transit/					
10. Does your Unit identify alternative fueling stations in your working area and encourage employees to use alternative fuels? *Definition: alternative fueling stations include E85, bio-diesel, and CNG, LPG locations* http://maps.nrel.gov/transatlas					EO13514§2(g), EISA§142
11. Does your Unit use video teleconferencing and webinar technologies as alternatives to meeting travel? http://fsweb.dv.r5.fs.fed.us:88/videostats/index.php					EO13423§2(g), EO13514§2(a)(iii)(A), (B),&(C), EISA§142
12. Has your unit collaborated with other government agencies and entities nearby to aggregate demand for alternative fuel?					EO 13423§2(g) 2% EO13514§2(g), EO 13423§12

Action Item	Yes/ No	Completion Year	Project Scope	Specific Action (please quantify where possible)	Regulation
This can include partnering with local clean city coalitions, and joint written requests for alternative fuels to local providers. http://www.afdc.energy.gov/afdc/data/fleets.html					

Waste Prevention and Recycling

Goals: Divert 55% of non-hazardous solid waste in buildings by FY2015 (2005 baseline); divert 50% of construction and demolition debris by FY2015; increase recycling; and divert compostable and organic materials. Purchase uncoated printing and writing paper containing at least 30% post-consumer fiber. Employ environmentally sound disposition of excess or surplus electronics.

Action Item	Yes/ No	Completion Year	Project Scope	Specific Action (please quantify where possible)	Regulation
1. Does your Unit regularly recycle at least three different materials (e.g., paper, plastic, aluminum, tin, glass, cardboard)? *Note: Item also covered in HPSB assessment for those qualified*					EO13423§2(e), EO13514§2(d), EO13514§2(e)(ii)

buildings.					
2. Does your Unit have an incident recycling guide that is being used for incidents? (eg., fire incidents)					
3. During incidents, does your unit partner with incident management teams to promote sustainable operations business practices? *Examples of sustainable operations business practices are: reducing the use of bottled beverages, encouraging waste reduction, donating non-perishable food, providing recycling opportunities, and providing durable products such as reusable eating utensils.*					
4. Has your Unit completed a waste stream analysis on at least one facility this year?					EO13423§2(e), EO13514§2(e)(ii)
5. Does your Unit retain recycling proceeds to reinvest in additional sustainable operations activities? FSH 6509.19, Ch. 10: www.fs.fed.us/im/directives/fsh/6509.19/6509.19_10.doc					EO13423§2(e), EO13514§2(e)(ii)

6. Does your Unit recycle most electronic waste? Link to Lighten Your Load Video: http://www.fs.fed.us/sustainableoperations/media#youtube					EO13423§2(h), EO13514§2(i)(i),(ii), (iii), (iv), & (v), EISA§431
7. Has your Unit considered establishing a composting program at multiple facilities across your Unit and implemented such a program in at least one of these locations? *A composting program can be on-site or through a commercial composting service.*					EO13514§2(e)(iv)
8. Has your Unit made a concerted effort to significantly reduce junk mail from your mailroom?					EO13423§2(e), EO13514§2(d), EO13514§2(e)(ii)
9. Does your Unit use GOOS (Good On One Side) paper to reduce the amount of paper purchased whenever possible? *GOOS paper is paper that has only been used on one side and may be turned into paper tablets, used to supply printer and copier trays, etc.*					EO13423§2(e), EO13514§2(d), EO13514§2(e)(ii)

10. Does your Unit recycle or salvage at least 50% of construction waste?					EO13514§2(e)(iii)
11. Does your Unit provide recycling for rechargeable and alkaline batteries? http://www.fs.fed.us/sustainableoperations/documents/MOUAgreementwittheRBRCFAQ.rtf For example: http://www.biggreenbox.com/catalog/index.php?cPath=2					EO13423§2(e), EO13514§2(e)(ii)
12. Does your Unit minimize paper use when printing and copying documents? *This includes setting printer driver defaults on all computers to double-sided printing, when applicable, and to "no cover sheet", as well setting copier driver defaults to double-sided copying.* http://www.fs.fed.us/sustainableoperations/documents/savepaper.pdf					EO13514§2(e)(iv)
13. Does your Unit regularly share methods for waste prevention and					

recycling with all employees, seasonal and permanent? *Methods include sharing recycling options on the unit, how employees can reduce waste, reuse tips, etc.*					

Green Purchasing

Goals: Ensure 95% compliance by 2015 with acquisition of all 6 categories of green products: energy efficient (Energy Star-qualified, FEMP-designated, and low standby power), water efficient, environmentally preferable, EPEAT, biobased, recycled content, and non-ozone depleting.

