Activity: Climate Change Planning and Adaptive Science Capacity

		2008 Actual	2009 Enacted	2010 Fixed Costs & Related Changes (+/-)	2010 Program Changes (+/-)	2010 Budget Request	Change from 2009 (+/-)
Climate Change Planning	($000)	0	0	0	+10,000	10,000	+ 10,000
	FTE	0	0	0	+45	45	+45
Adaptive Science Capacity	($000)	0	0	0	+10,000	10,000	+10,000
	FTE	0	0	0	+18	18	+18
Total, Climate Change and Science Capacity	**($000)**	0	0	0	**+20,000**	**20,000**	**+20,000**
	FTE	0	0	0	**+63**	**63**	**+63**

Summary of 2010 Program Changes for Climate Change Planning and Science Capacity

Request Component	($000)	FTE
• Climate Change Planning	+ 10,000	45
• Adaptive Science Capacity	+10,000	18
Total, Program Changes	**+20,000**	**63**

Justification of 2010 Program Changes

The 2010 budget request for Climate Change Planning and Adaptive Science Capacity is $20,000,000 and 63 FTE, a net program change of +$20,000,000 and +63 FTE from the 2009 Enacted.

Climate Change Planning (+$10,000,000/+45 FTE) - The 2010 budget request for climate change planning is $10,000,000. With this $10 million increase, the Service will work with partners, leveraging their contributions of funds, facilities, expertise and technology, to develop shared scientific and technical capacity for biological planning and conservation design to address the impacts of climate change on fish and wildlife resources. These investments will begin to build a national network of Landscape Conservation Cooperatives (LCCs) with our partners. These cooperatives will, in cooperation with partners and other Service programs, conduct the planning necessary to implement effective on-the-ground strategies and actions to help fish and wildlife adapt to the impacts of climate change. They will analyze available science, formulate population and habitat objectives, develop and use predictive, locally-based models, and strategically target site-scale conservation delivery. These cooperatives will provide the scientific analysis that will inform and empower public and private managers to link actions at project sites to outcomes on broader scales, including major eco-regions, and species ranges. This ability to understand, design and drive conservation across broad scales is fundamental to our ability to successfully address climate change. Furthermore, building shared capacities within LCCs will reduce redundancies across conservation and science organizations. This crucial investment will spur a new generation of partnership to address the impacts of a changing climate across large and interconnected networks of ecologically functioning and sustainable habitats - what we call *landscapes*.

Adaptive Science Capacity (+$10,000,000/+18 FTE) - The 2010 budget request for climate change adaptive science is $10,000,000. This $10 million increase will help to inform

conservation management decisions and prevent erosion of mission success. The Service will use the funding requested to supply scientific knowledge and expertise needed most by the Service and its partners. In particular the Service will target science support for LCCs to: 1) anticipate climate change effects and reflect them, at landscape scales, in conservation designs; 2) assess species and habitat vulnerabilities; and 3) identify and target the highest priority species and habitats. While a portion of these funds will be used to hire new employees with key skills in areas like conservation biology, hydrology, statistics and quantitative ecology, the majority of the requested funding will be used to acquire science from the U.S. Geological Survey (USGS), the National Parks Service Cooperative Ecosystem Studies Units, the National Aeronautics and Space Administration, and academic institutions. This investment will address six specific areas of applied science, discussed in detail later in this request.

Program Overview

The Service began addressing changing climate ten years ago, in the Southeast Region, working with industry to conserve wildlife and sequester carbon by reforesting once-productive habitats in the Lower Mississippi Valley. In FY 2004, the Service joined with the U.S. Geological Survey (USGS) in sponsoring six mini-symposia across the country. This *Future Challenges Initiative* engaged partners in discussions about climate change, water shortages, invasive species, and bioengineering. These efforts greatly expanded our awareness of the enormity and scale of the grand challenges facing conservation in the 21st Century.

In order to address these challenges, the Service again partnered with the USGS, assembling a *National Ecological Assessment Team* (NEAT) to investigate and recommend approaches to improve conservation. The resulting recommendations outlined not simple or incremental improvements, but called for an entirely new landscape conservation business model, which we call *Strategic Habitat Conservation* (SHC). This business model is built on a foundation of distributed scientific and technical capacities supporting model-based and predictive approaches to conservation that allow us to see conservation at large eco-regional scales (i.e., landscapes), and target and deliver conservation priorities at site-scales (i.e., local scale). The SHC model is ideally suited to support a strategic framework for climate change response. Therefore, requested funds would be used to accelerate the development of geographically distributed scientific and technical capacities.

