Western Governors' Association

Wildlife Corridors Initiative

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June 2008 Report

Western Governors' Association
Jackson, Wyoming
June 29, 2008

Western Wildlife Habitat Council Established

To coordinate and manage implementation of the *WGA Wildlife Corridors Initiative Report*, the Western Governors hereby establish the Western Wildlife Habitat Council (WWHC). Initially, the WWHC shall function in a manner similar to other such WGA-established entities as the Forest Health Advisory Council, and the Western Regional Air Partnership, and eventually may become an independent, affiliated organization, such as the Western Interstate Energy Board, and the Western States Water Council.

Each WGA member Governor may appoint one member to the WWHC, who shall be a state employee and policy expert in a related field from the member Governor's state. The WWHC shall develop and adopt bylaws that will govern the operation of the Council and ensure direct accountability to the Governors through WGA. The WWHC shall develop and adopt an annual work plan that will guide the Council's efforts to further evaluate the various recommendations contained in the *WGA Wildlife Corridors Initiative Report* and more fully develop the recommendations as appropriate; prioritize recommendations; and oversee coordination and implementation of recommendations to ensure that all associated programs, projects, advocacy positions, and new policies are consistent with WGA policies.

The WWHC may hire a small staff that shall be co-located within the WGA- Denver Office.

The WWHC may charter and otherwise establish state technical issue teams, working groups, and *ad hoc* advisory committees, to advise the WWHC on the relevant issue areas pertinent to implementation of the WWHC's annual work plan. It is anticipated that such teams, committees, and working groups would include fish and wildlife personnel, and as appropriate, expertise from disciplines relevant to the Wildlife Corridors Initiative, including, transportation, land use, oil & gas, renewable energy and energy transmission, and climate change. The objective of the state technical teams, working groups and advisory councils shall be to provide expertise to the WWHC and ensure inter-agency and inter-disciplinary coordination, as well as inter-governmental coordination, and broad stakeholder involvement.

The mission of the WWHC, consistent with WGA Resolution 07-01, is to identify key wildlife corridors and crucial wildlife habitats in the West and coordinate implementation

of needed policy options and tools for preserving those landscapes. Guided by the recommendations contained in this report, the Governors identify the following priorities for action by the WWHC:

- Coordinate and implement steps that foster establishment of a "Decision Support System" (DSS) within each state. Coordination shall include:
  - Further developing and refining definitions for "Key Wildlife Corridors" and "Crucial Wildlife Habitats"
  - Ensuring portability of definitions so that they extend beyond, and can be operationalized across, political boundaries as appropriate, while maintaining flexibility that recognizes localized needs and conditions.
  - Prioritization of the process for identifying wildlife corridors and crucial habitats.
  - Supporting research to understand climate change impacts on wildlife corridors and crucial habitat, and taking steps accordingly to support adaptation to climate change.

- Seek to establish policies that ensure information from state-led Decision Support Systems is considered early in planning and decision-making processes, whether federal, tribal, state or local, in order to preserve these sensitive landscapes through avoidance, minimization, and mitigation.

- Make the WGA Western Renewable Energy Zone project (REZ) a model for applying the wildlife corridors recommendations. In particular, WGA, in coordination with the WWHC, should ensure that development of the renewable energy zones 1) includes identification of relevant wildlife corridors and crucial habitat from the relevant state DSS, and 2) considers appropriate policies and actions to avoid, minimize, or mitigate impacts in these sensitive areas.

- Seek funding from state and federal sources, and from private foundations to support the WWHC. Regarding federal funding, there are many recommendations in the report that point to Congressional authorizations and appropriations. WWHC should develop a Congressional strategy related to funding for wildlife corridor and crucial habitat issues, targeting such federal legislation as the Farm Bill, climate change bills, and the transportation bill.

BACKGROUND

Western states are made up of a patchwork of federal, state, tribal, local government and private lands that support robust development and ecologically intact landscapes—essential assets to economic vitality and quality of life in the West. Change is occurring in the region at a pace that is difficult for decision-makers at all levels to track and accommodate. This rapid change is happening on many fronts, including unprecedented population growth and associated land-use impacts, energy development to meet growing demands and reduce dependence on foreign supplies, and new transportation

infrastructure. Possible climate change poses further challenges for the region, with scientists projecting greater climate extremes, including increases in drought. These fast-paced changes are resulting in notable landscape impacts—including habitat loss and habitat fragmentation—ultimately impacting the West's wildlife and aquatic resources.

In February 2007, The Western Governors' Association (WGA) unanimously approved policy resolution 07-01, *Protecting Wildlife Migration Corridors and Crucial Wildlife Habitat in the West.* This resolution describes the importance of wildlife corridors and crucial habitat and asks the Western states, in partnership with important stakeholders, to identify key wildlife corridors and crucial wildlife habitats in the West and make recommendations on needed policy options and tools for preserving those landscapes.

To implement the resolution, WGA launched the *WGA Wildlife Corridors Initiative*, a multi-state and collaborative effort that included six separate working groups, each of which was charged with developing findings and recommendations on various aspects of wildlife corridors and crucial habitat. These Working Groups are as follows:

Science Committee	Oil & Gas Working Group
Energy Working Group	Climate Change Working Group
Land Use Working Group	Transportation Working Group

This report is a compilation of the work achieved by the six working groups. The *WGA Wildlife Corridors Initiative* report was approved by the Governors during the WGA Annual Meeting in Jackson, Wyoming, on June 29, 2008, with the understanding and condition that implementation of the report will be coordinated and overseen by the Western Governors' Association through the Western Wildlife Habitat Council that will be established under WGA.

Healthy Ecosystems and Abundant Wildlife are an Important Economic Driver

Open spaces support a diversity of wildlife and fish habitat. Wildlife-associated recreation brings important economic benefits to communities throughout the West. Small rural communities in particular benefit from the revenue that comes with tourism, hunting and fishing, and other forms of outdoor recreation. Retail tax revenue for many small towns is provided to a large degree during the key hunting and fishing seasons. In the contiguous Western states, more than 43.6 million people participated in hunting, fishing or wildlife watching in 2006, spending almost $33.6 billion. This revenue is dependent on significant, reliable wildlife populations, which in turn depend on quality habitat and corridor movement.

A 2006 Outdoor Industry Association report compiled data that demonstrates the importance of outdoor recreation. Nationwide, 45 million people go camping, 33 million people fish, 56 million people hike, and 66 million people engage in wildlife viewing. In the Rocky Mountain West, 13 percent of the population fishes, 6 percent hunt and 31 percent participate in some form of watching wildlife (*2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation*). This reflects strong support for the open space and healthy ecosystems that either directly or indirectly make these activities

satisfying. The natural beauty and landscapes create a quality of life in the West that attracts new residents who contribute additional talent, economic activity and jobs to the region.

Wildlife in the West at Risk

Large, intact and functioning ecosystems, healthy fish and wildlife populations, and public access to natural landscapes contribute to the West's quality of life and economic well-being. Important wildlife movement corridors and crucial wildlife habitats within these landscapes are critical to maintaining these Western qualities.

Yet the integrity of these ecosystems is at risk around the nation, and the Western States are also affected by human activity occurring in important wildlife corridors and crucial wildlife habitats. Western States must also contend with an inter-connected mixture of private, state and federal lands.

Land Use

Across the western states, we can see how human land uses can compromise wildlife and the environment. A vast scientific literature demonstrates how the patterns of land use can affect the movement of wildlife and the functioning of the ecosystems. When land is converted to human land uses, natural habitat is lost, and the remaining habitat is, to varying degrees, altered due to fragmentation and degradation. These direct and indirect land use impacts can lead to species endangerment and extinction. One of the most effective strategies to abate the threats posed by habitat fragmentation is to design our communities in a manner that protects crucial habitats and maintains the ecological permeability of the intervening landscape so that wildlife can move between those areas.

Transportation

Roads and rail lines can be impediments that make it difficult for animals to meet their basic life needs (e.g., food, mates, other resources), sometimes completely isolating wildlife populations, which reduces genetic diversity and can threaten the population's persistence. Venturing near roads can also be deadly, due to collisions with vehicles, illegal roadside hunting, or exposure to pollutants. Vehicles collide with wildlife over one million times each year in the U.S., and the annual number of collisions has grown by 50% in the last 15 years. A recent study estimated the total cost of wildlife-vehicle collisions at $8.8 billion annually. Road mortality is also cited as a major threat to twenty-one federally listed threatened and endangered animal species.

Energy

Construction of solar and wind generation plants, associated power lines, and access/maintenance roads may reduce available habitat and fragment remaining habitat into smaller, more isolated patches that are less valuable to wildlife. Improperly sited wind turbines pose direct mortality threats to birds and bats, and can cause habitat fragmentation for sensitive species if sited in or near those corridors. Transmission lines may contribute indirectly to the loss of wildlife by altering habitats, as well as directly by increasing wildlife mortality rates through collisions, electrocution, and by serving as perches for raptors and other potential nest predators. In addition, transmission lines may

inadvertently increase raptor mortality from collisions with wind turbines, by providing structures that encourage raptors to perch in areas near turbines.

Oil & Gas

Sage grouse are considered an important measure of the health of the larger sage shrub-land habitat because of their sensitivity to change. Conservation of sagebrush habitats is not only crucial to Sage Grouse, but also to other species that are part of this wildlife community, such as mule deer, antelope and various non-game species. Oil and gas development can fragment remaining sagebrush habitats. Additionally, oil and gas development infrastructure, including roads, tanks, equipment staging areas, compressor stations, shops, pipelines, power line corridors, associated traffic, and human activity have the potential to affect wildlife more than just the wells themselves. For example, when impact zones surrounding each well pad, facility, and road corridor begin to overlap, habitat effectiveness is reduced over a much larger contiguous area. Development at this level reduces the ability of wildlife to use the habitat. Mule deer in particular may be displaced from their winter ranges by high levels of activity associated with intensive development.

Climate Change

Climatic changes over the 20th century have already had significant effects on wildlife species throughout the American West, and in the coming decade these effects will continue and intensify (Root et al. 2005). Shifts in the timing of wildlife mating, migration, and other life-history traits (phenological shifts) will continue to occur as climate conditions change, and these shifts will lead to potential mismatches between wildlife and their food sources or other habitat attributes. Climatic changes in the West increasingly will restructure the composition of wildlife populations as some species adapt and proliferate while others are displaced or die out, and the changes increasingly will alter the functions and values of crucial habitats and wildlife corridors. The effects on wildlife will manifest at the level of whole communities (e.g. sagebrush-steppe, high alpine, wetland, stream, lake) as well as at the level of individual species. Also, temperature and precipitation changes are facilitating the northward expansion of exotic and invasive species and pests (such as the pine beetle) that can cause major shifts in the types of plants and animals present.

COMMON THEMES ACROSS ALL REPORTS

In developing the *WGA Wildlife Corridors Report*, the six working groups considered a great deal of information covering a broad array of issues related to wildlife corridors and crucial habitat. Likewise, the recommendations that evolved from each working group are broad and diverse. Embedded in that breadth of issues and recommendations, certain important themes arose, including the following:

- Science-based and other information about wildlife corridors and crucial habitat should remain a priority for future inventory work and research, and be made

available and considered at the earliest opportunity in federal, tribal, state and local planning and decision-making processes.

- Working through a public process, states should be the leads in identifying wildlife corridors and crucial habitat.

- Within each state's designation of wildlife corridors and crucial habitat, there is need for further prioritization of these areas to encourage appropriate and corresponding actions when development is being considered, i.e., avoidance, minimization, mitigation.

- Governors should consider exercising their power as coordinators and conveners to build tools and models for incorporating wildlife values into planning and decision-making processes, e.g., the Decision Support System (DSS) proposed by the Science Committee, the Wildlife Adaptation Advisory Council (WAAC) proposed by the Climate Change Working Group, and through participation in the Renewable Energy Zone project (REZ) proposed by the Energy Working Group.

- States should fully employ their status as a possible "Cooperating Agency" under the Council of Environmental Quality regulations interpreting the provisions of the National Environmental Policy Act to integrate wildlife information into actions evaluated under NEPA.

- Wildlife do not observe political boundaries or land ownership. Conservation of wildlife corridors and crucial habitat must therefore be coordinated across government, including the federal land management agencies (BLM & Forest Service), federal agencies responsible for water delivery and flood control (Bureau of Reclamation and the Corps of Engineers), federal wildlife agencies (Fish & Wildlife Service and NOAA Fisheries); tribal governments; states; and local governments. Additionally, conservation must be coordinated with private land owners.

- Wildlife conservation on private lands is best accomplished through the use of incentives and tools that encourage and facilitate private land owners and private industry to achieve conservation objectives.

- All of the working groups identified the need for long-term, sustained funding to achieve wildlife conservation objectives. Funding is generally targeted for development of tools (e.g. DSS); building capacity in government agencies (i.e., training, and new personnel); incentives; and for research. The working groups also identified various possible funding sources. In implementing the report, Governors will want to be strategic in seeking and applying funding.

- Many of the impacts to wildlife are a result of growth. Increased demand for energy, water, and roads, as well as development of new homes and subdivisions are generally a result of growth. At issue is not whether to grow our communities and economies, but how and where we should grow them. We must learn to better utilize

the resources available to us, in order to minimize impacts to the wildlife with which we share this world. In that regard, we must focus society's efforts today to improve life in the future.

CALL TO ACTION

Western ecosystems do more than sustain wildlife. Crucial habitats and corridors provide ecosystem services that range from enhancing water quality to creating recreational opportunities to ensuring the pollination of our crops. To a great degree, the viability of wildlife is an indicator of the functionality of ecosystems—and so contributes to the sustainability of our communities, our economies, and our general well-being.

At issue is not whether to grow our communities and economies, but how and where we should grow them. These decisions will not only affect quality of life in our neighborhoods and communities. They will also determine whether the wildlife and landscapes that so characterize the West will persist in the future.

The Western Governors adopt the *WGA Wildlife Corridors Initiative Report*, and hereby establish the Western Wildlife Habitat Council for the purpose of coordinating and overseeing implementation of the report, so that we can identify key wildlife corridors and crucial wildlife habitats in the West, and preserve these lands—and the vast wildlife species that depend upon them—for future generations.

The six working group reports are attached in the following order:

Science
Energy
Transportation
Land Use
Climate Change
Oil and Gas

Individual documents also are available on the Web at **www.westgov.org**.

WGA Wildlife Corridors Initiative

Science Committee

June 23, 2008 Draft

1.0 WILDLIFE CORRIDORS AND CRUCIAL HABITAT IN THE WESTERN STATES

Large, intact and functioning ecosystems, healthy fish and wildlife populations, and public access to natural landscapes contribute to the West's quality of life and economic well-being. Important wildlife movement corridors and crucial wildlife habitats within these landscapes are critical to maintaining these Western qualities.

Yet the integrity of these ecosystems is at risk. The Western States are particularly affected by human activity occurring in important wildlife corridors and crucial wildlife habitats. Western States must also contend with an inter-connected mixture of private, state and federal lands. Because wildlife habitats and corridors cross political boundaries and land ownerships, States and their diverse partners need to work together to conserve them.

As early settlers made their way West, North America's wildlife populations dwindled from market hunting and habitat loss. Beginning in the late 1800's many conservation leaders including Theodore Roosevelt, George Bird Grinnell, and others led an effort to revolutionize wildlife management in North America. Their efforts are the backbone of the North American Model of Wildlife Conservation, the only one of its kind in the world. The model has two basic principles: 1) that our fish and wildlife belong to all North American citizens, and 2) they are to be managed in such a way that their populations will be sustained forever. With the explosive growth of the West, consideration of these principles, the public trust of these resources, and the balance of wildlife and human economic and social needs in a sustainable manner in the West is now being championed by the Western Governors.

In February 2007, The Western Governors' Association (WGA) unanimously approved Policy Resolution 07-01 **"Protecting Wildlife Migration Corridors and Crucial Wildlife Habitat in the West."** The first provision of this resolution advocated a moratorium on categorical exclusions for environmental review in the 2005 Energy Policy Act of "oil and gas exploration or development in wildlife corridors and crucial wildlife habitat on federal lands." The second provision calls for science-based policy recommendations to ensure healthy natural landscapes for flourishing wildlife populations.

In response, the WGA began the *Wildlife Corridors Initiative*, a multi-state and collaborative effort to improve knowledge and management of wildlife corridors and crucial habitat. The main objective of the initiative is to develop a tool for policy makers that integrates important wildlife corridor and crucial habitat values proactively into planning decisions, and promotes best practices for development, and thereby reduces harmful impacts on wildlife.

As part of the *Wildlife Corridors Initiative*, the WGA chartered a Science Committee to provide a science-based perspective on areas of the Western States' landscape that represent crucial wildlife habitats and important wildlife corridors. In its charter, the Science Committee was asked to: 1) collect and reconcile existing State data on wildlife corridors; 2) integrate other data from the scientific community; 3) identify gaps in data and make recommendations for improving wildlife maps, and 4) provide input to the policy working groups as they develop their recommendations. Key to this work was agreement on the definitions of crucial habitats and important wildlife corridors (sidebar). [NOTE: These definitions were developed for purposes of this report only, and may not be appropriate in application to individual species.]

The Science Committee used the following definitions:

Crucial Habitats are places containing the resources, including food, water, cover, shelter, and "important wildlife corridors" that contribute to survival and reproduction of wildlife, are necessary to prevent unacceptable declines, or facilitate future recovery of wildlife populations.

Important Wildlife Corridors are crucial habitats that provide connectivity over different time scales (including seasonal or longer), among areas used by animal and plant species. **Wildlife corridors** can exist within unfragmented landscapes or join naturally or artificially fragmented habitats, and serve to maintain or increase essential genetic and demographic connection of populations.

The WGA also established policy committees to recommend how five policy arenas (Oil and Gas, Energy Development, Land Use, Transportation, and Climate Change) should be considered with respect to wildlife corridors and crucial habitat. Each of these activities is causing widespread changes in Western landscapes that have the potential to impact important wildlife corridors and crucial habitats. The Science Committee's work will directly feed into the recommendations of the four policy committees.

1.1 Crucial Habitat: the Heart of the West

Unlike "critical habitat" (areas needed to recover endangered species), crucial habitats are those lands and waters needed to conserve the broad array of wildlife that make the West unique. The West would not be the West without pronghorn, bison, grizzly bears, rattlesnakes, wolverines, desert fishes, and the other common and uncommon species interacting in vast intact landscapes.

Many crucial habitats support high diversity of fish, wildlife, and plants. Areas of high diversity are more resilient to stresses such as drought, floods, pest infestations, disease outbreaks, and changes in climatic conditions (Lyons et al. 2005, Kremen 2005). Ecosystem resilience is an important factor underlying the ability of nature to provide services to people such as improved water quality, buffering of weather events, and carbon sequestration. The annual value of these ecosystem services is estimated at $300 billion in the U.S. and between $3 trillion and $26 trillion to the world economy (Pimentel et al. 1997, Costanza et al. 1997).

1.2 Wildlife Corridors: Nature Needs Room to Roam

Wildlife survival depends on movement – whether it be day-to-day movements, seasonal migration, gene flow, dispersal of offspring to new homes, recolonizing an area after a local extirpation, or the shift of a species' geographic range in response to changing climatic conditions. For most animals and plants, all of these types of movement require a well-connected natural landscape. Large, open spaces have long been emblematic of the West, but our burgeoning network of highways, canals, urbanization, energy development, and other land uses

now threaten to fragment our grand landscapes, cutting off pathways linking crucial habitats and reducing the ecological value of the remaining crucial habitats. Although Policy Resolution 07-01 refers to the role of corridors promoting *migration* (seasonal movement between summer and winter ranges), the Science Committee emphasizes two additional types of movement of equal or greater importance to conserving most wildlife species. *Dispersal* (movement of animals to a new area where they breed) underlies gene flow, demographic stability, and recolonization. *Shift in geographic distribution* is the type of movement that will allow wildlife to respond to climate change.

There is abundant scientific evidence that loss of habitat connectivity has profound negative impact on fish, wildlife and plant populations (Wilcove et al. 1998, Crooks and Sanjayan 2006). The evidence demonstrates the benefit of wildlife corridors and suggests that negative impacts, such as increased predation or spread of disease, do not occur in well-designed conservation corridors (Beier and Noss 1998, Crooks and Sanjayan 2006).

1.3 Vision

The Western Governors can help to conserve wildlife in this context by providing incentives for coordination among States, federal agencies, conservation organizations and other private interests, and by making modest, targeted investments to improve the state of our knowledge and fill key information gaps.

By building on existing efforts, establishing a more consistent technical infrastructure, and creating a more collaborative policy framework the WGA can catalyze rapid improvements in decisions about land and water use from the perspective of wildlife conservation.

The Science Committee envisions the creation of a ***geographic information system-based spatially-explicit Decision Support System*** that builds upon existing information and programs, but is improved by a commitment to invest in the information base by filling data gaps, bringing consistency across the West to the mapped data of crucial habitats and important wildlife corridors, increasing integration of that information into decision processes, promoting research on adaptive resource management (Lancia et al. 1996, Williams et al. 2007), and creating sustainable funding. The System must accommodate the dynamic nature of wildlife populations and habitat landscapes, and include regularly updated data as landscapes and wildlife populations change. It also should be designed to serve as a first-cut assessment tool that is used to flag circumstances in which potential impacts are of a serious enough nature to require additional inquiry at a more detailed, finer scale.