Action Item	Yes/ No	Completion Year	Project Scope	Specific Action (please quantify where possible)	Regulation

1. Does your Unit purchase at least three green products that replace products purchased in the past? • EPA Environmentally Preferable Purchases (EPP) http://www.epa.gov/opptintr/epp/index.htm; • OFFE Green Products Compilation: http://www.fedcenter.gov/Documents/index.cfm?id=11767&pge_prg_id=26960 • USDA Biopreferred Product Compilation: http://www.dm.usda.gov/procurement/programs/biopreferred.htm • Responsible Purchasing www.ResponsiblePurchasing.org					EO13423§2(d), EO13514§2(h)(i), EISA§525, EPAct2005§104
2. Does your Unit use only 100% post-consumer recycled content paper? *Note: Item also covered in HPSB assessment for those qualified buildings*. • http://www.responsiblepurchasing.org/publications/09-11-04--RPN_Paper_Standards_Comparison_Chart.pdf • http://www.epa.gov/opptintr/epp/index.htm http://www.fedcenter.gov/Documents/index.cfm?id=11767&pge_prg_id=26960					EO13423§2(d), EO13514§2(d), EO13514§2(h)(i), EISA§525, EPAct2005§104

3. Have all employees identified by the Unit as purchasers completed green purchasing training? Suggested sites: • AGlearn: log into AGlearn then search on "Green Purchasing" • Importance of Properly Coding BOCs) - http://www.fs.fed.us/sustainableoperations/documents/budget-objective-classification-codes-fact-sheet.pdf • Western Collective-sponsored green purchasing training —periodically offered webinars • http://www.fedcenter.gov/programs/buygreen/ (scroll to bottom for list of training links) • http://www.dm.usda.gov/procurement/ccsc/pc_policy_regs.htm					EO13423§2(d), EO13514§2(h)(i), EISA§525, EPAct2005§104

4. Does your Unit include sustainable operations requirements in acquisition orders and contracts whenever possible? http://www.fedcenter.gov/programs/buygreen/ (scroll down to the contract/procurement language subheading) http://www.dm.usda.gov/procurement/programs/biobased/procurementtools.htm					EO13423§2(d), EO13514§2(d), EO13514§2(h)(i), EISA§525, EPAct2005§104
5. Does your unit purchase biobased materials whenever possible? *Note: Item also covered in HPSB assessment for those qualified buildings*. http://www.dm.usda.gov/procurement/programs/biopreferred.htm					EO13423§2(d), EO13514§2(h)(i), EISA§525, EPAct2005§104

6. Does your Unit track purchasing through USDA-GSA Advantage's website and use the results to identify opportunities to increase green purchasing? https://usdaadvantage.gsa.gov/advgsa/advantage/main/start_page.do?store=USDA • https://www.gsaadvantage.gov/advgsa/advantage/main/start_page.do					EO13514§2(h)
7. Does your Unit share green purchasing information and Unit specific green purchasing goals with all employees?					

Sustainability Leadership

Goal: Institute a culture of sustainable consumption by implementing actions that integrate environmental footprint reduction principles into all programs, practices and policies throughout the organization. Provide organizational support for Green Teams, sustainable operations training, recognition programs and other activities that foster behavior changes towards a consumption ethic.