Over the past two years, the Service began: 1) engaging hundreds of partners across the nation in focused workshops and discussions about climate change and how to work together to support adaptations by fish, wildlife, plants and their habitats; 2) preparing a strategic plan and an action plan which identify how to engage ourselves and others in climate change adaptation and mitigation efforts; 3) implementing new programs to educate employees and the public on accelerating climate change and its impact on fish, wildlife, plants and their habitats; 4) initiated new training to provide new skills and expertise necessary for our workforce to respond to climate change, such as proficiency in adaptive resource management, structured decision analysis, predictive modeling and landscape conservation; 5) establishing teams at all levels of the Service to effectively engage and share emerging knowledge; 6) adopting 13 FY2009 Climate Change Action Priorities that demonstrate a strong and consistent commitment; 7) forging new science partnerships to meet the Service's mission needs for science support; and 8) assessing the status of Arctic species, especially polar bear and walrus, and determining how changing climate and reductions in sea ice are affecting those species.

These accomplishments have positioned the Service to address the climate change challenge strategically, collaboratively and efficiently.

Activity: Climate Change Planning and Science Capacity
Subactivity: Climate Change Planning

	2008 Actual	2009 Enacted	2010			Change from 2009 (+/-)
			Fixed Costs & Related Changes (+/-)	Program Changes (+/-)	Budget Request	
Climate Change Planning ($000)	0	0	0	+10,000	10,000	+ 10,000
FTE				+45	45	+45

Summary of 2010 Program Changes for Climate Change Planning

Request Component	($000)	FTE
• Climate Change Planning	$10,000	45
Total, Program Changes	**$10,000**	**45**

Justification of 2010 Program Changes

The 2010 budget request for Climate Change Planning is $10,000,000 and 45 FTE, a program change of +$10,000,000 and +45 FTE from the 2009 Enacted.

Climate Change Planning (+$10,000,000/+45 FTE) - With this $10 million increase, the Service will work with partners, leveraging their contributions of funds, facilities, expertise and technology, to develop the capacity for biological planning and conservation design to address climate change. Ultimately, these investments will build a national network of *Landscape Conservation Cooperatives* (LCCs) with our partners. Each of these cooperatives will be part of a network that covers the entire U.S. This network will provide technical and scientific expertise and will, in cooperation with partners and other Service programs, analyze available science, formulate population and habitat objectives, develop and use predictive locally-based models, and strategically target site-scale conservation delivery. These cooperatives will provide the scientific analysis that will inform and empower public and private land managers

The LCCs will produce spatially-explicit, landscape-level conservation designs at a landscape level, targeting agreed-upon biological objectives. LCC partners, including Service programs, will be able to use their personnel, organizational infrastructure, authorities and other assets to undertake conservation actions at specific points on the landscape that will contribute directly to the success of the LCC designs.

The Service plans to establish LCCs within key landscapes in each of the eight Fish and Wildlife Service regions, modeling them after the highly successful Joint Ventures that have helped conserve migratory birds. Commitment to shared decision-making is key to the success of LCCs.

In establishing LCCs, the Service will maximize use of existing facilities and infrastructure, and will similarly encourage partners to use existing infrastructure to result in efficient operation. It is anticipated that scientific and technical personnel contributing to work in the LCCs will use existing technological capability to interact "virtually" via the internet or other electronic means. Furthermore, it is anticipated that LCCs will be supported by varying degrees of funding from participating members, such as other federal agencies such as the USGS, Forest Service and National Park Service, state agencies, private organizations, universities, and other entities

involved in conserving fish, wildlife, plants and their habitats at landscape scales. We anticipate that the funding available to LCCs will be used to:

- develop explicit and measurable biological objectives to guide conservation design and delivery;
- apply and refine dynamic population-habitat models and other decision-support tools to inform various types of management plans;
- apply down-scaled climate models and landscape scales to predict effects on fish, wildlife, plants and their habitats;
- identify areas of converging climate and non-climate stressors;
- design and evaluate short- and long-term wildlife adaptation approaches;
- identify high-priority research and technology needs; and
- identify and, when necessary, design protocols and methodologies best suited to evaluating the success of conservation strategies, objectives and actions.

In addition, the Service plans to provide additional training and education for Service employees and our partners, to ensure they have the expertise needed to succeed in helping fish, wildlife, plants and their habitats adapt to climate change, and in implementing actions that will reduce the Service's carbon footprint. Increased awareness and understanding about climate change issues will help our employees identify the correlations among species, habitats, and landscapes, and the potential for both direct and indirect alterations at various scales.

The USGS will be an essential member of many, if not all, LCCs. The Service anticipates that USGS and other partners will work together to forecast climate-induced changes at relevant spatial scales. The USGS is prepared to help produce these forecasts and anticipates using its National Climate Change and Wildlife Science Center for this purpose. The Service is prepared to help support these forecasting activities with portions of its budget requests for Climate Change Planning and Climate Change Science.