1.4 Call to Action

The recommendations contained in this report are highly achievable, and represent a modest investment given what is at stake. The Science Committee has taken stock of the current state of knowledge about crucial habitat and important wildlife corridors, and it is our assessment that there is a good base of information upon which to build the GIS-based spatially-explicit Decision Support System. With coordinated scientific and political leadership, we have the ability to promote good planning across jurisdictional lines, whether among States, between levels of government in a single State, or with the private sector. A GIS-driven spatially-explicit Decision Support System has the potential to help move decision-making out of the reactive mode driven

by regulations such as the Endangered Species Act (ESA) and the National Environmental Policy Act (NEPA), into a proactive planning mode which helps to identify possible impacts when a variety of options for response are still possible.

1.5 Costs of inaction

Each year, wildlife viewing, hunting and fishing pump $40 billion in expenditures into the economies of the 19 States in the Western Governors Association (U.S. Department of Interior et al. 2006, see Appendix A.2). These economic benefits are at risk. The U.S. is now losing about 2 million acres of natural land per year, or 6,000 acres per day (NRCS-NRI and U.S. Forest Service 2006). Population growth has been especially high in many western states (Figure 1), even as the rate of habitat loss outpaces growth of the human population because people are increasingly building bigger houses and new cities in formerly remote areas (Ewing et al. 2005). These developments not only occur in crucial habitats, but also require roads, canals, and energy infrastructure that fragment crucial habitats and sever wildlife corridors.

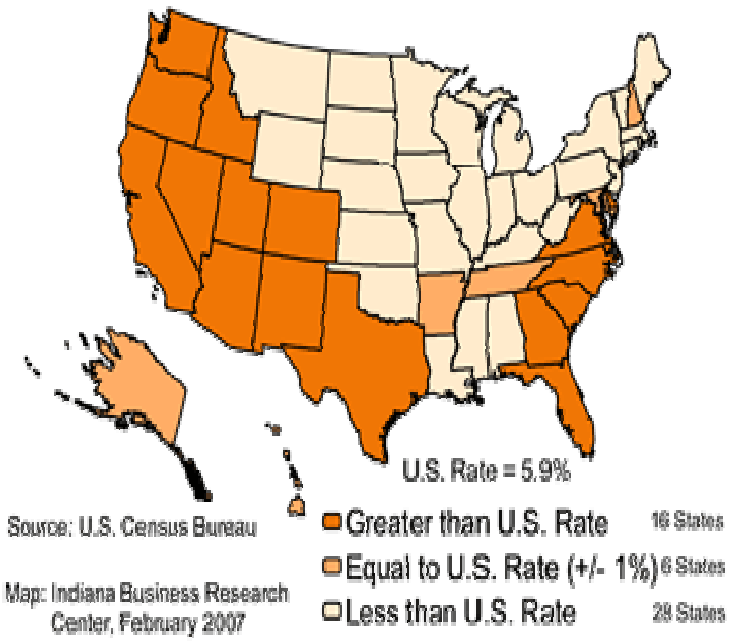


Figure 1. Many Western states are among those with the highest percent change in population. Source: US Census Bureau

Not surprisingly, wildlife is in retreat. Habitat loss and fragmentation is a cause of decline for about 83% of U.S. species that are becoming more rare (NatureServe and TNC 2000), and over 25% of species at risk (553 species) live only in fast-growing U.S. metropolitan areas (Ewing et al. 2005). Advancing development will intensify these threats. According to estimates by world-renowned conservation biologists, human impact on the environment is causing thousands of species to vanish each year – hundreds of times faster than the natural rate (Wilson 1992).

As a result, many citizens are concerned about the magnitude of our impact on the earth, and are searching for solutions big enough to make a difference. One thing we have learned since the passage of the Endangered Species Act in 1973, the longer we wait to take action the more difficult and expensive it will be to ensure the survival of species. There is a sense that current conservation efforts are insufficient, and that the choices that we make about which lands to protect and how we use the remaining lands are among the most important and fundamental decisions for our future prosperity.

2.0 FINDINGS OF THE SCIENCE COMMITTEE

The Science Committee was charged with the following four tasks: 1) collect and reconcile existing State data on wildlife corridors and crucial habitat; 2) integrate other data from the scientific community; 3) identify gaps in data and make recommendations for improving wildlife maps, and 4) provide input to the policy working groups as they develop their recommendations.

The primary input from the Science Committee to the policy working groups was to provide them with the standard definitions of crucial habitat and important wildlife corridors which would guide our own analysis of the data, and could help to focus their recommendations.

To gather data on crucial habitats and wildlife corridors from the States, the Science Committee sent a request to the 19 State fish and wildlife agencies, NatureServe and the State natural heritage programs for spatial data sets based on a set of near-term protocols (see Appendix A.3). The five states of Colorado, New Mexico, Utah, Wyoming, and Montana were targeted as pilot states and were asked to submit their data within a shorter time frame.

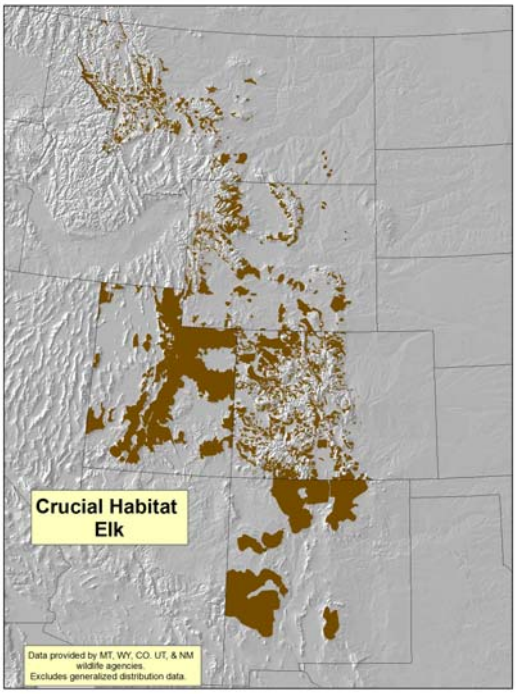


Figure 2. Existing information on crucial habitat for elk. Source: State fish and wildlife agencies

In developing the protocols, the Committee specifically considered which data sets would be most readily available in GIS format within the short time-frame required, would cover both a coarse-filter view (e.g., vegetation such as sagebrush and wetland maps) and a fine-filter view (species), would provide examples of corridor mapping, and would provide examples of priority areas based on previous planning efforts (e.g., State Wildlife Action Plans, Natural Heritage Program priority conservation areas, and The Nature Conservancy's (TNC) ecoregional portfolios).

The list of individual species requested for the preliminary analysis was selected based on its ability to illustrate the current state of the data, using criteria such as:

- Species with wide distribution in the West and present within as many States as possible to help ascertain mapping consistency among States for a given species;
- Species that are data-rich and for which data were readily available;
- Species of greatest conservation concern to many of the States;
- Species sensitive to environmental perturbation such as climate change; and
- Species with broad public support, especially game species.

The resulting list should be considered as only illustrative and efforts to develop a more precise assessment of wildlife corridors and crucial habitat would require a more thorough species selection process. In this instance, the initial species list is more indicative of the state of the data

in each of the States and less representative of the conservation status of the species themselves across the States.

Data sets were received from 14 of the 19 States, including the five pilot states, and were compiled into composite maps by ESRI. In addition, NatureServe compiled full regional data sets for ecological systems, natural heritage priority conservation areas and occurrences for imperiled species, and TNC's ecoregional conservation portfolios. In February 2008, the Science Committee reviewed the maps. It became clear that there is a wealth of information available, and that we have a very strong foundation of information upon which to develop a system for the conservation of crucial habitats and wildlife corridors in the West. Table 1 shows the specific data sets that were provided by each of the five pilot states. And Figure 2

Table 1. Data sets provided by States in response to a request from the WGA Science Committee (see Appendix A.3 for protocols). Elk was the only species for which all five pilot states provided maps of high-priority crucial habitat; even in this case, it was obvious that the states did not use a consistent definition of crucial habitat (Figure 2). Although Wyoming provided a prioritized map in response to most requests, no state had every type of requested data at hand. (Note: Entries in table cells are subject to revision after review by the states.)

Map or data layer requested	State				
	Colorado	**Montana**	**New Mexico**	**Utah**	**Wyoming**
Ecosystem or Biodiversity Data					
Water Bodies	-	Prioritized fish streams; Streams with known fish occurrences; Lakes with known fish occurrences	Hydrology map	Hydrology map; Prioritized stream and riparian corridors	Prioritized fish streams; Important stream and riparian corridors
SWAP Important Vegetation Communities	Terrestrial ecosystem types from USGS-GAP	MT SWAP Tier One biological communities	Terrestrial ecosystem types from the USGS-GAP	SWAP 10 Key Habitats (based on USGS-GAP)	Terrestrial ecosystem types from the USGS-GAP
SWAP Priority Areas	-	Terrestrial focus areas from SWAP	-	SWAP Focus Areas: forest, rangeland, riparian, wetland	Riparian and Upland, Terrestrial Priority Habitats
TNC Ecoregional Portfolio Areas	Provided by The Nature Conservancy	Provided by The Nature Conservancy	Provided by The Nature Conservancy	Provided by The Nature Conservancy	Provided by The Nature Conservancy
Natural Heritage Areas	Provided by CO Natural Heritage program	-	-	-	-
Species					
Elk	Prioritized crucial habitat; spring/fall migration corridors	Prioritized crucial habitat; spring/fall migration corridors	Prioritized crucial habitat; spring/fall migration corridors	Prioritized crucial habitat; spring/fall migration corridors	Prioritized crucial habitat; spring/fall migration corridors
Mule Deer	Prioritized crucial habitat; spring/fall migration corridors	Range distribution or potential habitat	Prioritized crucial habitat; spring/fall migration corridors	Prioritized crucial habitat; spring/fall migration corridors	Prioritized crucial habitat; spring/fall migration corridors
Bighorn Sheep	Prioritized crucial habitat; spring/fall migration corridors	Range distribution or potential habitat	Prioritized crucial habitat; spring/fall migration corridors	Prioritized crucial habitat; spring/fall migration corridors	Prioritized crucial habitat; spring/fall migration corridors
Black Bear	-	Range distribution or potential habitat	Prioritized crucial habitat; spring/fall migration corridors	Prioritized crucial habitat	-
Mountain Lion	-	Range distribution or potential habitat	Prioritized crucial habitat	-	-
Sage Grouse	Natural Heritage occurrences or lek sites	Range distribution or potential habitat; Natural Heritage occurrences or lek sites	Not applicable	Prioritized crucial habitat	Prioritized crucial habitat; spring/fall migration corridors

Map or data layer requested	State				
	Colorado	Montana	New Mexico	Utah	Wyoming
Pronghorn	Prioritized crucial habitat; spring/fall migration corridors	Range distribution or potential habitat	Prioritized crucial habitat; spring/fall migration corridors	Prioritized crucial habitat	Prioritized crucial habitat; spring/fall migration corridors
Marmots	-	Natural Heritage occurrences	Prioritized crucial habitat	-	-
Burrowing Owl	-	Natural Heritage occurrences	Range distribution or potential habitat	Natural Heritage occurrences	Prioritized crucial habitat
Leopard Frog	-	Range distribution or potential habitat; Natural Heritage occurrences	Range distribution or potential habitat	Natural Heritage occurrences	-
Prairie Dog	Natural Heritage occurrences	Range distribution or potential habitat; Natural Heritage occurrences	Range distribution or potential habitat	Natural Heritage occurrences	Prioritized crucial habitat
Long-billed Curlew	-	Range distribution or potential habitat; Natural Heritage occurrences	Range distribution or potential habitat	Natural Heritage occurrences	Prioritized crucial habitat

illustrates one set of data received for Elk, one of the game species included in the data request to the states. Maps of the data received for all 14 species included in the protocols are provided in Appendix A.3.

However, there are serious inconsistencies in the data for the individual species obtained from the State fish and wildlife agencies that made it impossible to reconcile the information for a scientifically-consistent view of the West. The Committee then decided to focus its efforts on using the data from the five pilot states to both illustrate the usefulness of current information and to highlight the need for improving the maps. Based on our findings, we have developed a "road map" for improving wildlife mapping across the West for use as decision-making tools that support a planning process with the following steps:

1. Define the conservation targets (in this case functioning ecosystems, big game, and species of greatest conservation concern)
2. Map the habitat of the conservation targets using consistent protocols
3. Map/quantify the quality & condition of the habitats using consistent protocols
4. Set representation goals for conservation of each target
5. Identify places that meet those goals
6. Prioritize the places
7. Identify linkages (e.g., corridors) among priority sites using consistent protocols
8. Prioritize the linkages
9. Identify gaps in needed knowledge and implement targeted research
10. Monitor the prioritization and linkage design for meeting conservation goals
11. Assess monitoring results and refine maps of as needed.

In preparing this report, the Committee also decided to highlight a few of other sources of information from the scientific community that were readily available, and that underscore the potential for analysis embodied in our recommendations.

In addition to producing this report, the Committee created illustrative maps that will be presented to the Western Governors at their Association Meeting in June 2008 (Appendix A.3).

2.1 Current State of Mapping Crucial Habitats

Recent, broad-scale mapping efforts across Western States have clarified approaches, information, and analyses that are essential to effective regional wildlife conservation. The process for developing State Wildlife Action Plans (SWAPs) provided many useful lessons for identifying crucial habitats, seeking public involvement, and sharing that information with decision makers in each State (Figure 3). The SWAPs had several required elements that make them useful in decision-support (as listed above), including gathering of information about the distribution and abundance of species of greatest conservation concern as planning targets, describing the locations and relative condition of key habitats and community types, describing the stressors which adversely affect the target species and habitats, describing conservation strategies for the target species and habitats, monitoring the targets to measure the effectiveness of conservation actions taken, and updating the SWAPs as needed.

A key weakness is the inconsistency among states in the selection of conservation targets and specific methods for identifying their habitats. In addition, most states did not prioritize crucial habitats, but treated all habitat for the target species equally. And very few States included a corridor planning approach or strategies to address climate change in their SWAPs.

3a. ***3b.***

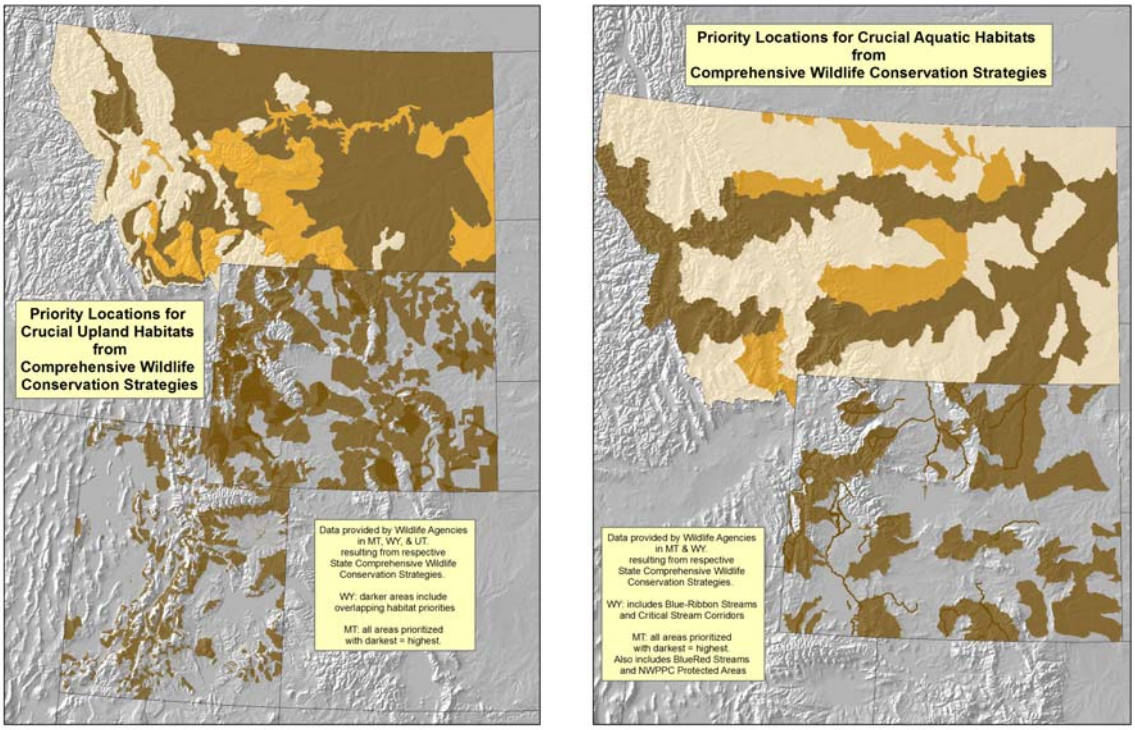


Figure 3a. Priority locations for crucial terrestrial habitats from the State Wildlife Action Plans (SWAPs). Darker areas in Wyoming include overlapping habitat priorities. Darker areas in Montana represent the highest priorities.

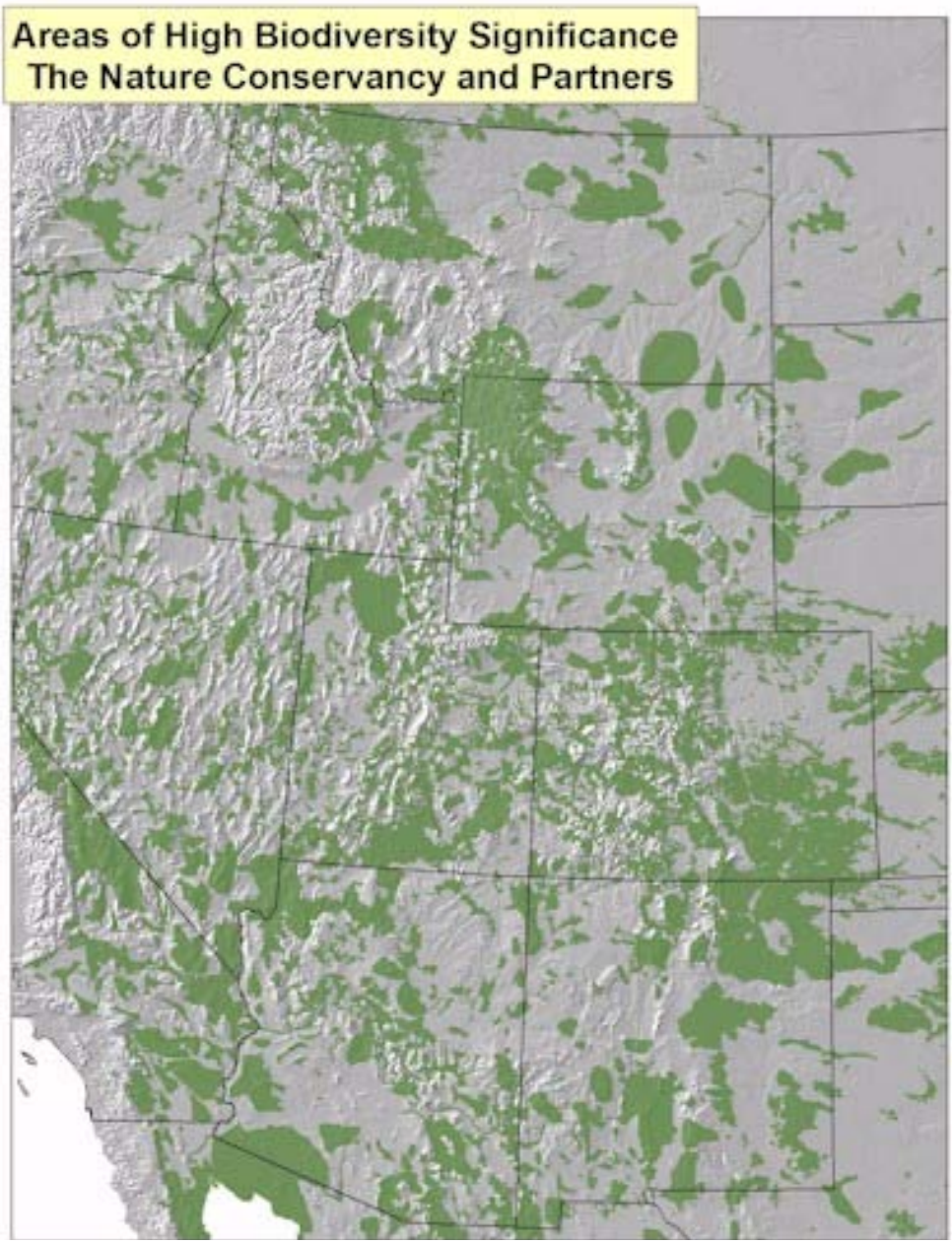
Figure 3b. Priority locations for crucial aquatic habitats from the State Wildlife Action Plans (SWAPs). Wyoming data include blue-ribbon streams and critical stream corridors. Montana data include blue-ribbon streams and NWPPC protected areas.

Source: Montana, Utah and Wyoming State Fish and Wildlife Agencies.

The 35 ecoregional assessments developed by The Nature Conservancy (TNC) and a wide variety of partners (Figure 4) were included in many of the SWAPs. They are highly prioritized to identify the least expensive land area that encompasses target amounts of each of the 35 ecoregion's vegetation communities, aquatic ecosystems, and occurrences of selected species. TNC's ecoregional assessments offer lessons for integrating conservation data across political borders, engaging multi-disciplinary expertise, and implementing science-driven processes for identifying crucial wildlife habitat. The Wildlands Network Designs, such as the Spine of the Continent (Figure 5), identify "core areas" as a proxy for habitat of wide-ranging carnivores based primarily roadless areas, with an emphasis on existing protected areas such as designated wilderness areas.