Action Item	Yes/ No	Completion Year	Project Scope	Specific Action (please quantify where possible)	Regulation

Action Item	Yes/ No	Completion Year	Project Scope	Specific Action (please quantify where possible)	Regulation
1. Has your Unit completed building assessments of each building on the National High Performance and Sustainable Building (HPSB) List using the Forest Service Existing Building Sustainability Ranking System? *The Sustainability Ranking System and other helpful information can be found on the Forest Service Engineering Sustainable/Green Building website at:* *http://fsweb.wo.fs.fed.us/eng/programs/facilities/sus_green/* *If your Unit has no HPSB facilities on the list, please answer N/A to this question.* ***Please note**: This item has been included in Leadership because successful implementation requires cross staff/discipline effort. The Existing Building Ranking System includes questions related to Energy, Water, Waste Reduction & Recycling, and Green Purchasing. Although not repeated in*					EO 13423§2.f.iii EO13514§2.g.iii Guiding *Principles*

Action Item	Yes/ No	Completion Year	Project Scope	Specific Action (please quantify where possible)	Regulation
those sections of Appendix G, this question will help reduce your consumption in those footprint areas.					
2. Are 15% of your eligible HPSBs deemed sustainable in accordance with the Ranking System? *If your Unit has no HPSB facilities on the list, please answer N/A to this question.* *Coordinate this work with Engineering and other specialists as needed.* ***Please note**: The Existing Building Ranking System includes questions related to Energy, Water, Waste Reduction & Recycling, and Green Purchasing. Although not repeated in those sections of Appendix G, this question will help reduce your consumption in those footprint areas.*					EO 13423§2.f.iii EO13514§2.g.iii Guiding *Principles*

Action Item	Yes/ No	Completion Year	Project Scope	Specific Action (please quantify where possible)	Regulation
3. Does your Unit have a cross-discipline green team that meets at least quarterly? http://www.fs.fed.us/sustainableoperations/greenteam-toolkit/how-to-start.shtml					
4. Does your Unit have a multi-year sustainable operations action plan, endorsed by Unit leadership, that is being implemented and shared with all employees?					
5. Do 10% or more of permanent employees on your Unit annually participate in sustainable operations related training or professional development?					
6. Do employees on your Unit participate in community sustainability projects? *Examples of sustainability projects*: start-up recycling effort, community education effort, sustainability fair, etc.					

Action Item	Yes/ No	Completion Year	Project Scope	Specific Action (please quantify where possible)	Regulation
7. Does your Unit formally recognize employees and partners for efforts to reduce their environmental footprint at work? *Examples include monetary awards, non-monetary awards, extra time off, submission to Regional Forester honor awards, etc.*					
8. Are green meeting principles annually incorporated into at least 5 meetings on your unit? *Examples of green meeting principles include paper use reduction, recycling, carpooling, staying in hotels with sustainable practices, etc.* http://www.fs.fed.us/sustainableoperations/greenteam-toolkit/documents/Top10ForGreenMeetings.pdf					
9. Are sustainable operations tips incorporated into your Unit's regular communications, such as newsletters, employee & seasonal orientations, websites, or employee meetings? *Examples of tips include reminders about Unit recycling options, eco-driving tips, water conservation ideas, facts*					

Action Item	Yes/ No	Completion Year	Project Scope	Specific Action (please quantify where possible)	Regulation
about energy savings from computer hibernation, etc. http://wms7.streamhoster.com/vlecd/ Whats Your Excuse.HQ.wmv					
10. Does Unit leadership regularly engage in a two-way conversation with Green Teams, sustainable operations champions, employees, and partners about progress and improvements to be made in sustainable operations? *Examples include sharing actual energy or water reduction data, strategies to increase green purchasing, sustainability success stories from employees or the green team, etc.*					
11. Does your unit have a teleworking policy in effect and communicate it to employees? Telework Enhancement Act of 2010					
12. Has your Unit computed the					EO13423§2(g),

Action Item	Yes/ No	Completion Year	Project Scope	Specific Action (please quantify where possible)	Regulation
greenhouse gas emissions associated with one Unit leadership team meeting and used this information to reduce greenhouse gas emissions for subsequent meetings? http://www.fs.fed.us/sustainableoperations/susops-summit-2009/2009-summit-carbon-footprint-report.docx					EO13514§2(a)(iii)(A), (B),&(C), EO13514§2(a)&(b), EISA§142

Additional Resources

- Executive Order 13423
- Executive Order 13514
- Energy Independence and Security Act
- Energy Policy Act of 2005
- EPA Mandatory Greenhouse Gas Reporting Requirement
- Pollution Prevention Act
- Solid Waste Disposal Act
- USDA Strategic Sustainability Performance Plan
- FSH – Chapter 70 Sustainable Buildings
- Forest Service Framework for Sustainable Recreation
- USDA Guiding Principles for Sustainable Building