Program Performance Change

Climate Change Key Performance Measure	FY 2009 Plan	FY 2010-2009 Variance	FY 2010 President's Budget
# of Landscape Conservation Cooperatives established	0	8	8
# of decision-support tools provided to conservation managers to inform management plans and ESA Recovery Plans	0	8	8
# of landscape-scale conservation strategies developed (including explicit biological objectives and adaptation approaches) that can direct management expenditures where they have the greatest effect and lowest relative cost	0	8	8
# of conservation delivery strategies and actions evaluated for effectiveness	0	16	16

2010 Program Performance

The Service's performance in FY2010 and beyond will be measured using metrics that tie tightly to key conservation planning activities described in this request and to priorities that have been established by the Service Directorate and in our strategic plan for climate change. LCCs will function as the technical core of a large and complex network of partnerships between the Service and partner agencies and organizations. The Service anticipates establishing 8 LCCs with these funds..

One of the functions of LCCs is to work with managers to develop and provide the necessary science required by managers and biologists to implement, monitor, and evaluate management and conservation actions. .

LCCs will also work to develop conservation strategies that include explicit biological objectives and adaptation approaches that can be used to recommend management expenditures based on the greatest effect and lowest relative cost. Incorporating a cost benefit evaluation based on overall biological benefit, incorporating species, habitats, and landscapes is of increased significance in climate change planning. In FY2010, 8 landscape-scale conservation strategies will be developed to direct management expenditures.

Evaluation of conservation delivery strategies and actions for their effectiveness is an important component of climate change planning. The potential for landscapes, habitats, and species to change in response to climate change is high, and the expertise provided by LCCs will be used in part to develop models to predict and monitor response and variability in the response. In FY2010, 16 conservation delivery strategies and actions will be evaluated for effectiveness. Evaluation of management and conservation actions on a changing landscape is critical for planning to determine the short and long-term effectiveness of the action.

Activity: Climate Change Planning and Adaptive Science Capacity
Subactivity: Adaptive Science Capacity

	2008 Actual	2009 Enacted	2010			Change from 2009 (+/-)
			Fixed Costs & Related Changes (+/-)	Program Changes (+/-)	Budget Request	
Adaptive Science Capacity ($000)	0	0	0	+10,000	10,000	+ 10,000
FTE	0	0	0	+18	18	+18

Summary of 2010 Program Changes for Adaptive Science Capacity

Request Component	($000)	FTE
• Adaptive Science Capacity	$10,000	18
Total, Program Changes	**$10,000**	**18**

Justification of 2010 Program Changes

The 2010 budget request for Adaptive Science Capacity is $10,000,000 and 18 FTE, a program change of +$10,000,000 and +18 FTE from the 2009 Enacted.

Adaptive Science Capacity (+$10,000,000/+18 FTE) - The requested increase is critical to building the additional scientific capacity the Service needs to accomplish its mission, particularly in the face of climate change. The funds will allow the Service to purchase the science it needs to support its LCCs and its programs as they work to respond to climate impacts... . Vulnerability assessments, for example, depend on the availability of good scientific information about species and their habitats. Only a small percentage of species have been studied sufficiently to have generated the information needed to conduct vulnerability assessments. These funds will enable the Service to contract for studies that answer specific questions needed on strategically important species and habitats.

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The additional climate change adaptive science funding will allow the Service to directly develop or contract for science capacity in the following six areas which are most consequential for the Service's mission success:

Risk and Vulnerability Assessments are scientific analyses of the risks likely to be produced by climate change and the associated effects on fish, wildlife, plants, their habitats, and ecological functions and processes. These assessments enable us to identify the species, habitats, and ecological functions and processes that are most sensitive and have the greatest exposure to the effects of climate change and other stressors so that conservation actions can be focused on the highest priority species and habitats. These assessments are an essential first step in identifying priorities for biological planning and conservation design. They help to set priorities among conservation actions that work towards the protection of FWS lands and other trust resources. Ultimately, these assessments will inform future conservation actions that remove, minimize, or offset specific stressors at appropriate scales in space and time.

Inventory and Monitoring is a long-recognized weakness in conservation. FY 2010 funding will be used to build on the existing capacity within the Service and to leverage the capacity of Service science partners to begin building a scientifically sound inventory and monitoring program. These funds will be used to design scientific protocols and frameworks for inventory and monitoring programs. Science expertise is needed to assure that monitoring is statistically valid, and can develop into long-term trend data. To the greatest extent possible, the Service will ensure that inventory and monitoring activities are coordinated across Service programs and with partners to maximize efficiency and ensure data are scientifically credible

Population and Habitat Assessments inform biological planning and conservation design at the landscape scale, and will enable the Service and its conservation partners to (1) better describe and predict changes in the nature and dynamics of populations of species and habitats; (2) make informed management decisions in the face of uncertainties resulting from climate change; (3) effectively assess changes in populations and habitats resulting from physical and chemical changes in the environment, especially as temperatures increase and water resources decrease; and (4) develop structured and adaptive decision support frameworks for harvest, species conservation, and habitat management at landscape or other appropriate scales.