Two fundamental data sets used in the SWAPs, TNC Ecoregional Assessments, and other efforts to identify crucial habitats are managed by the NatureServe network of State natural heritage programs. The first data set includes consistently mapped locations for imperiled species that were used to help select species of greatest conservation need for the SWAPS, and species

Fig. 4. The TNC Ecoregional Assessments (portfolio sites in green) provide a more consistent depiction of important biodiversity areas across the Western States. Source: The Nature Conservancy.



conservation targets by TNC. The second data set includes mapped ecological systems and vegetation communities, developed in partnership among the States, TNC, the U.S. Geological Survey (USGS-GAP), the National Park Service, and more recently the interagency, national Landfire effort, that helped guide habitat mapping in the SWAPs and selection of ecosystem conservation targets by TNC (Figure 6). Consistent standards for collecting and managing data allow information from different natural heritage programs to be shared and combined

Figure 5. Wildlands network designs identify linkages between large blocks of protected and roadless areas. Source: The Wildlands Project.

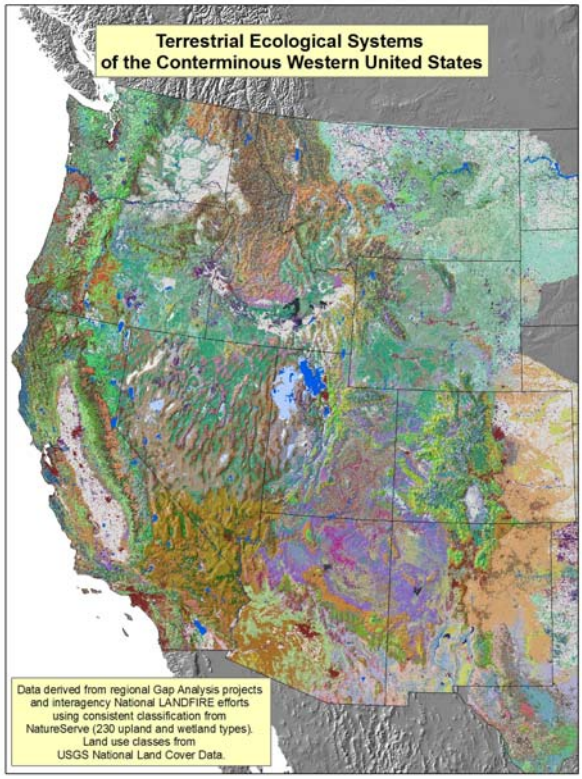


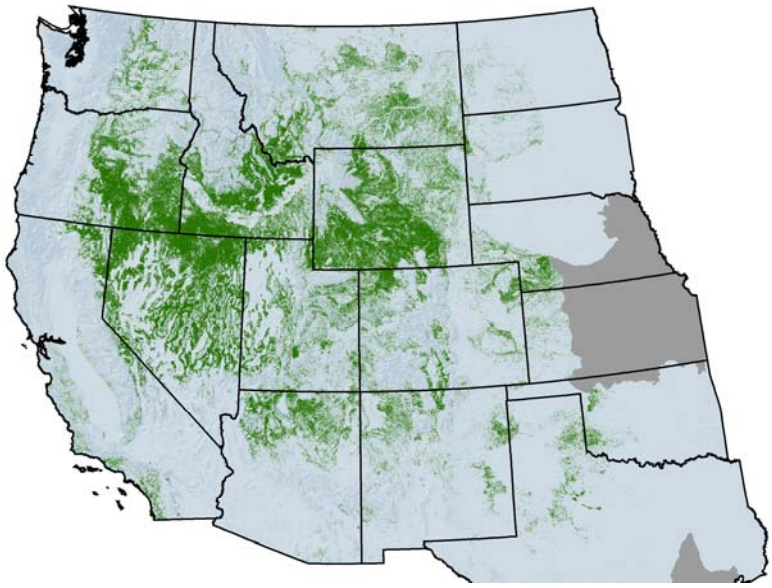
Figure 6. Ecological Systems map for the five pilot states. Source: Regional GAP, Landfire, NatureServe and USGS National Land Cover data.

regionally, nationally, and internationally to inform a variety of land use decisions. The main limitation of these data is that the state-by-state approach has led to uneven capacity to collect data among programs, resulting in data gaps.

Many State wildlife agencies maintain habitat maps for individual game species. Some of these are available only as hard-copy maps. Others, such as California's map of mountain lion habitat are electronic maps developed after extensive input from diverse experts and stakeholders. Even these more sophisticated maps are based on simple models and expert opinion, not on statewide surveys. All maps used to depict crucial habitats and corridors should be accompanied by estimates of accuracy and uncertainty.

There have been a number of efforts to map the ranges of individual species, notably by the Wildlife Conservation Society (e.g., pronghorn and wolverine) and NatureServe (mammals, birds, amphibians and fishes). There are also a few high-resolution range-wide maps for particular vegetation communities, such as the sagebrush map produced by BLM and its partners (Figure 7). These maps are probably the most reliable products available for the species and/or habitats that they cover, and are particularly valuable because they span State and jurisdictional boundaries.

Figure 7. Sagebrush dominated land cover in the Western United States. Compiled by Bureau of Land Management from the national Landfire EVT on 5-8-2008.



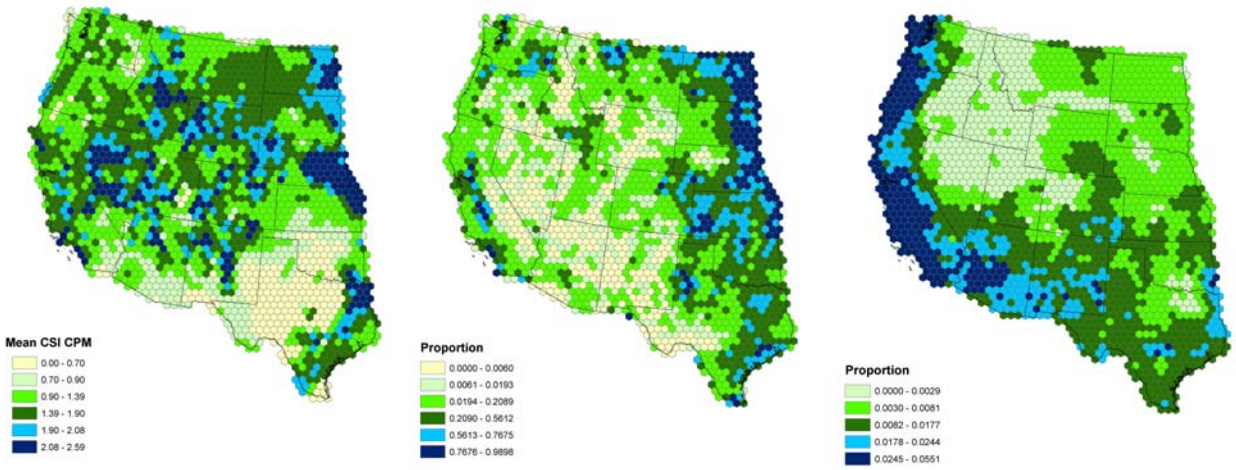


*Figure 8a. Areas of relatively high (dark blue) and low (pale yellow) **climate stress** as measured by the degree of change in temperature, precipitation, and productivity between the recent historical and future climate regime.*

*Figure 8b. The degree of **migration resistance** that current land use may create for terrestrial biodiversity movement. Dark blue reflects those areas with relatively high proportions of developed and agricultural land which may hinder species movements.*

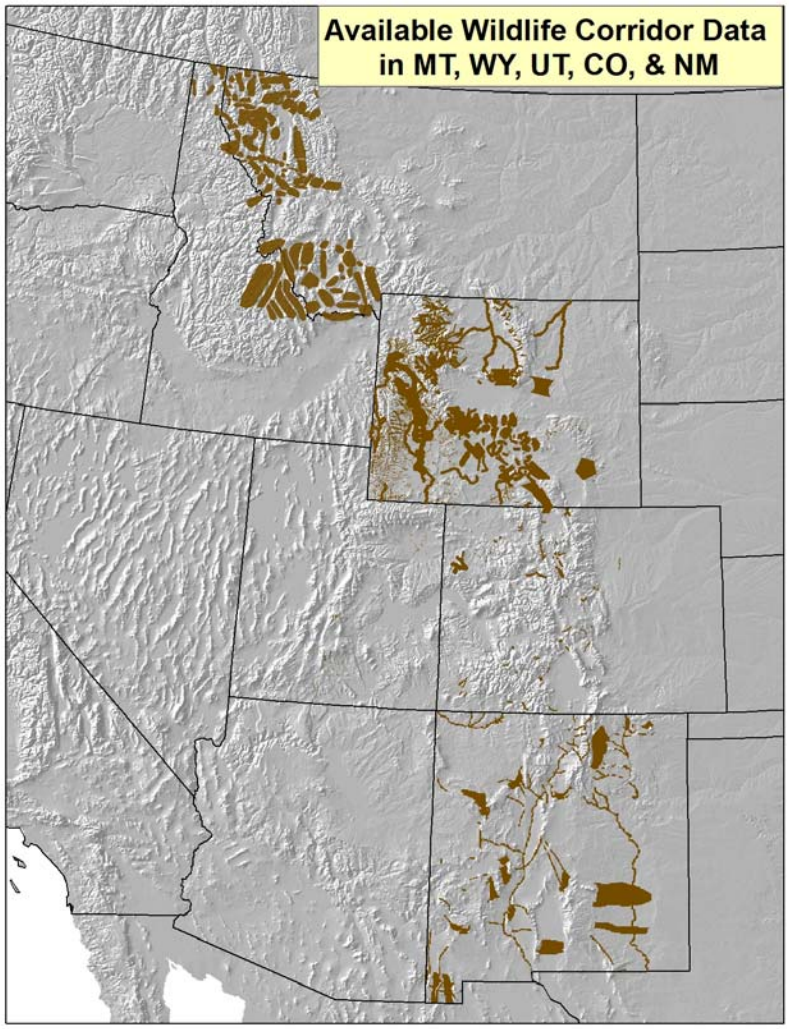
Figure 8c. Areas where the current species pool support a relatively high (dark blue) to low (pale green) proportion of at-risk species (G1, G2, G3 and GH).

Source: Flather, Joyce, and Koopman, in prep.

In addition to its role in mapping ecosystems, the Gap Analysis Program (USGS-GAP), a cooperative effort between the States and the U.S. Geological Survey, maps the potential LandScope America and DataBasin are two pending online tools for sharing data consistently, and will be very helpful in organizing information for access and comment by the user community. But these efforts will focus on serving existing data sets, and will not generate new data.

Few States have identified and mapped important wildlife corridors. In Section 2.1, we explained that mapping wildlife habitat is difficult because of problems such as gaps in data, obsolete data, inconsistent protocols, lack of common definitions, lack of cooperation across jurisdictions and agencies, and uncertain impacts of climate change. These problems are even more severe when it comes to mapping wildlife corridors. Figures 9 and 10 display the mapped corridor information obtained by the Science Committee from the States. While these maps represent valuable information about species movements, two challenges are immediately apparent. First, the corridors are mapped with low precision (often as buffered lines or as arrows of movement, rather than habitat corridors). Second, the States have not had the opportunity to prioritize among the many available corridors, leading to a situation in which it is not possible to identify the most important wildlife corridors for directed conservation action.

Figure 9. Available information about wildlife corridors provided by State fish and wildlife agencies.



The Wildlands Project and other entities also have developed network designs that depict important movement areas at low to intermediate resolution. Some of these are statewide efforts, such as *Linking Colorado's Landscapes* (http://www.restoretherockies.org/linkages.htm), while others are regional, such as the *Spine of the Continent* campaign (Figure 5). State maps depicting areas of high roadkill (e.g., Utah http://www.udot.utah.gov, and New Mexico's

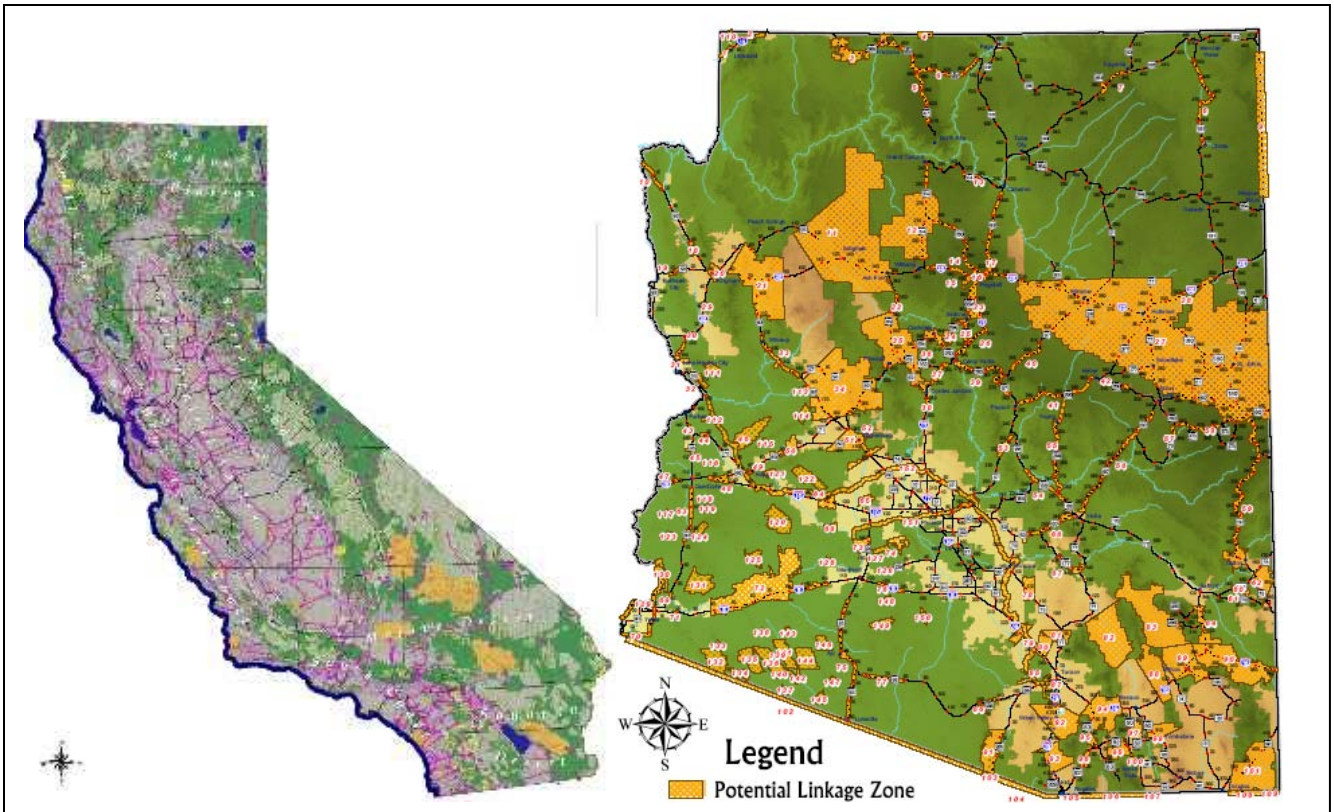


Figure 10. (left) California's statewide map depicting 232 unprioritized wildlife corridors as purple arrows. (right) Arizona's statewide map depicted 150 wildlife corridors as yellow polygons. Such maps are an essential starting point

http://www.wildlife.state.nm.us/conservation/criticalmass/index.htm) are useful to identify areas where roads were built without appropriate wildlife crossing structures, but do not identify areas where proposed new projects need to consider wildlife movement. In a few areas (e.g., Figure 9) these coarse corridors have been replaced by detailed designs.

2.3 Current Process for Obtaining Maps

The current process for obtaining maps of crucial habitats and important wildlife corridors is cumbersome, especially for anyone who has a need to access information from multiple states. There is no central repository for all of the information, so you need to know who to contact, and how to describe your information need. In addition, very few organizations besides the State fish and wildlife agencies, NatureServe and the State natural heritage programs, and the U.S. Geological Survey's National Biological Information Infrastructure have an organizational focus on making information available to users. A selection of important online resources includes:

- State Wildlife Action Plans (SWAPs) (http://www.wildlifeactionplans.org/)
- Downloadable, digital distribution maps for birds, mammals, amphibians and fish (http://www.natureserve.org/getData/animalData.jsp)
- Searchable database with downloadable species reports including range maps and status information (http://www.natureserve.org/explorer/)
- Downloadable data from TNC's Ecoregional Assessment Geodatabase for Western North America—January 2008—and a report explaining the data sets (http://azconservation.org/projects/ecoregions/)

- Searchable database of observation and specimen data for species worldwide, with interactive map viewer. Some data downloadable. (http://data.gbif.org/welcome.htm_
- Portals to biological data sets by region (http://www.nbii.gov/portal/community/Communities/Geographic_Perspectives/)
- Locate data sources for conservation areas, species, habitats and threats worldwide (http://www.conservationmaps.org/Portal/ptk)
- Links to individual State natural heritage program data resources (data vary by State) (http://www.natureserve.org/getData/programData.jsp#A)
- Selected species ranges, ecoregions, land cover and forest fragmentation (http://www.nationalatlas.gov/maplayers.html)
- U.S. vegetation map (complete for Western U.S) (http://landfire.cr.usgs.gov/viewer/)
- Land use history of North America (http://biology.usgs.gov/luhna/index.html)
- Land cover, protected areas, and potential habitat for vertebrates (http://www.gap.uidaho.edu/)
- Descriptions of the Wildlands Network Designs developed by Wildlands Project and partners (http://www.wildlandsproject.org/)
- An online library of wildlife monitoring protocols (http://nrmp.nbii.gov/portal/server.pt)
- Information about tools for ecosystem-based management (http://www.ebmtools.org/)
- *Under Construction*: Maps of conservation priorities, including species diversity and important ecosystems. sample map gallery available. (http://www.landscope.org/preview/Explore/FindAndView)
- *Under Construction*: A web page for every species on earth. Pages for 25 species are fully developed, most pages currently have minimal information (http://www.eol.org/)
- *Under Construction*: Data Basin (http://databasin.org/) an on-line facility for sharing data related to biodiversity.
- Links to wildlife connectivity research for the U.S. Northern Rockies and Canada (Yellowstone to Yukon Conservation Science Grants – www.y2y.net)

3.0 ISSUES AND RECOMMENDATIONS

Just as human population growth and landscape change are ongoing processes, so too this vision for mapping crucial habitats and corridors is an ongoing process, not an event or project that will be "done" on a certain date. In particular, coupling research to management actions (adaptive resource management) is essential to improve decisions affecting crucial habitats and wildlife corridors over time.

As the human footprint on the landscape increases, the ability of wildlife to move from place to place is more restricted. With increased building of infrastructure for transportation, natural resource development, and expansion of our communities, the resulting fragmentation reduces the function of the remaining crucial habitats, and cuts off the pathways that link crucial habitats to each other.

The West will continue to experience phenomenal growth. This need not occur at the expense of crucial wildlife habitats and corridors – but only if people plan growth appropriately. Such planning requires that crucial habitats and wildlife corridors are identified early in the planning process, and are considered in a spatially explicit way as energy exploration, urbanization,

highways, and other infrastructure projects are designed. Considering wildlife late in the planning process is expensive and unlikely to provide a good outcome for wildlife. For instance, over 20 years of litigation and $20 million in planning have not produced a single mile of construction on the Foothill South Toll Road in southern Orange County, California, where the initial plans failed to consider crucial habitats and wildlife corridors. The resulting road will be more expensive and worse for wildlife than alternative designs that could have been implemented 20 years ago. During the same years, other new highway projects in the same region considered wildlife early in the process and moved from proposal to construction in less than 5 years.

The central message from the policy committees to the Science Committee has been that all policy efforts require good information about where the crucial habitats and important wildlife corridors are located, what wildlife species rely on these areas, and how development projects can be designed to avoid and mitigate impacts to crucial habitat and corridors. For crucial habitat, the main technical issues are: understanding the habitat needs for a variety of wildlife species; identification, mapping, and prioritizing the areas of greatest importance; and expertise in developing conservation plans that take into account cumulative impacts. Under the SWAP program, states are making significant progress on identifying and mapping crucial habitats.

Similarly, for wildlife corridors, decision makers need to identify, map, and prioritize linkages, and develop conservation plans. The SWAPs have barely begun to address these issues for wildlife corridors. The States need assistance using the best available science to design corridors. Each corridor design is an experiment. Because corridor conservation plans are new, there are few examples of wildlife corridors that have been designed, implemented and found to have either succeeded or failed (Beier and Noss 1998, Horskins et al. 2006). Thus the States also need a central repository to collect and archive data that can eventually yield a large sample of designs and outcomes that can improve the process of conserving corridors.

There are challenges that must be overcome before the work that has been done so far can be of sufficient quality, consistency, and scientific rigor to achieve our vision. Based on data sets evaluated, the Science Committee identified important issues, each of which leads to one or more recommendations for action by the Governors. We organize the issues and our recommendations in three general areas:

3.1 Improving scientific resources (data and models)

3.2 Improving the application of science to conservation of crucial habitat and wildlife corridors, and

3.3 Establishing sustainable funding streams.

3.1 Improving Scientific Resources

Issue: **Lack of consistency among States in what is mapped as crucial habitat.** Western states have approached crucial habitat designation with varying methodologies. Although these approaches are appropriate within the context of each state's conservation priorities, there is not a consistent method that allows for range-wide analysis of crucial habitats. In the short term, the Science Committee recommends using maps in the State Wildlife Action Plans where they exist, in combination with the other resources listed in section 2.3. In the long term, a common set of methods to map crucial habitat and corridors is needed for rigorous analysis, transparency for all

stakeholders, and better partnerships with local government. The result will be a more solid foundation for making decisions about land and water use that preserve the character of the Western landscape.

***Recommendation*:**

1. **Create an Integrated Fish and Wildlife Decision Support System (DSS) .** The Western Governors, through WGA and the Western Wildlife Habitat Council (WWHC), should convene appropriate state representatives to coordinate regional and state efforts to develop Integrated Fish and Wildlife Decision Support Systems (DSS) (Recommendations 1 through 5), annually evaluate the status of knowledge about the West's crucial habitats and important wildlife corridors, and seek and coordinate funding for research that will address the most critical data gaps. The Decision Support Systems would exist in each state, with the WWHC providing coordination and support.

   The WWHC would focus on scientific and coordination challenges, and would ***not*** have regulatory authority. Existing regulatory protections for wildlife should continue to be enforced by the appropriate State and federal agencies.

Together, recommendations 1-5 will create an Integrated Fish and Wildlife Decision Support System (DSS) <u>within each state</u>. Each DSS will compile information, assure data quality, and make the data, models, and analyses available at scales useful to analyzing proposed energy, land use, and transportation projects in terms of on-site impacts, regional context, and a changing climate.

   The WWHC may partner with entities that coordinate among local governments, tribes, land management agencies, and conservation groups at local to county scales (such as Natural Resource Conservation Districts). Another important group of partners are university-based organizations that strive to improve the scientific basis for environmental decision making (such as National Center for Science and the Environment). Unlike any of these partners, the WWHC would have the targeted mission to coordinate among the States on crucial habitat and wildlife corridors at regional, multi-state scales. The WWHC should serve as a model for other regional councils, and possibly a similar state-based National Wildlife & Corridor Council. If a national council is established, however, states should retain the lead role in wildlife management and defining priorities, based on State Wildlife Action Plans and other state wildlife management strategies.

   The WWHC would assess region-wide needs for geospatial wildlife data and recommend strategic action. The system of consistent protocols and funding priorities established by the WWHC should help guide state-level investments by highlighting areas that require extra care for wildlife habitat and corridor conservation (see Appendix A5 for details about the types of information that should be developed using consistent protocols). Through the WWHC, the States should annually report to the WGA on their progress to achieve the Wildlife Corridors Initiative recommendations. In particular the WWHC would:

- In establishing Decision Support Systems, encourage states to build on existing efforts and to use data from state wildlife agencies, state natural heritage programs, federal agencies, tribes, local governments, conservation NGOs, and industry that meet accepted data quality standards.
    - The Wyoming Landscape Conservation Initiative, the Yellowstone to Yukon Conservation Initiative, the Spine of the Continent initiative, Arizona's Wildlife Linkage Workgroup, and southern California's Missing Linkages effort are examples of multi-agency, public-private collaborations with an emphasis on corridors that should be encouraged.
    - State Wildlife Action Plans and The Nature Conservancy's ecoregional assessments are widely accepted sources of information about the location and priority of crucial habitats.
    - The NatureServe network of state natural heritage programs provides an existing, state-based framework for the collaborative development and implementation of nationally-consistent protocols for sampling, mapping, and evaluating the conservation status of wildlife, plants and ecosystems.
    - Data Basin (http://databasin.org/) and LandScope America are examples of existing data sharing tools.
- Help states understand the best available science in a GIS format to flag areas where potential impacts to crucial habitat and wildlife corridors warrant more detailed, fine-scale analysis.
- Ensure that the habitat and corridor maps are updated as landscapes and wildlife populations change.
- Foster collaborative monitoring programs among agencies to evaluate efficacy of mapped crucial habitat and corridors in meeting management objectives, and integrate research into decision making.
- Develop and encourage States, counties, local governments, and other partners to use rigorous analytic tools for fine-scale analyses to guide conservation of important wildlife corridors. The Science Committee endorses the recommendations of the Land Use Working Group to build capacity of counties and local governments.

***Issue*: Incomplete and obsolete data**. Mapped information about species and habitats is usually gathered in projects that focus on small portions of the range of the species or vegetation community. Systematic, range-wide surveys are very rare. Thus a "blank spot" on the map could indicate a lack of survey effort rather than absence of the species or vegetation community. Decision-makers often recognize this problem, but because information is needed immediately, they emphasize using "existing data" and hope that better data will be available in the future. A related issue is that many data sets consist of observations and expert opinions gathered over decades, and do not reflect current conditions. Further, crucial habitat and corridor needs for many species are poorly understood; many existing maps are extrapolations from old and non-quantitative data.

***Recommendation*:**

2. **The Governors should support need-based prioritized systematic surveys for wildlife species, their habitat and connectivity.** Possible coordinating entities could be WWHC, AFWA, National Biological Information Infrastructure (a program of the Biological Resources Division of USGS), the state natural heritage data initiative, Cooperative Fish and Wildlife Research Units, and CESUs. A new source of funding may be necessary, consistent with an objective of the program's next phase to fill data gaps. Surveys should be designed to survey a substantial, representative portion of each major ecoregion, support the development of ecoregion-specific habitat models for each species, and coordinate across jurisdictional and organizational lines as appropriate.

***Issue*: At this time, no State Wildlife Action Plan includes maps that predict the future distribution of crucial habitats resulting from climate change.** Applied research focusing on interaction between climate impacts and land use change, habitat fragmentation and other stressors is needed to inform management strategies. Identifying current and future wildlife corridors is as an important component of enhancing landscape resiliency to cope with a changing climate (Hannah et al. 2003, Lovejoy and Hannah 2005), but to date wildlife corridors have been identified based on based on maps of current vegetation, and thus may not be robust to climate change.

Recommendation:

3. **The WWHC should include climate change as a central part of its program.** To that end, the Science Committee endorses the recommendation developed by the Climate Change Working Group to establish a Wildlife Adaptation Advisory Council and recommends direct collaboration between the WWHC and the WAAC.

***Issue*: Most states do not have a statewide corridor map; where statewide maps exist, they have too many unprioritized corridors**: Only 4 of 14 states responding to our data request indicated that a statewide corridor map existed. Where statewide corridor maps existed, they depicted many corridors (for example, 232 corridors in California and 150 corridors in Arizona) that cover a large fraction of the state (Figure 10). Although such maps may be biologically accurate (connectivity is at risk in many places), decision makers need information on the ecological importance of each linkage area, and some way to identify the most important linkages.

A related issue is obsolescence. Corridor maps become obsolete even faster than maps of crucial habitat. As new highways, cities, canals, fences, or energy field developments occur, wildlife movement is rapidly confined to corridors in a way that was not anticipated when maps were developed. Maps must be dynamic, responding to the human activities that transform our landscapes.

***Recommendation*:**

4. **The Governors should consider directing the appropriate State agencies, to create prioritized corridor maps for the entire state as part of each iteration of their SWAPs.** The early iterations of these maps will depict placeholder polygons or arrows, as in Figure 10. The process of putting corridors on the map should be open to all interested agencies and persons, including tribes, industry, and landowners. Each state

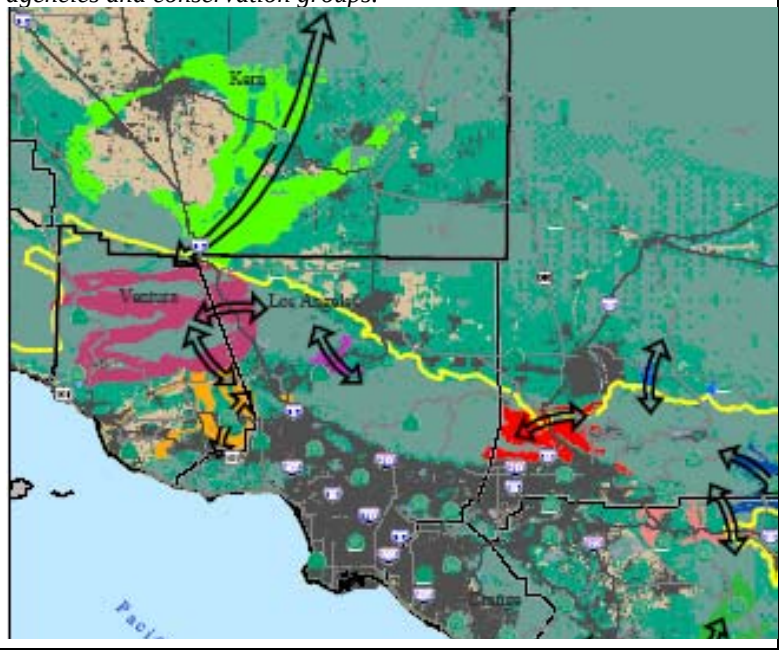
should look beyond its borders to consider important cross-border linkages, including linkages to important habitats in Canada or Mexico.

Statewide maps produced by multiple stakeholders will include some non-functioning, non-restorable corridors, and some corridors of low importance. Prioritization of linkages is essential to make the map consistent, quantitative, and useful. The prioritization process must be transparent, with explicit criteria and criteria weights. States should maximize opportunities to integrate these maps into the USDI *Healthy Landscapes Initiative* and the USFWS *Strategic Habitat Conservation Initiative*. As cooperators with federal entities, states have a unique opportunity to integrate their findings into federal EIS processes and management plan revisions.

***Issue*: Need for linkage designs.** In statewide maps, corridors are depicted as large polygons (Arizona – AWLW 2006) or arrows (California – Penrod et al. 2001) that simply indicate where more detailed corridor mapping is needed (Figure 11). The existing state-wide corridor maps are best characterized as maps of areas where connectivity is at risk. Decision-makers need more detailed analysis to identify the exact area to be conserved as a wildlife corridor, and to guide mitigation for highways, land use, and other infrastructure affecting the area. Although no State has completed such detailed analyses and corridor conservation plans statewide, Arizona has developed such plans for 16 of its 152 corridors (www.corridordesign.org/arizona). Although less than statewide in scope, the South Coast Missing Linkages effort (www.scwildlands.org) is the best example of an integrated network of detailed corridor plans that link all the major crucial habitats in a large geographic region, namely coastal southern California (Figure 11). Until linkage designs are developed, states can protect corridors only by reacting to development proposals that would harm the corridor. Developing proactive linkage conservation plans for high priority linkage will encourage proponents of transportation projects, mineral development projects, or new land uses to build wildlife permeability into their project proposals.

Once the States have created consistent corridor maps, and have assigned priority to certain corridors, they need to change the placeholder depictions of corridors (arrows or vague polygons) with detailed linkage designs. The science of corridor design is still in its infancy (Beier et al. 2008), and is rapidly changing. Several approaches are available (Carroll et al. 2003, Hargrove et al. 2004, McRae 2005, Crooks & Sanjayan 2006, McRae & Beier 2007, Beier et al. 2008) but many still need to be translated from scientific ideas into management-friendly tools that can be applied in real landscapes. Most approaches rely on models for focal species; typical model parameters are based solely on expert opinion. With additional research and improved data (Recommendation 1), model parameters could be estimated empirically for each ecoregion. There is a desperate need for modeling approaches robust with respect to climate change.

Figure 11. The South Coast Linkage network of California. Detailed analyses based on scientific understanding of wildlife were used to replace the placeholder arrows (black) with detailed linkage designs (color) that are being implemented by 25 federal, state, and local agencies and conservation groups.



***Recommendation*:**

5. **To improve state capacity for detailed corridor design, the Governors should consider funding for state personnel, such as a spatial ecologist to coordinate the state's effort to develop detailed corridor conservation plans for the top priority corridors.** Ultimately, the goal is a blueprint for a network of lands connected by corridors that will enable area-sensitive species to be ecologically effective in all suitable landscapes, and will facilitate range shifts of species in response to climate change. Both of these goals will require coordination beyond the state's borders. Because corridor design is a new science, the Science Committee does not recommend one "best" approach for all states but instead believes that progress will be stimulated by a diversity of state approaches. Alaska's approach would likely differ from that in Texas (virtually no public lands) or Indiana (where most land has been converted to intensive agriculture or urban land). Special strategies will be needed on international borders to balance needs for wildlife movement with needs for border security.

   To the extent that focal species are used to design linkages, we recommend that linkages be designed for a broad spectrum of species, including area-sensitive species, species sensitive to urbanization, roads, energy development, or other likely land uses, fragmentation-sensitive species, species sensitive to climate change. Fish and other aquatic species can be particularly vulnerable to blockages that impede movement up and down river courses, and should also be considered.

***Issue*: There are limited reasons for private entities to make the extra effort to coordinate and share data, and few effective incentives for public agencies, universities, and private, non-profit conservation organizations.**

***Recommendation*:**

6. **The Western Governors should consider requiring comprehensive availability of all non-confidential or non-protected data held or acquired by or through a state agency.**

3.2 Improving the Application of Science to Conservation of Wildlife Habitat and Corridors

***Issue*: Lack of input from state wildlife agencies into proposed projects that affect wildlife corridors and critical habitats.** Most state wildlife agencies receive little if any general fund revenues, and are funded solely by sale of hunting and fishing permits, federal grants, and lottery dollars. Accordingly, most state wildlife staff positions are oriented toward species that are hunted and fished. This means that when the state wildlife agency is asked to provide input on projects that affect crucial wildlife habitat or corridors, it may be "nobody's job" to do so. Although state agencies make good-faith efforts to provide input, the task often is added to the workload of persons with other primary responsibilities.

***Recommendation*:**

7. **The Governors should seek funding for sufficient staff to provide advice to federal, state, and local agencies on such issues as building highways and canals, approving energy and mining projects, managing public land, and making land-use decisions that affect wildlife corridors.** Science-based and other information must be made available to all appropriate agencies at the earliest opportunity in the planning and decision-making process. If the States do not have adequate staffing to consult with project proponents and decision-makers, the other recommendations of the Science Committee will not be effective.

***Issue*: Many projects proceed with little attention to crucial habitat and wildlife corridors.** In particular the 2005 Energy Bill exempted some oil and gas projects from NEPA review. Similar exemptions have been granted for some border security projects. In most Western States, those State actions without a federal nexus are not subject to any state requirement to consider impact on crucial habitat or wildlife corridors.

Recommendation:

8. **Governors should consider establishing goals and policies that will result in all development proposals considering using the data, models, and analyses from the Decision Support System developed by each state (under Recommendations 1-5) to assess impacts to crucial habitat or wildlife corridors. Avoidance, minimization, and mitigation of such impacts, in sequence, should be the goal.** There is no point creating the Decision Support System if it is not available and used. Avoidance and minimization of impacts should be preferred to mitigation.

   Governors should consider requiring compliance by state and local government via Executive Order or by working with legislatures to enact new State laws requiring state and local governments to consider the impact of their proposed actions on crucial habitat and wildlife corridors, and to use the state DSS when making land use decisions that affect crucial habitat or wildlife corridors. Currently only 4 Western states (California, Hawaii, Montana, and Washington) have a law requiring state and local government to consider how their most basic decisions – such as amending a land use plan, or selling or leasing state land – affect wildlife habitat or corridors.

Under the National Environmental Policy Act, proposed federal actions must, and typically do, consider impacts on wildlife. To increase the rigor of such consideration, the Governors should urge Congress or the President (by Executive Order or regulations from the Council on Environmental Quality) to require use of the state's information (each state's DSS) for federal actions that may affect crucial wildlife habitat and wildlife corridors as determined by the states.

In addition to reactive use of the DSS in response to proposed projects, federal agencies should become proactive. In particular, federal decision-making processes and plans such at USDI *Healthy Landscapes*, USDA Forest Plans, BLM Resource Management Plan revisions, and the USFWS *Strategic Habitat Conservation Initiative* should incorporate statewide corridor maps, detailed linkage designs, and other products of the state DSS. (see Appendix A.6 for a list of the fundamental research and planning components of a functional DSS).

3.3 Establishing Sustainable Funding Streams

The previous recommendations make it clear that creating the scientific information base for wildlife corridor conservation is not a one-time project, but an ongoing effort that supports current and future decision-making in a dynamic landscape. Thus it is critical to establish funding streams for the continued development of information about crucial habitats and important wildlife corridors as land and water uses change. Funding is also needed to monitor the sensitivity of these resources to disruption, their responses to management activities, and to cover the cost of coordination among the many key players from both the public and private sectors.

From the 1940's through the early 1990's the States were in the vanguard of developing high-quality information about the status, distribution, and habitat needs of wildlife. In the mid-1990's there was a valid push to put that information to work, and direct more resources toward on-the-ground management. Unfortunately, the pendulum swung farther than many people realize, and for the past 15 years the vast majority of funding has been directed toward using "existing data" to answer questions, coupled with a corresponding plunge in investments needed to keep data and the systems used to manage the information current. There is no funding mechanism dedicated to the ongoing information needs required to understand impacts of habitat fragmentation on wildlife and how that should drive decision making.

In addition, most state wildlife agencies receive little if any general fund revenues, and are funded primarily by revenues generated from hunting and fishing activities, federal distributions, and lottery dollars. This limits State capacity to engage actively in conserving wildlife habitat and corridors.

A modest infusion of funds would halt the erosion of these information resources, and usher in an era characterized by a renewed understanding of the crucial habitat and corridor needs for wildlife.

The Science Committee felt strongly that several existing programs provide a foundation of information and expertise that we can build upon; these include the State Wildlife Action Plans, existing State corridor initiatives, the State Natural Heritage Programs and NatureServe, the

National Phenology Network, State GIS Coordinators, USGS, the Wildlands Network Design and others. We emphasize helping existing programs grow and evolve rather than duplicating roles and programs that already are well positioned to fill the void.

The Western Governors can reach their goal of creating a solid scientific foundation for the *Wildlife Corridor Conservation Initiative* by voicing their support for the following sustainable funding streams that advance the recommendations in sections 3.1 and 3.2. The recommendations that follow focus on specific sources of funding, and how they could be enhanced to contribute to this effort.

***Issue*: The State Wildlife Grant Program (SWG), our nation's most important investment in keeping common species common, is not permanent, does not currently focus on several issues of importance to the *Wildlife Corridor Conservation Initiative*, and does not yet provide sufficient funding.** This program, administered by the U.S. Fish and Wildlife Service (FWS) and supported by the Teaming With Wildlife Coalition (with over 5,500 members nationwide), provides grants to States to implement and refine the State Wildlife Action Plans (SWAPs). These plans, first delivered to the FWS in October 2005, have highlighted information gaps, provided an important set of strategies to guide actions, and helped many States identify spatially-explicit priority areas for on-the-ground wildlife conservation. They are also designed to be updated and improved over time—a key element to any Decision Support System.

Now that the SWG Program has moved into the implementation phase, funding for continued information development in a rapidly changing landscape has been drastically reduced, and the Program's funding is at risk annually. Without a permanent funding stream, the States and their partners cannot establish the long-term programs needed to ensure the conservation of crucial habitats and important wildlife corridors. We stand to lose the important gains that were made during the planning phase of this program, and without additional resources we will not be able to create a robust system that supports decision making. Additionally, some of the original requirements which are key needs of the *Wildlife Corridor Conservation Initiative*—such as the need to establish monitoring strategies—were not fully addressed in the first round of planning.

***Recommendation*:**

9. **The Western Governors should urge Congress to create a permanent funding stream for state wildlife and plant conservation programs**, and amend the Program's requirements to focus on activities important to the implementation of a science strategy for the *Wildlife Corridor Conservation Initiative* as follows:
    - Set the SWG Program match requirement for activities that support improved wildlife information and development of the spatially-explicit Decision Support System for crucial habitat and corridor conservation at a rate of 75:25 (federal:non-federal) or higher (e.g., 90:10). The Governors should also consider working with their State Legislatures to increase State general fund appropriations to match the SWG funding.
    - Encourage other Western States in addition to Colorado and Washington to invest the needed funds ($250,000 per state) to bring their state information, and to fund ongoing positions at the State level to keep the online information up-to-date**.**

***Issue*: Key programs of the U.S. Geological Survey (USGS) have not received sufficient funding to support coordination with the States to create key wildlife information resources needed for a spatially-explicit Decision Support System**.

***Recommendation*:**

10. **The Western Governors should urge Congress to increase funding for the USGS to improve the focus of its programs on implementation of the spatially-explicit Decision Support System at the State level.** The Western Governors should consider requesting a total increase of $26 million over the allocation in the FY08 USGS budget to support the following programs:
    - The Gap Analysis Program (GAP) to support the adoption of standard protocols for ecosystem mapping.
    - The Status and Trends Program efforts to fill data gaps and improve consistency of the national data set on imperiled wildlife and ecosystems.
    - The National Biological Information Infrastructure (NBII) to invest in information sharing with the States.
    - Sufficient funding to fill vacancies within the Cooperative Fish and Wildlife Research Units to support the coordination of State and federal research on protocols for corridor delineation, and the application of adaptive management to test and improve the Decision Support System.

***Issue*: The current lack of capacity to map and monitor the crucial habitats and important corridors needed for wildlife to be able to adapt to climate change is an enormous barrier to long-term wildlife conservation objectives.**

***Recommendation*:**

11. **The Western Governors should urge Congress to include a provision directing funding to the States that supports implementation of the decision-support system for crucial habitats and important wildlife corridors in any climate change legislation under consideration.** They should support explicit language for long-term support of the WWHC efforts. Funds should be available for research that improves wildlife information and monitoring programs and evaluation of options for wildlife conservation as habitats are impacted by climate change and associated changes in land/water uses.

***Issue*: Current National Science Foundation (NSF) grant programs such as the Long-Term Ecological Research (LTER) Network and the National Ecological Observatory Network (NEON) emphasize research on ecological processes and nutrient flows across representative landscapes, rather than the status and trends of crucial habitats and important wildlife movement corridors.**

***Recommendation*:**

12. **The Western Governors should advocate for the creation of new grant programs within NSF that fund long-term research on the status and trends of crucial habitats and important wildlife corridors useful to the States.** The NSF should direct funding towards research that contributes to greater understanding of likely intersections between

current stressors to wildlife habitats and the additional pressures created by climate change. Of particular importance is the need to increase the number of monitoring sites to measure changes to the full range of potential stressors on crucial habitats and wildlife movement corridors, and to detect ecosystem responses to these stressors.