Biological Planning and Conservation Design is an primary function of LCCs, and requires the input of scientific studies and analysis. The Service needs to use the best available scientific information to develop explicit fish and wildlife population objectives, conservation strategies, and decision-support tools in the face of climate change.

Management Evaluation and Research are important tools for evaluating current delivery strategies and activities, which will then provide information for the Service to address crucial information gaps in relation to stressors produced by climate change on a landscape scale. The requested funding will be used to work closely with other Federal agencies and partners to bolster the Service's limited capacity to support evaluation of the effectiveness of conservation actions, and research related to climate change. Evaluation will provide essential feedback needed to determine which actions produce desired conservation results at the lowest cost, and help identify research needed to reduce uncertainty in future decisions. Targeted research will enable the Service to fill information gaps and reduce uncertainty regarding climate change and its likely impacts on species and habitat. This information and knowledge will guide improvements to the SHC processes of biological planning, conservation design, conservation delivery, inventory and monitoring, and operational evaluations.

Conservation Genetics is needed to support landscape conservation strategy, delivery and evaluation. Understanding genetic variation provides the raw material which enables the Service to better understand species adaptation and evolutionary flexibility in response to environmental change. As genetic diversity declines, a species' ability to adapt to environmental change decreases and extinction risk increases. Furthermore, when habitat shifts occur, conservation and management habitats (landscapes) can use genetic information to conserve the genetic diversity and variability of a species.

The expansion of the Service's science capacity in these six key areas will support the Service in continuing to achieve mission success. The Service will set priorities for species, habitats and landscapes in consultations with partners. Whenever possible, the expertise of these partners will be accessed, and, where appropriate, contracts established to ensure the Service acquires the necessary information to address climate change.

Program Performance Change

Climate Change Key Performance Measure	FY 2009 Plan	FY 2010-2009 Variance	FY 2010 President's Budget
# of risk and vulnerability assessments developed or refined for priority species and habitats	0	8	8
# of inventory and monitoring protocols developed or refined to capture data on fish and wildlife populations and their habitats to detect changes resulting from climate change	0	16	16
# of population and habitat assessments developed or refined to predict changes in species populations and habitats	0	8	8
# of biological planning and conservation design projects developed in response to climate change	0	8	8
# of management evaluation actions evaluated for effectiveness in response to climate change and research activities conducted to address information needs in response to climate change	0	16	16
# of conservation genetics projects to improve and enhance conservation design and delivery for fish and wildlife populations in response to climate change	0	8	8

2010 Program Performance

The foundation for Fish and Wildlife Service mission accomplishment is science. The challenges presented by climate change necessitate that the Service increase its ability to generate or contract for the science it needs to effectively manage the nation's fish and wildlife populations and their habitats.

Climate change will affect some species more adversely than others, and the Service will conduct up to 8 risk and vulnerability assessments (single or multiple species and habitats) to predict the threats posed to trust species and their habitats. Vulnerability assessments, for example, depend on the availability of good scientific information about species and their habitats. Only a small percentage of species have been studied sufficiently to have generated the information needed to conduct vulnerability assessments. These funds will enable the Service to contract for studies that answer specific questions needed on strategically important species and habitats.

The Service will develop up to 16 scientifically rigorous inventory and monitoring protocols (single or multiple species and habitats) to be used consistently among the regions of the Service. These protocols will enable the Service to collect critically important data needed to detect changes in fish and wildlife populations and their habitats over time resulting from climate change. The Service will partner with other Interior bureaus such as the National Park Service, U.S. Geological Survey, and Bureau of Land Management, and with partners in Landscape Conservation Cooperatives (LCCs) to coordinate our inventory and monitoring protocols so that data may be compared over geographic areas.

Up to eight population and habitat assessments will be conducted to predict changes in the dynamics of populations of species and habitats and to make informed management decisions in the face of uncertainties resulting from climate change. The Service will model the relationships between physical and chemical changes produced by climate change and predict how these changes will affect species and habitats.

Conservation delivery strategies and activities will be evaluated for their effectiveness in assisting fish and wildlife populations to adapt to changes in climate. Up to 16 conservation strategies (single or multiple species) will be evaluated in FY 2010 among the regions of the Service. Conservation strategies that are found to be the most effective in assisting fish and wildlife populations to adapt to climate change will be highlighted and promoted to Service managers for implementation to effectively address climate change.

Conservation genetics projects will be initiated in each of the Service's eight regions to increase our understanding of the genetic relationships among organisms and to predict a species ability to adapt to environmental changes. Additional genetics research opportunities will be identified and initiated based on guidance from the Landscape Conservation Cooperatives in each region.

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