***Issue*: A variety of federal agencies will need to use the spatially-explicit Decision Support System and the information about crucial habitats and important wildlife corridors**. The Transportation, Land Use, Energy, and Climate Change Committees have all targeted federal spending bills as a key mechanism for implementing policy recommendations. These federal spending bills will be renewed in the coming years, influencing how both federal agencies and private companies make decisions about their investments in energy, transportation, land development, and other activities that may impact the ability of wildlife to move and adapt to changing conditions. The lead federal agencies for these sectors have a responsibility to contribute to development of the system and the underlying data sets, as well as the costs of incorporating information about crucial habitats and important wildlife corridors into their own decision-making processes.

***Recommendation*:**

13. The Western Governors should make a concerted effort to ensure that future federal investments contain provisions for supporting the work of the States to meet the need for mapped information highlighted by the WGA Policy Committees. Without a focused push by the Governors, the States will lose the opportunity to make the required linkages between major federal spending initiatives (e.g., the Farm Bill, Energy Bill, and Transportation Bill) to existing decision-making processes and ensure a broad sense of commitment to wildlife corridor conservation.

WGA Wildlife Corridors Initiative

Energy Working Group

June 23, 2008 Draft

I. Introduction

With rapid population growth and increasing demand for energy, new generation sources of all types are being targeted by utilities to meet these demands. At the same time, concerns about air pollution, climate change and energy independence are raising the public's and policy makers' expectations that higher percentages of energy production will come from renewable and clean energy sources. Linking these resources to the western power grid faces its own set of challenges given the need to expand an aging electric transmission system while working within the boundaries of changing and sometimes inconsistent permitting and regulatory environments.

In 2006, the Western Governors' Association completed its work on the Clean and Diversified Energy Initiative – providing focused policy recommendations relating to achieving: (a) 30,000 megawatts of new clean and diverse energy generation by 2015; (b) a 20 percent increase in energy efficiency by 2020; and (c) adequate transmission capacity for the region over the next 25 years. By the close of 2007, 10 of the 19 western states had passed laws requiring regulated utilities to significantly increase the amount of power derived from renewable energy sources over the next 15 years. In addition, many western states have created renewable energy authorities aimed at expediting the financial investment necessary to link areas high in renewable resource potential to population centers.

This exciting renewable energy transformation in the West must be implemented properly in order to minimize impacts to crucial habitat and wildlife corridors. Consequently, in February 2007, The Western Governors' Association unanimously approved policy resolution (07-01) "Protecting Wildlife Migration Corridors and Crucial Wildlife Habitat in the West" which initiated the five policy working groups and the Science Committee. The Energy Working Group (EWG) will focus its policy recommendations with the ultimate goal of long-lasting protection for the region's wildlife corridors and crucial habitat as the region moves to a new energy economy focused on increased use of renewable and clean energy sources.

The EWG work builds upon and complements prior work and leadership shown by the western United States that has set the stage for the renewable energy transformation. In 2008 and the years ahead, the region is expected to see sustained growth through the planning and implementation phases of this vision. Importantly, as the region moves from renewable energy concepts to actual implementation, the EWG has focused its policy recommendations on defining the parameters, criteria and processes necessary to ensure the rich wildlife heritage of the West remains healthy and intact.

The EWG will also coordinate with the Western Renewable Energy Zones(WREZ) project, which began in May 2008 to develop reports that will identify Renewable Energy Zones (REZ) in the Western Interconnection based on development potential, development timeframes, common transmission needs, and cost of development. Included in the WREZ will be identification of developable resources that are not suited for aggregation into Renewable Energy Zones. The WREZ will then seek to develop transmission plans of service to priority zones to facilitate the environmentally sensitive development of the most cost-effective renewable resources located in the Western Interconnection. The WREZ will evaluate all feasible renewable resource technologies that are likely to contribute to the realization of the goal in WGA policy resolution 6-10 for the development of 30,000 megawatts of clean and diversified energy by 2015, but may not include all such resources in the WREZ.

Like the WREZ, the EWG (which focuses on solar, wind and geothermal energy sources) is intended to complement all the efforts related to implementing WGA policy, including the development of a mix of clean and diverse energy resources and having a secure, reliable interstate transmission network that can move all generated electricity to markets.

A. Scope

The EWG agrees that there are many benefits associated with renewable energy resources including achieving energy independence, the contribution of emission-free resources, (such as wind, solar and geothermal) reducing pollution, and combating global climate change. According to the fourth International Panel on Climate Change assessment report, global warming could have significant impacts on wildlife over the next century. In this context, given the growing concern in the scientific community about the impacts on wildlife species from a warming planet, renewable energy development will have an important role as a strategy to stabilize and possibly reverse carbon emissions. Second, utilizing higher percentages of these renewable resources will result in better air quality for the region. Third, some renewable energy technologies do not require water and less competition for water can help preserve aquatic as well as other wildlife.

Despite the benefits of renewable energy, it will still have impacts on the environment. Indeed, western lands, including portions of public lands, will be necessary to site utility-scale renewable energy projects and associated transmission rights-of-way to bring these energy sources to major population centers. On the generation side, the 11 states in the Western Interconnection will have to site and construct over 15,700 new megawatts of renewable energy by 2017 to meet the minimum requirements of current state renewable portfolio standards. The Western Interconnection is the alternating current power grid that covers much of the Western United States as well as territory in Canada and Mexico. That number will increase significantly by 2020 as increased levels of adopted RPS requirements come on line. The total amount of new renewable generation could far exceed the amount required to meet RPS requirements as the price of renewable energy becomes more competitive and the transmission grid is expanded to accommodate more renewable generating facilities. For example, the WGA Clean and Diversified Energy

Initiative (CDEi) had a goal of adding 30,000 new megawatts of clean energy in the WGA states over the next decade. However, the CDEi report demonstrated the potential for over 80,000 MW of energy from wind, solar, geothermal and biomass by 2015 if the right incentives and infrastructure are available. This would represent more than a fivefold increase over current renewable generating capacity in the West. Given the tremendous potential for new renewable energy development, it is critical to generate and properly utilize accurate information on wildlife corridors and habitat.

Increased energy efficiency and the use of distributed generation (such as rooftop solar) can reduce the need to add new generation sources with the related effect of reducing the need for and associated impacts from transmission facilities. For example, the Clean and Diverse Energy Adisory Committee's 2006 Transmission Task Force found that if high levels of efficiency are reached in the region, 1,150 of a projected 4,000 miles of new power lines in one study could be eliminated – approximately 30%. While the EWG understands that demand reducing strategies including energy efficiency are a vital part of the region's new energy economy, there is no question that there is still a resulting need for long distance transmission to connect utility-scale renewable projects to the western power grid. Current estimates based on input from the Western Electricity Coordinating Council and other industry experts are that at least 9,000 linear-miles of new or upgraded power lines and associated rights-of-way will be needed by 2017 within the Western Interconnection to meet load growth and renewable energy policy requirements even after current demand side management efforts are taken into account – this compared to 119,000 existing linear miles. While there may be potential for some level of this current planned transmission investment to be deferred or avoided through more aggressive demand-side management efforts, there will still be significant need for large scale transmission expansion to bring large-scale renewable energy projects to market.

While the EWG recognizes that many generation sources could be developed to meet western states' goal of clean and diversified energy and meet growing energy demand, the EWG limited its scope to renewable energy sources (including associated transmission needs) that are most likely result in utility-scale generation additions given current economic and technological considerations. Other generation types, including conventional, nuclear, or less utilized renewable energy sources can also have impacts on wildlife, and may need to be considered in future initiatives. These generation types not described in this report include biomass, nuclear power and associated uranium mining, conventional and/or advanced coal technologies, small and large-scale hydropower, and energy storage facilities. Focusing on wind, solar and geothermal energy production, the EWG developed policy recommendations to ensure that renewable energy generation and related transmission can be developed in the context of wildlife's needs for crucial habitat and corridors.

Recommendations were also developed recognizing past WGA efforts and policies targeted at streamlining the transmission permitting process, and care was taken to not unnecessarily add major timing delays to permit needed transmission facilities necessary to implement regional clean and diverse energy and meet growing demand for energy.

B. Renewable Energy, Transmission and Wildlife

Large intact and functioning ecosystems and healthy fish and wildlife populations are significant contributing factors to the high quality of life found in western communities and to thriving local economies based on hunting, fishing, wildlife viewing and outdoor recreation opportunities. Impacts to wildlife, both from renewable resources and transmission facilities are further described in this report. In order to protect these resources, wildlife corridors and crucial habitats must be identified, maintained and preserved. A wildlife database, such as the Decision Support System proposed by the Science Committee, could play a vital role in all renewable energy generation and transmission planning efforts – particularly to the extent that major renewable energy and related transmission projects can be sited outside identified wildlife corridors and crucial wildlife habitat or sited to avoid, minimize or mitigate impacts to wildlife corridors and crucial habitat.

C. A Smooth Transition to the New Renewable Energy Economy in the West

While it is true that the new energy economy and efforts to create new generation capacity with lower carbon emissions need renewable energy and associated additional transmission capacity, it is also true that if wildlife values are not considered early, either unnecessary impacts to wildlife and/or major delays to the development of renewable energy and transmission projects could occur. For example, the proposed Sunrise Powerlink transmission line in California's Imperial Valley is poised to connect up to 1,000 MW of solar, geothermal and wind resources to meet growing energy needs in San Diego. However, environmental concerns with the identified route for the 130-mile power line – including potential impacts to the Anza Borrego Desert, wildlife habitat and sensitive species – have the project surrounded in controversy. Renewable energy projects *including associated transmission proposals,* therefore, need to carefully address lands and wildlife concerns early-on in the planning and decision-making processes to ensure that wildlife species and habitat values are properly considered in order to achieve timely implementation and completion of these projects.

II. Renewable Energy (RE)

Renewable energy technologies —especially wind, solar (photovoltaics and central solar), and geothermal— will play an increasingly critical role in meeting the West's future electricity needs. These environmentally friendly energy technologies will help mitigate threats to wildlife and plant species posed by global warming. Because the West has the best resource base in the country in all these clean energy technologies, it will be important to plan new projects and transmission routes wisely for the benefit of the West's rapidly growing population, and the equally rapid growth in demand for new renewable energy capacity.

A. Wind

Wind Resources in the West: Wind resources are abundant and located throughout the WGA region. According to the CDEAC, the potential wind resources in the WGA footprint are enormous, on the order of 250,000 MW available at under $60/MWh delivered to the existing transmission network or load centers. The American Wind Energy Association has devoted considerable effort to address and mitigate potential wildlife impacts resulting from the installation and operation of wind projects. In addition, leading industry companies recently formed the American Wind Wildlife Institute to address wildlife-related siting issues in a proactive, collaborative manner with all interested stakeholders.

Many important wind resources are found on private lands, which are already used for agricultural or grazing purposes. These agricultural and grazing lands can provide important wildlife benefits. A typical utility-scale wind project requires 30 to 80 acres of land per megawatt of installed capacity. However, only about two percent of this land is taken out of production for project development, allowing the rest of the land to be used for its original purposes

Federal public lands also have significant wind resources. According to the Bureau of Land Management, some 20.6 million acres of public lands have "wind potential," with about 160,000 acres of that being considered economically developable. NREL has projected that more than 3,200 MW of power from could be developed on BLM lands by 2025.

Rock River Wind Farm, Wyoming. *Located 30 miles east of Elk Mountain, the Rock River Wind Farm stretches out over the blustery south Wyoming plains. These turbines produce enough energy to power over 13,000 homes.*

How Wind Power Works: Wind turbines have blades designed like airplane wings. They rotate due to a pressure differential caused by air moving over the surface of the blade. The blades turn a rotor which drives an electrical generator. Turbines are designed to automatically face the wind either mechanically or by computer-controlled drive systems.

Phases of Wind Power Development: Activities associated with the development of a wind energy project are site selection, site testing and monitoring, construction, operation, and decommissioning. The construction phase includes the following

activities: site access, clearing, grade alterations, foundation excavations, installations, tower erection and rotor installation. Operation and maintenance of a wind plant over time will require periodic visits to the site by maintenance personnel to provide preventive and restorative maintenance as well as potential for major repairs or retrofits involving mobilization of large cranes. These visits typically use graded gravel roads that access each turbine in a wind plant.

B. Solar

Solar Resources in the West: The solar energy resources in the southwestern United States are among the best in the world for large-scale solar power plants. Arizona, California, Nevada, and New Mexico have the greatest number of "premium" solar sites in the country. An analysis by NREL, found that even when considering only the high-value resources, there is the potential for more than 7 million MW of solar generation capacity in the Southwest. Currently, there are about 100,000 MW of potential generation capacity in these four states. Each state has enough land illuminated by only the highest solar radiation levels, such that only a small segment would be enough to generate its current electricity needs. A significant number of acres administered by the BLM in Arizona, southern California, Nevada and New Mexico register levels of solar radiation suitable for solar power plant development using current technology. Many of these lands are in proximity to Phoenix and Tucson (Arizona) and Las Vegas (Nevada) and to the energy grid supplying Los Angeles and San Diego (California).

Solar Energy Generating Systems (SEGS), California. *Solel and FPL Energy operate the 354 M, SEGS in the Mojave Desert in Southern California.*

How Solar Power Works: Broadly speaking, there are two types of solar technology: central station and distributed generation. **Central station solar** fits the typical power-production model employed throughout the grid, generating electricity at an often remote location and wheeling that energy across the grid to recipient utilities and other customers. In contrast, **distributed solar systems** are installed on rooftops or on land adjacent to buildings, enabling homeowners, businesses, schools and government buildings to generate their own electricity and/or heat.

Within central station solar, (also known as **Concentrating Solar Power (CSP))** there are several different types of solar power systems. **Solar Parabolic Troughs** consist of

curved mirrors, formed in troughs that focus the sun's energy on a pipe. A fluid, typically oil, is circulated through the pipes. The heated fluid drives a conventional turbine that is connected to an electrical generator. **Solar Parabolic Dish** systems consist of a parabolic-shaped concentrator (similar in shape to a satellite dish) that reflects solar radiation onto a receiver mounted at the focal point at the center. The collected heat is utilized directly by a heat engine mounted on the receiver, which generates electricity. **Solar Central Receivers** or "Power Towers" consist of a tower surrounded by a large array of heliostats. Heliostats are mirrors that track the sun and reflect its rays onto the receiver, which absorbs the heat energy that is then utilized in driving a turbine electric generator. **Concentrating Solar Photovoltaics** convert solar energy directly into electricity. Heat storage technology utilizing molten salts is extending generation into peak evening periods. Currently in the U.S., there are commercial solar power plants using solar parabolic troughs (for example, Kemmer Station, California and Solar One, Nevada) and photovoltaics (for example, Nellis Air Force Base, Nevada).

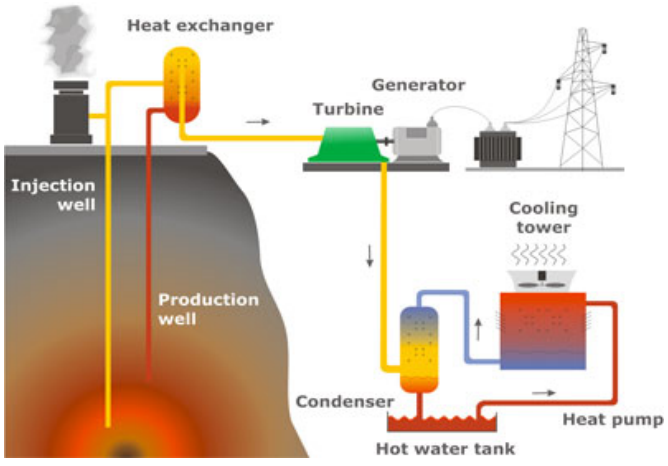
Phases of Solar Power Development: A concentrating solar power plant requires about 5 acres per megawatt of generating capacity. Sites for CSP plants can occupy up to several square miles.

C. Geothermal

Geothermal Resources in the West: Geothermal energy accounts for 17 percent of the electricity generated from renewable sources in the U.S. Half of the nation's geothermal energy production occurs on federal land, much of it in California and Nevada with 90% of the potential resources located on public lands.

The CDEAC Geothermal Taskforce estimated that in the Western States, approximately 5,600 megawatts of geothermal electricity is viable for commercial development by about 2015, from some 138 sites around the West. This is a commercially achievable capacity for new generation and does not include the much larger potential of unknown, undiscovered resources.

How Geothermal Power Works:
Geothermal resources, such as steam and hot water, are used directly to heat buildings and in greenhouses and aquaculture, and indirectly to generate electric power through steam-driven turbines.



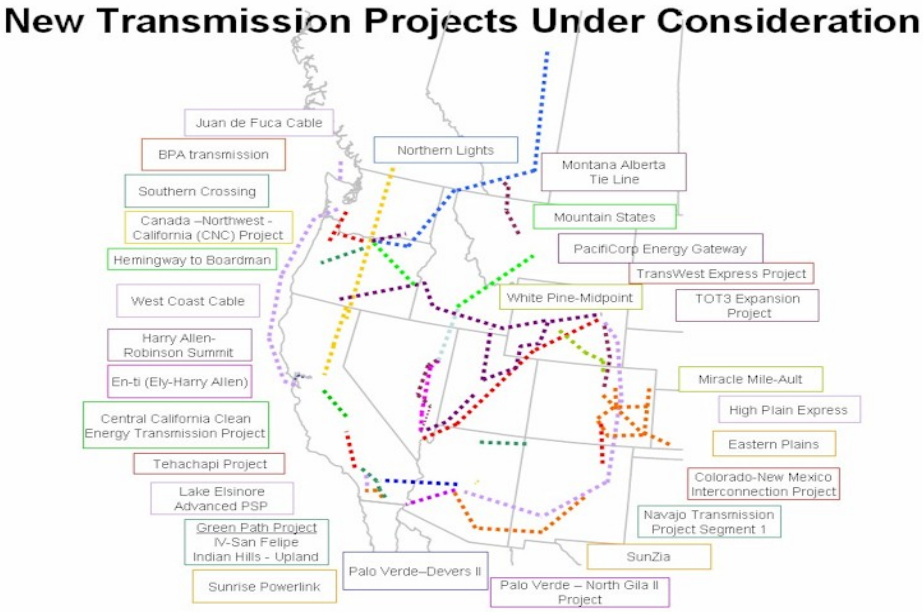
Phases of Geothermal Power Development:
Typical activities associated with operation and development of geothermal resources include exploration, drilling, development, utilization, and decommisioning. In general, geothermal projects involving exploratory drilling, and, if developed, multiple well

drilling during field development. During the drilling phase, wells need well pads, access roads and pipelines. In addition to well sites, geothermal developments need power plants, additional access roads, and transmission. Pipelines and transmission lines within geothermal fields may be buried.

Over 30 years, the period of time commonly used to compare the life cycle impacts from different power sources, a geothermal facility uses 404 square meters of land per gigawatt hour, while a coal facility uses 3632 square meters per gigawatt hour. (

III. Transmission

Transmission will be an integral component in the development and delivery of new power generation resources to customers, particularly renewable resources which are generally located in areas remote from load centers. While the amount of new transmission required may be tempered by the success of demand-side management (DSM), conservation, and improvements in energy efficiency, the fact remains that substantial new transmission will have to be installed – not only to deliver new power supplies to customers, but to facilitate increasing amounts of energy resources, particularly driven by Renewable Portfolio Standards (RPS). This situation has been exacerbated by a 15-year hiatus in major new multi-state transmission construction, which has effectively eliminated any major excess capacity in the existing transmission grid that might otherwise be used to serve these new requirements. Requirements for new transmission are also increased by state renewable portfolio standards, which mandate that a certain percentage of electrical generation or use be from renewable sources. It is likely that some areas will "import" power from other, renewable-energy-rich areas to meet these requirements, with additional transmission line capacities being needed to accomplish this transport.



While transmission lines have a relatively small on-ground footprint as towers are generally widely spaced in a linear configuration, cumulative effects of both on-ground and overhead facilities must be considered in assessing the implications on wildlife. While there are well established protocols for considering the myriad issues (including wildlife) that must be addressed for new transmission projects, they need to be reconsidered to accommodate new stakeholder processes and wildlife information that has emerged over the past 15 years – particularly now that there are clear economic and public policy signals to expand the transmission grid to serve renewable and other remote energy resources. This is reflected in an unprecedented number of proposed transmission projects throughout the West (see insert).

The planning and development of new transmission lines is a very time-consuming process which can range from five to ten years from the time of project inception to the time of commercial operation. This process generally follows a five-step sequence consisting of the following phases:

- Planning
- Siting & Routing
- Permitting, Land Acquisition & Design
- Construction
- Operations & Decommissioning

As such, there are multiple entry points, including early-on opportunities, for the consideration of wildlife and other issues. This provides numerous opportunities to intersect the transmission planning process with a goal towards optimizing the results and avoiding, minimizing, and mitigating impacts. Each of these phases is discussed in the following sections.

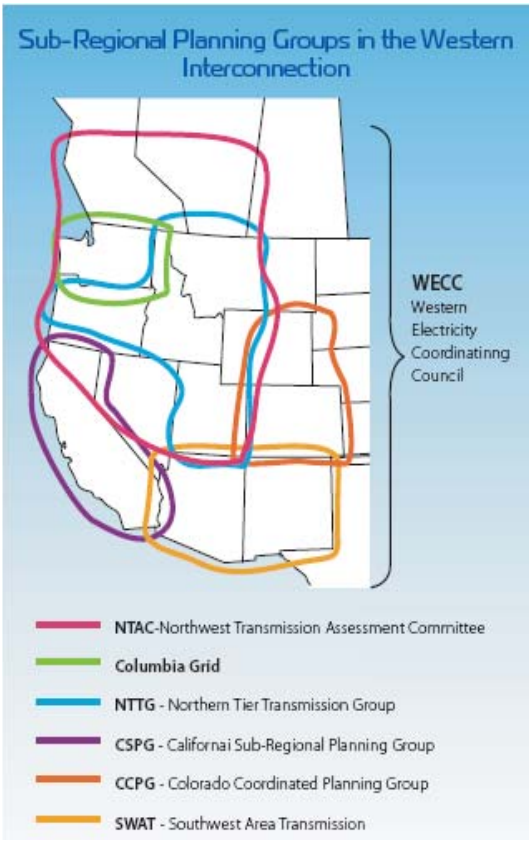
Transmission Planning

As described in the WGA's June 2007 CDEAC Progress Report, transmission planning in the West is influenced and facilitated by Federal, regional, utility, and state initiatives. These result in several levels of transmission planning, in which new projects are progressively vetted at each higher level, generally in the following sequence – all of which provide stakeholder input opportunities:

- Utility Level: Pursuant to FERC Order 890, each utility is now required to conduct its transmission planning in a coordinated, transparent, and public manner, with protocols (known as Attachment K filings) established and posted by each utility on their transmission (OASIS) websites;
- Project-Specific: Transmission projects under development are typically announced in the trade press and in public transmission planning venues, each with their own project websites;
- State Planning: Transmission projects and the transmission plans of each in-state utility are commonly subject to review by the utility regulatory authorities within each state;
- Sub-Regional Planning: In recent years, a number of sub-regional transmission planning groups have emerged to coordinate and consider individual projects and to

conduct sub-regional planning (see inset); each have their own websites and most major utilities within each sub-region are participants;

- Regional Planning: Mature transmission projects are ultimately processed through Western Electricity Coordinating Council (WECC)'s Regional Planning Process for a path rating and reliability assessment. In addition, WECC has recently instituted a west-wide transmission economic modeling process to consider scenarios proposed by stakeholders. Both processes overlap and involve significant stakeholder input opportunities.



<u>Transmission Siting & Routing</u>
Transmission siting and routing is considered on a regional and conceptual basis and on a project-specific basis, with both approaches involving significant stakeholder input opportunities.

Regional Concepts: Recent Federal legislation has set into motion an effort to identify and designate two types of corridors in which transmission upgrades or new lines would be considered: (1) Energy corridors that would include new power lines on public lands in the 11 western states and (2) National Interest Electrical Transmission Corridors (NIETCs) – which may accelerate power line siting approvals on private lands in areas of documented electrical congestion. These ongoing stakeholder-driven processes have identified a number of potential corridors within the West in which both individual and shared transmission routes would ultimately be considered.

Project-Specific: Siting and routing of project-specific transmission lines is typically studied by a multi-disciplinary team of specialists – typically an in-house team supplemented by consulting firms that specialize in such activities. Their goal is to identify and rank multiple 3-5 mile wide corridors within a broad study area that might be suitable for consideration by transmission line developers, the public, regulatory entities, and stakeholders in an iterative process to select the optimal routing and preferred alternatives. These efforts have become increasingly complex in recent years as a multitude of issues are considered and ultimately vetted with stakeholders, including:

- Wildlife and Vegetation
- Land Ownership & Values
- Public Preference
- Terrain and Ground Clearance
- Cultural Features
- Public Safety
- Noise and EMF
- Geotechnical and Ground Conditions

- Visibility and Aesthetics
- Infrastructure Crossings
- Access
- Flight Paths and Restrictions
- Proximity to Sensitive Areas
- Wetlands
- Economics
- Restricted Areas

In order to properly consider these issues, it is imperative that the siting and routing team have access to databases and other tools – many of which are available via GIS and desktop computer applications.

Permitting, Right-of-Way Acquisition & Design

Many long-distance transmission projects in the West are likely to involve crossing over private, state and federal public lands, and possibly tribal lands. Right-of-way approval for a transmission line across multi-jurisdictional lands means seeking permit approvals from local, state, federal and other authorities. While there is considerable variability in Western permit approval processes among states, in many instances state public utility commission retains authority for transmission siting. Mindful of the multi-layered and jurisdictional permitting processes in the West, in 2002 WGA formally adopted a protocol to coordinate these processes in the event of long distance, multi-state transmission proposals.

On a project-specific basis, once potential routes have been identified (taking into account the assessments made in transmission siting and routing studies), these are vetted with governmental officials, stakeholders and landowners. In most instances, this involves a series of public meetings to secure a consensus concerning optimum configuration and preferred alternatives. In some cases, particularly where Federal lands or where Western Area Power Administration (a federal power agency reporting to the Department of Energy) are involved, Environmental Impact Statements are required, pursuant to the National Environmental Policy Act. However, the existence of other broader-level entry points such as regional and sub-regional planning efforts offer key opportunities long before the initiation of the NEPA process to vet and discuss conceptual routes with the public and scientific agencies.

Subsequent to finalization of routes, permits are then applied for with applicable county, state, and/or Federal regulatory agencies. Such permits invariably include restrictions and requirements to avoid, minimize and/or mitigate the impacts of construction and associated activity, based on focused studies and input from concerned parties. As such, the permitting processes are integral to finalizing designs of transmission projects.

Right-of-way acquisition activities typically proceed simultaneously with or immediately subsequent to the issuance of permits. This typically involves acquisition via lease, easement, or outright purchase of a 150-300’ wide strip of land within preferred corridor. In many cases, additional restrictions are imposed by private landowners as a condition of land use.

In the case of Federally-designated Energy Corridors and NIETCs, which operate under different protocols, it is unclear the extent to which Federal permit approvals and

Environmental Impact Statements will apply to specific projects – recognizing that such corridors will be substantially wider than routes needed for individual projects. Once individual projects are proposed, they would then be subject to normal permitting protocols, with permitting processes potentially streamlined by the federal corridor designation process. In the case of NIETCs, there is provision for FERC to preempt state jurisdiction under certain circumstances.

Transmission Construction

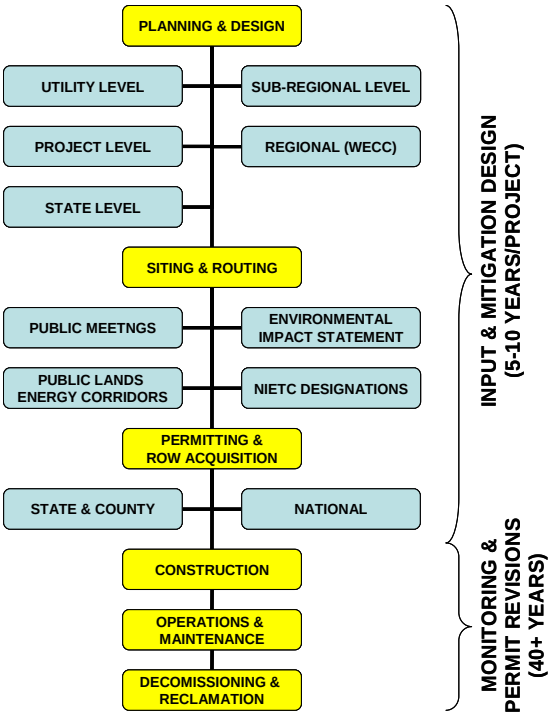
Transmission construction is an invasive activity that involves ground disturbance along the transmission path and associated staging areas and access routes. The extensiveness of such disturbance varies, depending on the season, weather conditions, terrain, availability of access, ground conditions, support requirements, and permit limitations, among other factors. To mitigate ground disturbance and associated impacts, helicopter operations are sometimes employed. In extreme cases, particularly in urban areas, transmission lines are sometimes considered for underground installation – generally where other options are infeasible.

Transmission Operations, Reclamation, Monitoring & Decommissioning

Many of the elements raised in the preceding discussion apply in the long-term operation of transmission lines. Land reclamation is the restoration of productivity or use to lands that have been degraded by human activities or impaired by natural phenomena. Subsequent to transmission right of way construction, transmission owners conduct ongoing operation and maintenance of transmission lines and this commonly involves a combination of on-ground and aerial activities for regular inspections, controlling the encroachment of vegetation, managing water run-off, and maintenance of structures. Such measures are conducted in accordance with limitations and requirements defined in the permits for the transmission lines.

Monitoring is the regular observation and recording of activities taking place on a project. Both during and after transmission ROW construction and throughout operations and maintenance phases, monitoring protocols are established to measure projected versus anticipated impacts as well as to adjust mitigation practices to adapt to new or unforeseen management situations to best protect lands and wildlife resources. Monitoring is also important to determine whether established reclamation and mitigation measures are effective and working as intended and may shed light on whether a new or adapted reclamation strategy is appropriate.

Decommissioning and subsequent reclamation of a transmission line is an unusual event, as these facilities are generally considered as very long-term infrastructure facilities that would be upgraded rather than decommissioned. As such, regulations extant at the time of decommissioning would control reclamation activities in which such activities would be independently monitored by applicable regulating agencies.



Summary

A new era in Western transmission development has dawned – one that is now a very public, stakeholder-driven process which portends widespread transmission expansions throughout the West to serve increasing demands for renewable energy. Given the long planning cycle and long operating life of a transmission project (see insert), transmission developers and operators, permitting and compliance entities, and the wildlife community will be challenged over the long term to collect, disseminate, and evaluate information needed to mitigate impacts on wildlife in planning, operation and monitoring of transmission projects.

IV. Impacts to Wildlife

Our scientific understanding of the impact of renewable energy sources and associated transmission infrastructure on wildlife and their habitat is still in its infancy. Still, recent studies have provided important insights regarding potential impacts from development of renewable energy sources, and we can draw upon basic biological principles to understand generalized impacts associated with habitat fragmentation and loss, independent of the type of development. We outline below potential impacts and interaction of wildlife species and energy generation and transmission to be considered and assessed when striving to achieve conservation of crucial wildlife habitats and corridors.

Some examples of impacts to wildlife are listed below. To the extent that development occurs within functioning habitat area, some species may find these lands no longer suitable for habitation. Proper siting or mitigation is critical to avoid soil erosion, stream sedimentation and invasion of noxious weeds. Beyond land impacts, improperly sited wind turbines pose direct mortality threats to birds and bats, although these impacts today are minimized through improved siting and turbine technologies. Wind turbines (along with other human features or activities) can also cause habitat fragmentation for sensitive species if sited in or near those corridors. Specific transmission impacts are habitat fragmentation, wildlife corridor disruption, electrocution and increased raptor prey opportunities on ground-nesting species such as the sage grouse (a species of particular concern and West-wide significance) and the lesser prairie chicken (a candidate species for listing under the Endangered Species Act).

Over thousands of years, wildlife has developed patterns of habitat use across the landscape to ensure their survival and successful rearing of young. Anthropogenic

changes can alter the relationship between wildlife and their habitat, thereby potentially influencing both survival and reproduction. Construction of solar and wind generation plants, associated power lines, and access/maintenance roads may reduce available habitat and fragment remaining habitat into smaller, more isolated patches that are less valuable to wildlife. Likely habitat-related impacts associated with development of renewable energy sources and transmission lines may include:

- Loss of food resources resulting in an eventual reduction in carrying capacity;
- Elimination or alteration of important water sources;
- Elimination of rare, but crucial, seasonal habitats;
- Decreases in population size and viability due to disruption of traditional movement patterns associated with blockage of migration routes, loss of access to seasonal ranges, or alteration of a group of spatially separated populations of the same species which interact;
- Indirect habitat loss due to avoidance of surrounding areas in response to increased noise levels, human activity, or the presence of vertical structures;
- Habitat degradation due to colonization by invasive species or altered fire regimes associated with soil disturbance.

In addition, construction of access roads and infrastructure can elevate wildlife mortality rates by increasing poaching through improved road access into formerly roadless areas, and by improving the hunting efficiency of natural predators by providing additional stalking or hiding cover.

Development of wind and solar energy generation facilities necessitates the construction of new transmission lines to connect these facilities to the power grid. While in some cases these lines may be very short, in others new lines may extend over miles in previously undisturbed wildlife habitat.

Transmission lines may contribute indirectly to the loss of wildlife by altering habitats, as well as directly by increasing wildlife mortality rates through collisions, electrocution, and by serving as perches for raptors and other potential nest predators. In addition, transmission lines may inadvertently increase raptor mortality from collisions with wind turbines, by providing structures that encourage raptors to perch in areas near turbines. This risk can be reduced by burying transmission lines; a common practice in modern wind-energy facilities.

Although wind resources provide significant environmental benefits in comparison with conventional energy sources, as they emit little or no pollutants, improperly sited wind farms may result in negative impacts to wildlife. For instance, although sage grouse and prairie chickens are unlikely to collide with turbine blades, construction of turbines may render developed areas unsuitable for these species because of their intolerance to human disturbance (Robel 2002, Bidwell et al. 2002a, b). In general, collision mortalities associated with wind turbines pose the greatest threat to species with low reproductive

rates, because populations of these species cannot easily absorb additional mortalities (Kuvlesky et al. 2007).

While our understanding of the species-specific impacts of transmission lines and wind turbines is still growing, we do know that certain characteristics render some species more vulnerable to impacts than others. For instance:

- Species of birds with high wing loading and low aspect, such as trumpeter swans, herons, and storks, run a high risk of colliding with power lines. These birds are characterized by rapid flight, and the combination of heavy body and small wings hinders swift reaction to unexpected obstacles (Bevanger 1998).
- Migratory species of both bats and birds account for a disproportionate number of collisions,
- Species with low reproductive rates are not necessarily more susceptible to collisions with structures. However, they are more likely to experience population declines because their populations are not as resilient to this additional source of mortality.
- Ground-nesting species such as prairie chickens and sage grouse appear to be disproportionally impacted by development because of their intolerance of human activity, avoidance of vertical structures, and susceptibility to increased nest predation.

Strategies to Reduce or Avoid Impacts

In the Appendix, a list of possible strategies for mitigating impacts of transmission lines and renewable energy sources is included. Additionally, voluntary established principles referenced in the Avian Protection Plans (APP) can help utilities greatly reduce risks to birds.

It is important to note that there are many areas where renewable energy and transmission can be developed that are not considered “crucial habitat” or “important wildlife corridors.” In these areas there are existing regulatory provisions that can foster understanding of potential impacts and promote the use of mitigation strategies that can improve areas for wildlife. To meet the compliance requirements of the National Environmental Policy Act (NEPA), Resource Management Plans (BLM), Forest Management Plans (USFS), and other pertinent regulations (State and or Tribal), many utilities have either developed internal departments or hire outside consultants to address the diversified and complex issues that arise when planning transmission lines and related facilities.

Processes exist to address impacts to wildlife and habitat from the initial inception of a plan to develop transmission and renewable energy projects. These include plans for wildlife conservation and mitigation, stream and water crossings, vegetation management, invasion of noxious weeds, and various other environmental concerns. There can be roadblocks to the efficient management of these projects that can lead to

impacts, whether planned or unplanned. The key to effectively managing these large-scale projects is early coordination and free exchange of all pertinent information.

In areas that have previously been degraded, it is possible to manage habitat in such a way that the end result can be an overall improvement of habitat. In these previously degraded areas, in the construction of transmission infrastructure, the aim of current Rights of Way (ROW) management is to minimize the negative impacts through use of maintenance methods designed to protect the environment (Olenik and Rossman 1977).

Mitigation is an important way to reduce impacts. However, because successful mitigation can be challenging for industries to achieve—as has often been the experience with mitigating sage brush communities, for example—avoidance and minimization should be considered before mitigation.

V. Recommendations

The recommendations in Section A below address both renewable energy and associated transmission. The recommendations in Section B are additional recommendations that apply specifically to transmission. While existing statutes and permitting requirements are currently in place to guide such renewable energy development and its associated transmission, the Energy Work Group has been convened to consider how to more consistently incorporate information on wildlife corridors and crucial habitat.

The recommendations in this report make reference to the Decision Support System (DSS), which is outlined in Recommendation 1 of the Science Committee report. The Energy Working Group did not participate in drafting the Science Committee's recommendation, and therefore does not take a position on the DSS as described by the Science Committee. That said, the Energy Working Group believes the DSS could be the starting point for meeting the needs expressed in the recommendations in this report. This report refers to the DSS throughout the recommendations with the intent that there be a centralized data clearing house on wildlife crucial habitat and corridors that would not be a duplicative process to the Decision Support System, if implemented by the governors.

A. Renewable Energy and Associated Transmission

Information

***Issue*:** There is no uniform collection of crucial habitat and wildlife corridor information, with associated mitigation or avoidance strategies, to use in the early steps of the decision making process for siting of renewable energy projects and associated transmission. Such considerations are often made after substantial commitments have already been made to a chosen site and permitting processes are underway. High-quality information needs to be made available quickly and easily as project developers make investment decisions and projects are designed and implemented, recognizing projects currently well along in the siting and permitting processes will continue to proceed without the benefit of this crucial information. In the case of transmission, emergence of critical new

information late in the development cycle can potentially derail years of planning at great expense that, if not considered in each of the distinct phases of transmission (a) planning, (b) siting, (c) construction, and (d) operations and reclamation, could negatively impact wildlife resources without appropriate monitoring and mitigation.

Recommendations:

1: (Short Term) Consistent with the Western Renewable Energy Zones(WREZ) project, Governors, working through the WGA and public utility commissioners, should call for the identification of renewable energy zones (REZ) that identify the greatest potential environmentally responsible for renewable energy development, and develop a collaborative and inclusive process for considering wildlife corridors and crucial habitat for state or federal species of conservation concern, state and federal species protected as threatened or endangered species, and state managed game species that exist in those zones. When renewable energy projects are proposed in the renewable energy zones, the WREZ process should ensure that the best available data are available for assessing, avoiding or mitigating potential impacts of the proposed development on species of concern in those zones. The wildlife data generated through the state-led Decision Support System (DSS) and its associated processes (proposed by the Science Committee and coordinated by the Western Wildlife Habitat Council to be established by WGA) should be used by the WREZ as a starting point for addressing wildlife impacts from renewable energy and transmission development.

2: (Short Term) Governors should consider actions and policies that will ensure that information from the state's Decision Support System appropriately inform decision making processes for energy projects. Further, Governors should consider an appropriate prioritization process which includes conservation priority levels, i.e., areas to avoid for development; areas to minimize impacts from development; areas to mitigate impacts from development; and areas to monitor for impacts. .

3: (Long Term) Governors, working through the WGA, should call for a collaborative process to establish, and update as new information and technology warrants, mitigation strategies, monitoring protocols, best management practices (BMPs) and avoidance strategies associated with conservation priority levels identified in R2 for industry to incorporate into its siting decision making process for utility scale (a) wind, (b) solar, (c) geothermal, and (d) transmission line facilities.

4: (Short Term) Governors, working through the WGA, should ensure that the state-led DSS, if established, includes information relevant to renewable energy siting gathered through the process established in R1. Stakeholders, including industry, non government organizations, and state and federal wildlife agencies should be encouraged to update and otherwise populate a database, such as the DSS, for industry to incorporate early in the siting decision-making process. This

database should include the data necessary to ensure that appropriate protections are included in planning to avoid unwanted outcomes such as raptor nest invasion. The renewable energy information collected should include:

(1) Results of EIS study work completed for renewable energy and transmission projects.
(2) Success stories of projects with positive impacts on wildlife areas.
(3) Successful best management practices.
(4) Monitoring protocols, including management adaptations for ongoing and future projects.
(5) Where needed, improve the information within the DSS (if implemented), focusing on filling in data gaps within corridors where transmission is being considered.

Incentives

***Issue*:** Industry should be encouraged to go beyond current regulatory and permitting requirements to further consider, mitigate, and avoid impacts to wildlife corridors and habitat areas. Current short-life financial incentives, such as renewable production tax credits, can encourage siting decisions that, while compliant with permits, may detrimentally affect wildlife corridors and habitat over siting these facilities in areas with longer siting processes or higher cost of installation.

Recommendations:

5: (Long Term) Governors should work with industry to establish clear incentives aligning with the recommendations established in R2 and R3 to encourage industry to avoid the highest impact areas and/or provide appropriate mitigation above and beyond current base requirements. The Energy Work Group generated a list of incentives for the Governors to consider, but it is neither comprehensive nor an interdependent package.

(1) Establishment of a WGA recognition project award for exemplary consideration of wildlife issues in project development.
(2) Establishment of a fair and balanced voluntary ranking or scorecard system, possibly based on a Leadership in Energy and Environmental Design model, to rank completed renewable energy and transmission projects based on impact to wildlife.
(3) Financial incentives to encourage industry to site projects in areas that may have lower impact to wildlife corridors and crucial habitat but at a higher up front cost. This will likely require legislation and may require significant effort.
(4) Accelerated decision making and permitting for permitting within areas pre-defined as lower impact to wildlife corridors and crucial habitat.

Coordination

***Issue*:** Given differences among siting jurisdictions across and within states, no single entity is individually positioned to assess the cumulative impacts of all facilities within a single state or ecological region. Siting standards vary across jurisdictional boundaries, and can encourage development in less restrictive areas regardless of impacts on wildlife corridors and habitat.

Recommendations:

6: (Long Term) Governors, through WGA and the WWHC, should consider establishing a single permanent entity, process or mechanism, such as the DSS, that coordinates regionally and assesses any cumulative impacts on wildlife, wildlife corridors, and wildlife habitat crossing jurisdictional boundaries from renewable energy programs and associated transmission. This entity should also be responsible to update wildlife corridor data and resolve wildlife information and mapping discrepancies that can exist at jurisdictional boundaries.

7: (Short Term) Governors should call for the WGA to collaboratively establish comprehensive mechanisms to encourage industry, if not already required to in state or federal permitting processes, to show how information on identified wildlife corridors and other habitat areas was considered in siting decisions.

8: (Long Term) Governors, in coordination with AFWA and WAFWA, should seek uniform siting approval processes or mechanisms within their states, and in coordination with their neighboring states, for renewable energy and transmission projects. Governors should also consider establishing uniform minimum siting standards for renewable energy that are applicable on all public (state jurisdictional) and private lands in that state.

Funding

***Issue*:** Many state agencies lack the resources and funding to support the increased development of renewable energy and associated transmission projects, as this level of interest in investment in renewable resources and transmission infrastructure has not occurred for many years.

Recommendations:

9: (Long term) Governors should consider the funding sources for efforts to identify and protect key wildlife migration corridors and crucial wildlife habitats during the renewable energy and transmission development cycle. Governors should consider supporting, through WGA, establishment of new dedicated revenue streams to support wildlife data collection, mapping, and state agency participation in the processes established in earlier recommendations in this report. These funding sources could include:

(1) Reallocation of existing state funds.

(2) Revenue sharing with federal agencies of renewable energy and transmission facility lease and rental revenues similar to revenues received by state agencies from oil and gas leasing on federal lands. This will likely require federal legislation and may require significant effort.
(3) Funding resulting from comprehensive federal energy legislation including, if implemented, carbon cap and trade or production tax credit legislation. This will require federal legislation and may require significant effort.

E. Transmission

The West is entering a new era of electricity transmission expansion, largely driven by the need to incorporate increasing amounts of renewable resources into the nation's energy mix. Western Governors will be challenged to provide policy and leadership that ensures timely and cost-effective development of transmission for those renewable resources while protecting wildlife corridors and crucial wildlife habitat. Transmission projects and installations can have unique characteristics, including planning and permitting processes that differ from renewable energy facility siting and installation. To that end, the Energy Work Group has compiled an additional list of transmission-specific issues and consensus recommendations for consideration by the Governors, as follows.

Issue: Transmission planning and siting processes in the West are complex and involve many institutions and processes at the federal, regional and state levels. This complexity has the potential to hinder effective engagement of wildlife agencies and the public in the transmission development cycle resulting in missed opportunities to identify and avoid potential conflicts between transmission plans and wildlife needs.

Recommendation:

10. Governors should encourage their state wildlife agencies to monitor and participate in early and appropriate phases of transmission development. These include sub-regional transmission planning venues, the results of industry-sponsored screening studies that identify potential transmission routes, and notification of specific planning venues when wildlife issues will be considered.

Issue: Transmission permitting processes are inconsistent between regulatory jurisdictions, transmission ownership classes, and land ownership categories. Such inconsistencies complicate and extend the transmission permitting process, and may also allow transmission projects to "slip between the cracks" to the detriment of wildlife considerations.

***Recommendation*:**

11. Each Governor should encourage that their state transmission siting processes incorporate wildlife considerations and that they are consistently applied to private and public lands for all transmission projects involving lines of 230 kV and larger. In situations involving multi-state transmission lines, the 2002 WGA Protocol Governing the Siting and Permitting of Interstate Electric Transmission Lines in the Western United States (transmission protocol) should be used**.**

Issue: State-imposed regulatory requirements for incremental and least-cost transmission expansions as well as WECC reliability considerations can sometimes lead to lines that cannot be easily expanded and/or multiple lines in separate corridors, when an oversized single line or corridor might cause the least impacts to wildlife. For example, a single double-circuit 500 kV line could reduce wildlife impacts by serving in the place of multiple lower voltage lines sited in separate corridors.

Recommendation:

> **12.** The Governors and WGA should provide public policy support to over-sizing transmission lines to reduce the need for multiple transmission corridors and/or lines that may affect wildlife (including mechanisms to provide early cost recovery assurance for transmission investments at both the state and federal levels) and encourage WECC to reconsider and, where appropriate, provide more flexibility in its transmission separation guidelines.

Issue: Differences in state renewable energy development policies are driving associated transmission planning efforts that will determine the location and scale of impacts to wildlife. Interstate policies cause a focus on multi-state transmission corridors, while intrastate policies would tend to focus on lower voltage lines radiating from urban areas to in-state renewable resources. WGA's WREZ initiative is likely to consider the implications of these differences.

Recommendation:

> **13.** The Governors should evaluate the extent to which their state's renewable development policies are hindering or promoting efficient transmission expansion and associated wildlife impacts. To the extent that multi-state transmission plans emerge from such policies, wildlife issues should be considered on a collaborative and cumulative basis by the states involved.

Appendix A: Renewable Energy Siting and Permitting Processes

State Siting and Permitting

Permitting renewable energy facilities varies, depending on the state. Energy permitting, more commonly called "siting," can be handled at the state level or at the local level. The number of agencies and the level of government involvement will depend on various factors specific to each development. These factors primarily include: applicable existing laws and regulations, location of facilities or equipment, need for transmission lines and access roads, size of the energy project, and project and land ownership.

In some states, siting authority rests with a local branch of government. In these cases, county commissions, planning and zoning boards, or other local government departments are responsible for reviewing, conditioning, and approving energy facilities. In some states, one or more state agencies may have siting or review responsibilities for energy project developments. Regulating authorities may include energy departments, natural resource agencies, public utility commissions, or state siting boards. Where there is state level regulation there may be a lead agency to coordinate the regulatory review process or a "onestop" siting process housed under one agency. The federal government has jurisdiction over siting when projects are sited on or may affect federal lands or when federally regulated natural resources or endangered species may be affected.

State siting processes fall into five main categories:

1. Mandatory, state-level siting statutes;
2. Voluntary guidelines for siting within states;
3. Model ordinances for local governments to apply and use;
4. Local government siting rules; and
5. Voluntary checklists and resources for local governments.

Types of non-federal jurisdictional relationships:

1. State agencies siting projects on state lands:
2. State agencies siting projects on private lands:
3. Municipal/county agencies siting projects on private lands (and municipal/county lands).
4. Tribal authorities siting projects on tribal lands:

Federal Siting and Permitting on Private Lands

There is currently no federal nexus requiring a permit or approval for construction or operation of renewable energy facilities, due to the lack of air emissions, wastewater discharges, waste generation or disposal, etc. Consequently, there is no requirement for a federally mandated Environmental Impact Statement or review of environmental consequences of the planned facility. The U.S. Fish and Wildlife Service has interim voluntary guidelines for siting wind plants and is currently developing more permanent guidelines.

Siting and Permitting on Federal Public Lands

Wind and Solar Energy: Unlike other forms of energy development on public lands, there are no specific laws governing siting and development of solar and wind energy on public lands. The laws governing oil and gas leasing (the Mineral Leasing Act) do not address these resources. The Geothermal Steam Act of 1970 governs leasing geothermal resources only. The general permitting authority provided by the Federal Land Policy and Management Act provides the basis for permitting activities for wind and solar energy on public lands. The BLM has established rules and procedures that will govern solar and wind energy development through policies, appropriate National Environmental Policy Act documentation, and land use plan amendments. Applications for commercial solar and wind energy facilities are processed as right-of-way authorizations under Title V of the Federal Land Policy and Management Act (FLPMA). Right-of-way applications for solar and wind energy development are generally processed on a first-come, first-serve basis, although BLM regulations permit offering public lands for solar energy under competitive bidding procedures. Rental rates for renewable energy sites (rights-of-way) are set after an appraisal and are to reflect market conditions. These rights-of-way grants are subject to a due diligence requirement not exceed 3 years. Failure to develop in this timeframe would result in loss of the grant.

The US Forest Service is still in the process of establishing rules and procedures for Forest lands.

The BLM and DOE worked together on programmatic environmental impacts statement for wind that projected that more than 3,200 MW could be developed on BLM lands by 2025. In addition, it established "Best Management Practices" to protect birds, bats, and other wildlife during all phases of development and operation and identified specific areas where wind energy development will be excluded. The two agencies are now collaborating on Programmatic Environmental Impact Statements (PEIS) for geothermal and solar resource development on public lands. These reviews will identify areas with the greatest potential for commercials development of geothermal and solar resources on public lands, assess the impacts of leasing and development of those resources, evaluate availability of transmission lines to potential development areas, identify areas where development will be excluded and amend land use plans in areas where potential for commercial development is significant.

Geothermal Energy: The Geothermal Steam Act of 1970 provides for leasing these public lands, developing geothermal resources, and collecting federal royalties. The Energy Policy Act of 2005 included a major rewrite of the Geothermal Steam Act. Geothermal leasing is allowed on Interior and other federal lands that are deemed suitable for this use as part of a land use planning analysis and decision. The BLM manages 58 producing geothermal leases that provide geothermal energy to 34 power plants with a total capacity of 1,275 megawatts**.** The BLM has issued 380 geothermal leases since 2001, compared to 25 leases from 1996-2001.

BLM leases these lands and sets the royalty rate, and the Minerals Management Service (MMS)—another agency within the Department of the Interior (DOI)—collects the federal geothermal royalties and disburses to the state and county governments their share

of these royalties as required by law. In 2005, MMS collected $12.3 million in geothermal royalties, almost all of which was derived from electricity production. [Source: GAO http://www.gao.gov/new.items/d06930t.pdf]

In response to increased demand for clean, renewable energy sources, in June of 2007 the BLM and the US Forest Service initiated a PEIS for public lands with the highest potential for geothermal development. The analysis could result in amendment of land use plans to allow for expanded geothermal leasing.

The PEIS will analyze steps necessary to facilitate processing approximately pending 100 geothermal lease applications. The Energy Policy Act of 2005 stipulated that 90 percent of pending applications be issued, rejected or otherwise disposed of by August 2010.

Best Management practices for development of geothermal projects are often similar to those applied for traditional oil and gas projects. The BLM hosts a useful Best Management Practices website for oil and gas activities located at:

http://www.blm.gov/wo/st/en/prog/energy/oil_and_gas/best_management_practices.html

Additional BMPs which may apply to concentrated geothermal activities may be found as part of the WGA coalbed-methane BMP Handbook which can be found at:

http://www.westgov.org/wga/initiatives/coalbed/

Appendix B: Strategies for Reducing Renewable Energy and Transmission Impacts to Wildlife

This Appendix contains examples of strategies that could possibly be used to mitigate impacts of renewable energy and associated transmission on wildlife corridors and crucial habitats. These strategies are "for information only", and were not vetted by consensus of the working group nor should be viewed as recommendations of the working group.

The development of strategies to mitigate impacts of transmission lines and renewable energy sources to wildlife lags significantly behind our efforts to understand the impacts, themselves. However, recent studies have suggested that the following strategies may be useful for reducing risks in certain circumstances:

1) Collisions may be reduced by decreasing the operating time of problem turbines or wind resource areas. Critical shutdown times could be seasonal (e.g., during migration periods) or based on inclement weather or nighttime periods when visibility is reduced.

2) Power lines should not be constructed through or within 1 km of known historical high-water marks of wetlands, through dry basins known to hold water intermittently,

or through heavily used waterbird migration routes (Malcolm 1982). In cases where power lines must cross flyways, an attempt should be made to mask the lines with structures such as bridges (McKenna 1976). Power lines should be buried where possible and corridors established where power lines can be congregated to reduce their proliferation (McKenna 1976).

3) Design and maintenance characteristics of roads and structures may indirectly contribute to higher bird fatality rates by increasing prey densities. Prey densities appear to be highest at disturbed sites such as roads and turbine pads, the latter of which would exacerbate collision risk. Reducing prey populations within the vicinity of wind turbines might reduce high-risk foraging activities for raptors. Suggested methods include county-sponsored abatement programs, reduced grazing intensities, and revegetation with higher-stature plants that pocket gophers and ground squirrels tend to avoid. Hence, Integrated Vegetation Management (IVM) plans should be developed and followed. However, the effects of a widespread control programs need to consider the effects on other wildlife, such as protected species that prey on ground squirrels or depend on their burrows for nesting and cover habitat. Widespread use of rodenticides or other measures to remove prey may be controversial and costly. Thus, the feasibility of more benign habitat modification measures—such as manipulation of annual grassland grazing practices or conversion to perennial grassland which can be a major function of IVM—may be worth studying.

4) Facilities that are built with larger, more-efficient turbines require fewer roads and have a greater amount of space between them. Construction of underground distribution lines greatly reducing the likelihood of wire collisions and electrocutions. (Undergound distribution/transmission lines are not fault free, meaning they have to be maintained which means tearing up the ground again and again which can have negative impacts to wildlife and its habitat)

5) Lighting of tall structures appears to contribute to avian fatalities by attracting birds. Thus, illuminating aerial structures to increase visibility to aircraft increases bird fatalities. Migratory species, especially those that migrate at night, appear to be most susceptible to collisions, especially when visibility is impaired by inclement weather. Solid or blinking red lights seem to attract birds on foggy, misty nights more than white strobes, which may flash every 1–3 seconds. Preliminary research suggests that the longer the duration of the “off” phase, the less likely a light is to attract birds. This is a requirement for towers and may be need examination to address wildlife mortalities.

6) Tower placement is a site-specific phenomenon, but several key conclusions have been found. First, irregularly spaced turbines might increase fatalities because birds try to negotiate the apparent gaps between turbines. Second, turbines placed close to the edge of ridges show higher fatality rates because raptors often hover in such locations. Third, turbines placed near gullies have higher fatalities because birds often use these locations as flight paths. Thus, locating wind farms away from migration corridors, cliffs, and ridges utilized by raptors to gain altitude may help to

reduce the risk of collisions. Similarly, the construction of "dummy" turbines may deter bats from being attracted to working turbines, thereby reducing their mortality.

7) Motion smear, which makes the blade tips of wind turbines appear transparent at high speeds, increases the risk of collisions. Studies suggest that a single, solid-black blade paired with two white blades (inverse blade pattern) may be effective at reducing visual smearing of blades. In addition, a rectangular attachment to the outer tip at right angles to the long axis of the blade may also help to increase the visibility of blades that have a very narrow profile when approached from the side. However, the visibility and practicality of these attachments has not yet been evaluated (Hodos 2003). In short, although effective visual treatments could provide a cost-effective method to reduce risk from turbines, laboratory and field tests of treatments to make turbine blades more conspicuous to raptors and other birds are needed.

8) Avoid ground disturbance activities in the floodplains containing occupied breeding habitat with related timing restrictions

9) Avoid the use of loud machinery within ¼ mile of Protected Activity Centers (PAC) during the breeding season.

10) When feasible, schedule line maintenance activities after the breeding seasons or defer activity to a later date to as to not disturb breeding/nesting areas.

Appendix C: Studies on impacts on wildlife from energy development. Note: these are listed for the convenience of the reader. This Appendix contains examples of references and studies containing further information on past what is outlined in the report body. These recommendations are "for information only", and were not vetted by consensus of the working group nor viewed as being supported by consensus of the working group.

Abbasi, S.A., and N. Abbasi. 2000. The likely adverse environmental impacts of renewable energy sources. Applied Energy 65:121-144.

Arnett, E.B., W.K. Brown, W.P. Erickson, J.K. Fiedler, B.L. Hamilton, et al. 2008. Patterns of Bat Fatalities at Wind Energy Facilities in North America. Journal of Wildlife Management: 72:61–78.

Bevanger, K. 1998. Biological and conservation aspects of bird mortality caused by electricity power lines: a review. Biological Conservation 86:67-76.

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Research needs

Note: Excerpted from Morrison 2006 Bird Movements and Behaviors in the Gulf Coast Region - Relation to Potential Wind Energy Development.

- The priority research objective is to quantify seasonal occurrence, abundance, and location of bats and birds. Specifically, research should focus on the following issues.
- The location, magnitude, and timing of movements of raptors during fall migration. Although "hawk watch" locations and data sets are available, they are few in number and should be substantially expanded to gain a better understanding of the extent of raptor migration.
- The location, magnitude, and timing of movements of bats and birds during spring and fall migration.
- Identification of locations where rare and endangered species (bats and birds) occur during breeding and nonbreeding periods.
- Identification of any special environmental features that could concentrate bats and birds (e.g., roosting caves for bats, riparian areas for birds). Surveys should be conducted to identify any potential bat roosts, foraging areas (e.g., open water), locations of concentrated bird activity (e.g., springs, riparian areas), and other environmental features that could concentrate bats and birds near proposed wind facilities

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[**An Analysis of Siting Opportunities for Concentrating Solar Power Plants in the Southwestern United States, http://www.cdphe.state.co.us/ap/comanche/commentsbeforehearing/glustrom2-concentratingsolar/SouthwesternSitingAnalysisforConcentratingSolarPlants.pdf**]

[http://www.blm.gov/wo/st/en/prog/energy/solar_energy.html]

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WGA Wildlife Corridors Initiative

Transportation Working Group

June 23, 2008 Draft

Section I: Introduction

Elk attempt to find safe passage across US 550, near Durango, CO (J. McBride, Durango Herald)

Overview

Just as people need safe highways to move across the vast and beautiful lands of the American West, wildlife needs safe movement corridors to meet their basic survival requirements. The goal of the Western Governors' Association Wildlife Corridors Initiative is to maintain the West's Wildlife Movement Corridors and Crucial Habitats so that our wildlife and ecological legacy remain intact for our great grandchildren. This document describes how members of the Western Governors' Association can improve the West's economic vitality, quality of life, and ecological legacy through four specific action items that encompass practice, policy, and fiscal initiatives:

1. **Make the preservation of Wildlife Corridors and Crucial Habitat priorities** for transportation planning, design and construction;
2. **Integrate conservation and transportation coordination, planning and implementation** across jurisdictions;
3. **Manage and coordinate data information systems** and methodology to increase efficiency and reduce redundancy;
4. **Establish long-term capacity** to staff and fund these initiatives.

These actions are summarized through problem statements and recommendations with details in the appendices. We believe these actions, in conjunction with the recommendations from the Science, Land Use, Climate Change, Energy, and Oil & Gas committees will lead to seamless Wildlife Corridor and Crucial Habitat preservation plans across the Western states. We encourage Governors to instruct their state Department of Transportation and Fish and Wildlife Agency to adopt the recommendations contained in this report to inform future state policy.

Background

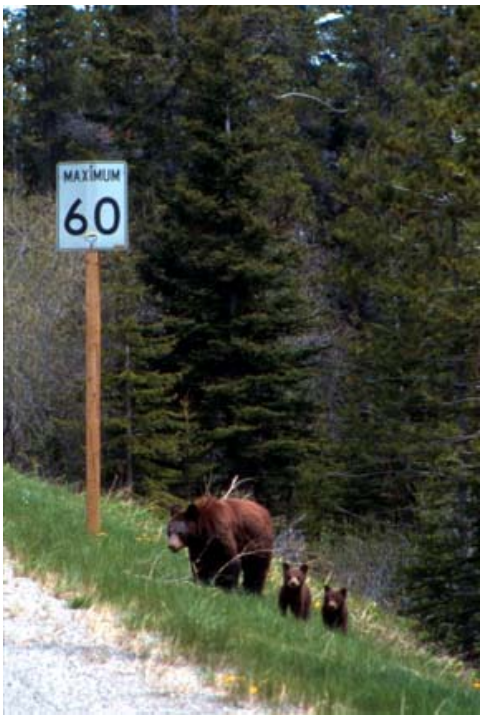
Our quality of life depends on the vitality and beauty of our Western Heritage, such as abundant wildlife, scenic vistas, and wide open lands, which are vital to maintain vibrant

state economies throughout the West. Our transportation infrastructure is a critical component of a vibrant Western economy. The settlement and growth of Western states have been fueled by extensive highway construction and advancements in transportation. Our highway system provides safe and efficient travel, rapid freight delivery, access to tourist and recreational activities, and a high quality of life for residents in both urban and rural areas.

Wildlife plays an important role in the economies of Western states. Hunting, fishing and wildlife watching contribute billions of dollars to every Western state's economy. State, tribal, and federal governments have invested billions of dollars in managing wildlife, protecting valuable wildlife habitat, and promoting wildlife resources. The average annual state return on state fish and wildlife agency budgets is 1,573%.[1] (AZ Game & Fish)

Impediments and Challenges

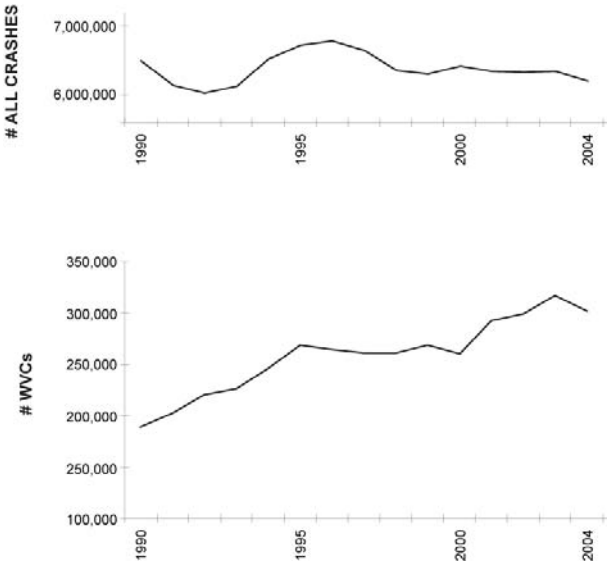
The development of the transportation network has improved our quality of life and fueled our economies. However, these same highways can create barriers to fish and wildlife movement and fragment crucial habitats wildlife need to survive. The ability to move is critical for large animals with relatively low numbers and densities as well as smaller species that depend on interconnected lands and waterways. Since 15%-20% of the United States is directly or indirectly ecologically affected by roads this creates serious challenges for wildlife.[2]



All species need room to roam, this is particularly true for large animals, like black bear (R. Sommerhalder)

Roads and rail lines can be impediments that make it difficult for animals to meet their basic life needs (e.g., food, mates, other resources), sometimes completely isolating wildlife populations, which reduces genetic diversity and can threaten the population's persistence. Many animals completely avoid roaded areas. Venturing near roads can also be deadly, due to collisions with vehicles, illegal roadside hunting, or exposure to pollutants. Animals that are killed along roads and rail lines may not be the only victims, as their orphaned young often die.

Wildlife-vehicle collisions are a major public safety concern. Vehicles collide with wildlife over one million times each year in the U.S., and the annual number of collisions has grown by 50% in the last 15 years[3]. Wildlife-vehicle collisions cause human fatalities, injuries, and property damage, and pose safety and maintenance challenges for departments of transportation. A recent study estimated the total cost of wildlife-vehicle



The national rate of wildlife-vehicle collisions has increased significantly over the past 15 years, while overall crashes have remained relatively stable. Source: General Estimates System, Western Transportation Institute.

collisions at $8.8 billion annually.[3] Road mortality is also cited as a major threat to twenty-one federally listed threatened and endangered animal species[3.]

As transportation infrastructure expands to accommodate our growing Western communities, vehicles and wildlife will "cross paths" with increasing frequency. Transportation agencies are racing to meet projected demands for safe and cost-effective mobility. While this report does not specifically address the barrier effects of railroads and canals, implementing the recommendations contained herein will take cooperation among all transportation agencies. Long-term coordinated plans will ensure that crossing structures are aligned in a way that maximizes their utility to wildlife. For instance, coordinated plans will ensure that a planned wildlife crossing structure on a freeway doesn't abut an impermeable section of the railroad for which no crossing structure is planned.

Opportunities

Endangered San Joaquin kit fox trapped by vehicles in CA (B. Cypher)

Transportation planning, construction, and maintenance present opportunities to improve infrastructure to enable wildlife and fish movement. For instance, bridges and culverts to accommodate wildlife and fish passage can be incorporated into road upgrade projects, such as lane additions and culvert and bridge replacements. These types of improvements are best planned for at the landscape scale in advance of transportation projects, at the mid to long range planning levels, instead of project by project. Landscape and project level planning is most effective when done early and often among jurisdictions. However, most local, state, and federal jurisdictions have not identified Wildlife Corridors and Crucial Habitat as major priorities, making protection difficult to achieve. There is however, a change occurring across the West.

Several notable inter-agency actions have been taken to protect crucial habitats and restore wildlife corridors across the West; we envision these as standard operating procedure. Wildlife crossing structures have been installed in over 700 locations across the West, to make our transportation network more permeable to terrestrial and aquatic wildlife movement[4].

We can improve transportation infrastructure and sustain our ecological legacy, provided that our remaining crucial habitats are functionally connected into a large network of open space. The 2005 U.S. Transportation Act, Safe, Accountable, Flexible, and Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) includes provisions aimed at improving environmental outcomes for transportation projects. Transportation departments in many states, such as Arizona, Colorado, Montana, and California have already begun to improve permeability across transportation barriers as part of SAFETEA-LU. Several states, such as California and Colorado, have initiated statewide assessments to incorporate protection and restoration of wildlife corridors directly into transportation planning efforts. The Federal Highway Administration's *Eco-Logical: An Ecosystem Approach to Developing Infrastructure Projects* (http://www.environment.fhwa.dot.gov/ecological/eco_index.asp) provides planning and mitigation approaches that can be applied at the landscape scale. There is a key opportunity in 2009 to guide the reauthorization of the transportation bill to protect wildlife corridors and crucial habitats.

Montana's US 93 has over 50 wildlife passages. Here mule deer use new passage (P. Basting and W. Camel)

Addressing transportation challenges and opportunities for wildlife movement includes improving public transit. Reducing congestion is a rural road opportunity as well as a city challenge. All over the West, highways from small towns to small cities are rapidly increasing in congestion at commute times, which is also the time many animals are actively moving about. Travel between Bend and La Pine, Oregon, Missoula and Hamilton, Montana, and Salt Lake City and Ogden, Utah have all noted a reduction of traffic volume proportional to their transit options. Each bus can remove forty vehicles off rural highways, light rail even more, all during key wildlife activity times in morning and evening. This reduces the need for more travel lanes to handle peak traffic, reduces emissions, and reduces the number of opportunities for wildlife-vehicle collisions.

Through the recommendations in this report, we have an opportunity to improve our transportation network and sustain the West's ecological legacy. This document outlines a course of action to reconnect the West within and across state boundaries in order to protect our wildlife and renowned ecological legacy on a regional scale. This document outlines challenges as well as opportunities to restore connectivity for wildlife, while improving and maintaining our transportation infrastructure.

Section II: Policy Recommendations

I. Make the preservation of Wildlife Corridors and Crucial Habitat priorities for transportation planning, design and construction

Issue: Federal, State, Tribal and local agencies responsible for transportation often do not sufficiently prioritize or address wildlife values beyond current federal requirements to protect wetlands (Clean Water Act) and threatened and endangered species (Endangered Species Act). Consequently, the opportunity to proactively and effectively avoid and mitigate impacts to fish and wildlife corridors and crucial habitat is often missed.

Recommendations:

R1: Western Governors should consider directing their respective state department of transportation and fish and wildlife agencies to coordinate in the implementation of this report to ensure that transportation infrastructure is planned designed and constructed to protect and restore wildlife corridors and crucial habitat.

Coordination in the implementation of this report should also occur in the development of regional and national policies advocated by organizations that are extensions of the state fish and wildlife agencies and state transportation agencies including:

- American Association of State Highway and Transportation Officials (AASHTO)
- Western Association of State Highway and Transportation Officials (WASHTO)
- Association of Fish and Wildlife Agencies (AFWA)
- Western Association of Fish and Wildlife Agencies (WAFWA)

Western Governors should also urge coordination through their respective representatives in other groups including the National Governors' Association, the Western Governors' Association and interested Non-Governmental Organizations.

R2: Western Governors should consider instructing their respective state department of transportation and fish and wildlife agencies to conduct an economic analysis of transportation plans, activities and structures that may impact state wildlife resources. Such an analysis would inform states about infrastructure improvements that would protect wildlife corridors and crucial habitats, improve public safety, emphasize economic benefits, and evaluate related budgetary considerations. Such an assessment would also provide an analysis of initial financial investment and long-term cost-saving benefits. Also, inclusion of a public outreach component that explains the results of the (cost savings) analysis would provide additional program incentive, justification and support. The Arizona Wildlife Linkages project is an example of this type of analysis (http://www.azdot.gov/Highways/OES/AZ_Wildlife_Linkages/index.asp).

Issue: Many of the processes governing transportation already require consideration of site-specific fish and wildlife values, but are often inadequate in actually protecting such values at the landscape scale that conservation of wildlife corridors and crucial habitat requires.

Recommendations:

R3: Western Governors should consider directing their state department of transportation and fish and wildlife agency to develop cooperative, large scale mitigation plans with local, state, tribal and federal agencies to protect and/or restore wildlife corridors and crucial habitats under the intent of SAFETEA-LU Section 6001 planning efforts, the State Wildlife Action Plans, and other applicable laws. Governors should also recognize that funding flexibility may be required in order to focus resources and identify possible added costs to identify, assess, retrofit and maintain existing roads in this way**.**

R4: As regional transportation improvement plans and state transportation improvement plans are revised, state departments of transportation and state resource agencies should include wildlife corridors and crucial habitat issue, needs and goals as identified in the State Wildlife Action Plans and the state's Decisions Support System (proposed by the Science Committee and coordinated through the Western Wildlife Habitat Council to be established under WGA). As transportation projects are defined and scoped, States should address these wildlife corridors and crucial habitat issues including impacts on local economies through the National Environmental Policy Act (NEPA) scoping process and should address wildlife corridors and crucial habitat issues in the purpose and need statements in the NEPA documents where appropriate.

Western Governors should ensure that wildlife corridors and crucial habitat concerns are addressed through environmental review that ensures compliance with state, tribal and federal statutes, policies, and agreements in situations when it is appropriate and the NEPA process is not triggered (i.e., a project that is not federally funded).

R5: Western Governors should consider directing their respective state agencies to implement ecosystem planning and mitigation approaches as outlined in the Federal Highway Administration's *Eco-Logical: An Ecosystem Approach to Developing Infrastructure Projects*(http://www.environment.fhwa.dot.gov/ecological/eco_index.asp) document in a way that institutionalizes addressing landscape scale impacts through offsite mitigation where it provides the most ecological value.

R6: Western Governors should consider asking Congress to take steps to ensure opportunities for states to promote wildlife corridors and crucial habitats in the new Federal Transportation Act (expires in 2009) to further promote wildlife corridors and crucial habitats:

- Western Governors should urge Congress to support the continuation of Section 6001 and 6002 of SAFETEA-LU and support provisions that will strengthen the institutionalization of Sections 6001 and 6002. As highlighted in the 2005 transportation legislation report issued April 25, 2008, by the Government Accountability Office (http://www.gao.gov/cgi-bin/getrpt?GAO-08-512R), process improvements are occurring but the full scope of improvements may not be realized for several more years.

- Western Governors should request that wildlife corridors and crucial habitat information become more of a priority for the State Planning and Research set-aside.

- Western Governors should recommend creating an appropriate balance for projects that do not adversely impact wildlife corridors and crucial habitat, or which protect or restore such habitats. To ensure that new information is incorporated into project scoping, Western Governors should direct their respective state department of transportation, where applicable, to conduct periodic audits of project lists, and reprioritize as needed to meet this objective. Increased federal matching funds should be provided for projects that address current needs but do not impact and perhaps even restore wildlife corridors and crucial habitat.

- Western Governors should recommend new provisions that require standardized wildlife-vehicle collision data collection and support the sharing and analysis within and among states.

- Western Governors should make every effort to ensure that their state transportation enhancement programs prioritize eligibility for wildlife related crossing projects.

R7: Western Governors should urge federal land management agencies to incorporate wildlife corridors and crucial habitat information into the Forest Service Travel Management Planning process and the FHWA Federal Lands Highway Program.

Issue: As traffic volume increases, wildlife/vehicle collisions increase and the barrier effect of highways increase. Currently, much of the effort focused on decreasing the number of vehicles using our highways is based on air quality concerns instead of impacts to wildlife. States can affect wildlife-vehicle collisions and other impacts to wildlife corridors and crucial habitat by leading efforts to reduce traffic volume. Other benefits include reduced citizen travel costs and improved air quality.

Recommendations:

R8: 1) Western Governors should consider developing and expanding programs to reduce traffic volume (vehicle miles traveled). Methods to reduce traffic volume include rerouting or focusing traffic on highways less impacting to wildlife, transit, travel demand management, and other multi-modal options

(biking, walking, etc.) as well as administrative or fiscal tools such as incentives fees and outreach as appropriate.

2) Western Governors should consider supporting policies that encourage integration of land use and transportation plans that may promote urban infill and dense development within existing urban areas instead of policies that promote low-density growth. Greater density development encourages the efficient use of transit and reduces the demand for new roads and lanes, thus reducing the demand for development in wildlife corridors and crucial habitat. The Western Riverside Integrated Project is an example of these policies (www.rcip.org).

II. Integrate conservation and transportation coordination, planning and implementation across jurisdictions

Issue: The transportation planning process varies across states, local governments, and metropolitan planning organizations and therefore does not consistently prioritize or integrate wildlife corridors and crucial habitat.

Recommendations:

R9: To affect intergovernmental coordination between transportation agencies and fish and wildlife agencies on the protection of wildlife corridors and crucial habitat in state and regional transportation planning, Governors should consider memoranda of agreement with the relevant government agencies, issuing executive orders as appropriate, as well as including explicit goals and objectives in strategic documents. The WA Executive Order is available at: (http://www.wsdot.wa.gov/NR/rdonlyres/1767D116-9F7B-487C-9F37-D15D71069B49/0/ExecutiveOrder1031.pdf). The VT MOA is available at: (http://www.aot.state.vt.us/TechServices/EnvPermit/Documents/InteragencyTransportation&WildlifeMOA.pdf).

R10: Western Governors should consider directing their respective state department of transportation and fish and wildlife agency to integrate information about wildlife corridors and crucial habitat early in the transportation planning process through training, guidance and specific methods for Regional Transportation Plan development as well as project development for safety and design considerations.

R11: Western Governors and state transportation agencies should consider prioritizing funding to local transportation projects in ways that may create incentives for local governments to protect and restore wildlife corridors and crucial habitat. Similarly, state agencies should be directed to identify and remove existing funding mechanisms and policies that may provide incentives to local governments for taking actions detrimental to wildlife corridors and crucial habitat.

R12: The Western Governors' Association should urge Congress to permanently fund Legacy Roads and Trails Remediation Initiative (LRRI), which is a

Department of the Interior program to restore watersheds and decommission roads.

III. Manage and coordinate data information systems and methodology to increase efficiency and reduce redundancy

Issue: Currently, data collection, management and integration is not coordinated or consistently available in order to inform transportation planning and projects.

Recommendations:

R13: Through their representatives on WASHTO, the Western Governors should recommend that WASHTO conduct an assessment of inter-jurisdictional data compatibility for use in transportation planning and implementation. The Decision Support System created under the WGA Science Committee's recommendation should integrate such data as: road-kill locations; existing infrastructure, such as bridges, culverts, fencing etc.; and identification of where structural wildlife crossing improvements have already been made.

R14: The Western Governors' Association should work with federal, tribal, state and local transportation agencies to ensure that wildlife corridors and crucial habitat data is integrated into short-range Statewide Transportation Improvement Programs, long-range transportation plans, and regional plans. A transportation GIS identifying wildlife corridors and crucial habitats would greatly facilitate the use of visual tools when planning upcoming transportation projects.

IV. Establish long-term capacity to staff and fund these initiatives

Issue: Current wildlife corridors and crucial habitat protection and restoration by transportation agencies are often inconsistent and temporary due to the lack of adequate funding, staff, or understanding of the issue (capacity) at the federal, state and local level.

Recommendations:

R15: Western Governors should work to establish permanent funding sources to protect wildlife corridors and crucial habitat in relation to transportation impacts.

R16: Western Governors should consider directing their state department of transportation and fish and wildlife agency to develop training for state and local transportation planners, engineers and biologist to recognize and avoid impacts to wildlife corridors and crucial habitat.

R17: Western Governors should encourage their state department of transportation and fish and wildlife agency to jointly fund resources for coordination, such as a dedicated wildlife liaison position(s), processes to ensure cross-fertilization, and personnel exchanges.

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"We have become great because of the lavish use of our resources and we have just reason to be proud of our growth. But the time has come to inquire seriously what will happen when our forests are gone, when the coal, iron, the oil and the gas exhausted." Exhibiting tremendous foresight, Teddy Roosevelt concluded that "we must handle the water, the wood, the grasses, so that we will hand them to our children and our children's children in better not worse shape than we got them."

-President Theodore Roosevelt, in his 1908 address to the first Governors' Conference on the Conservation of Natural Resources.

WGA Wildlife Corridors Initiative

Land Use Working Group

June 23, 2008 Draft

I. Introduction

A. Background

America's western frontier has a near mythic role in our country's psyche. Americans see the West as a place of iconic landscapes, wide-open spaces, small towns, Indian Nations, farmers, ranchers, loggers and miners -- all of which played a seminal role in defining our country's cultural and natural heritage. The paradox of the modern West at the end of the 20th century and continuing through today is reconciling our romanticized legacy of the Old West with that of the New. The New West is becoming the most urbanized area in the country and its economy is diversifying to create jobs in record numbers. Between 1990 and 2000, five of the six fastest growing states in the country were in the West, and more people will come to live, work and play here. We are in an unprecedented period of change in both our human and natural systems. What is needed is a new vision for how we grow, anchored by a commitment to balance economic needs with protection of wildlife habitat.

Land Use Change on the Western Horizon

The United States will experience more growth than any other country outside of China and India, and the West will see the largest percentage of this growth. Between 1990 and 2000, five of the six fastest growing states in the country were in the West. (Nelson 2004)

One fifth of the nation's 250 million acres of prime agricultural land is at risk for development because of its proximity to the nation's 100 largest cities (NRCS 2006).

In 2030, about half of the buildings in which Americans live, work, and shop will have been built after 2000 (Nelson 2004).

The American West faces a dramatic and accelerating transformation: burgeoning population growth and ever-increasing demand on increasingly limited resources; changing demographics and economics, culture, and climate. Especially in concert, these dynamics pose an unprecedented challenge for government and an urgent imperative for action. At issue is not whether to grow our communities and economies – but how and where we should grow them. These decisions will not only affect quality of life in our neighborhoods and communities, but will also determine whether the wildlife and landscapes that so characterize the West will persist for future generations.

Across the western states, we can see how human land uses can compromise wildlife and the environment. A vast scientific literature demonstrates how the patterns of land use can affect the movement of wildlife and the functioning of the ecosystems. When land is converted to human land uses, natural habitat is lost, and the remaining habitat is, to varying degrees, altered due to fragmentation and degradation. Direct and indirect land use impacts can lead to species decline, endangerment and possibly extinction. One of the most effective strategies to abate the threats posed by habitat fragmentation is to design our communities in a manner that protects crucial habitats and maintains the ecological permeability of the intervening landscape so that wildlife can move between those areas.

"Connectivity" is needed at a multitude of spatial and temporal scales. For some populations of wildlife, the primary concern may be how to get individuals safely across a road. But for most others, the needs are far more complex. What sustains wildlife is quality habitat, and that in turn is supported by a functional ecosystem. Because the ecological processes that sustain ecosystems – like flooding and fire regimes, or animal migration – play out over very large areas, maintaining them is a shared responsibility.

Of course, the benefits of maintaining ecosystem health are also shared. Western ecosystems do more than sustain wildlife. Crucial habitats and corridors provide ecosystem services that range from enhancing water quality to ensuring the pollination of our crops. These areas may also provide for human needs such as recreation. To a great degree, we can think of the viability of wildlife as an indicator of the functionality of ecosystems – and so the sustainability of our communities, our economies, and our general well being.

Where we guide future development will be fateful for the American West. Local land use decisions have far reaching implications not only ecologically but also socially and economically. Consider that between 1960 and 1990, the population in metropolitan areas grew by 50 percent – while the acreage of developed land increased by 100 percent. Increasing costs of essential services strain budgets at all levels of government. A National League of Cities survey found that more than four out of five cities were less able to meet their fiscal needs compared with the previous year – the largest proportion in nearly 20 years. Simply put, how changes in land use impact wildlife and obligate infrastructure and resources make us all vested in the myriad of land use decisions to come.

Development in wildlands can incur public cost, whether in basic services like utilities, roads, and fire response capacity, or in impacts that compound throughout the West. People and property adjacent to public lands can constrain resource management on those lands; housing near a National Forest, for example, may obligate funding to fuels reduction projects rather than other activities. Private lands, when properly managed are critical to maintaining wildlife connectivity and habitat health. In addition, growth that is not planned in a regional context can even compromise military preparedness and national security if it encroaches upon military bases, flight zones, and international borders. Absent that more regional perspective, we may also miss fleeting opportunities to protect vital ecological processes and essential connectivity for wildlife.

B. Land Use and Government Decisions

Municipal and county governments play a pivotal role in shaping future growth across the West. So do private landowners. So do state, federal, tribal, and regional governments. Taken together, our land use decisions heavily influence the long-term health of the ecological processes which sustain us and our wildlife populations.

How we collectively guide future development will determine the landscape of the West.. Effective partnership across all levels of government and all sectors of society will be critical. Planning and protection of crucial habitat and corridors before the integrity of the landscape is compromised is not only precautionary, but ultimately cost effective. The active conservation of

species in advance of Endangered Species Act listing decisions avoids economic and political "train wrecks" all too familiar in the West. To accomplish this, we must ensure that agencies and local governments receive the tools and support they need to incorporate wildlife corridors and crucial habitat considerations into land use and land management plans and policies. We need to ensure that these efforts are integrated across jurisdictions – and that there is adequate funding to see to their implementation. Finally, we need effective incentives structures and regulatory mechanisms that keep pace with current market forces, if we are to secure collaboration across public agencies and full and willing partnership with communities, businesses, and private landowners.

The defining opportunity before Western Governors today is to create a framework that considers a sustainable land use ethic. This report outlines a roadmap to that future, one characterized by:

- Recognition of existing state and local strategies for protecting habitat.
- Land use plans and policies that sustain our economies and communities while also minimizing fragmentation of intact landscapes, preserving ecological permeability, and minimizing disruption of ecological processes that sustain life.
- Informed and integrated goals and processes across agencies and jurisdictions in land use planning, policy, and resource use.
- Coordinated and complementary management of public lands to support integrity of crucial habitats and corridors.
- Private landowner engagement and willing participation in maintaining the ecological function of the West

C. Military Bases, International Borders, and Tribal Lands as Part of the Wildlife Landscape

There is a unique opportunity to work with the Department of Defense (DoD) on cooperative planning so that crucial habitat, and military mission viability are protected. The Department of Defense (DoD) manages military installations and ranges throughout the nation to fulfill its testing and training mission. These military lands have generally remained intact for over 70 years and have not been fragmented by urban development; however, military lands are no longer located in remote areas and many are surrounded by expanding population centers. As a result these lands are becoming islands of biodiversity. It is estimated that over 300 federally listed threatened and endangered species are on DoD-managed lands, many of which were Bureau of Land Management lands withdrawn for military use.

> The 2003 GAO report on military training stated that urban growth and development near military installations exceeded the national average by 80 per cent.

Tribal lands are found throughout the West and many contain crucial habitat or provide essential connectivity for wildlife. Many of these lands are experiencing dramatic changes in land use, often as a result of economic opportunity provided from natural resources development, gaming revenues, and other contributing sources. Tribal governments may benefit from planning tools and resources that can be employed to reduce the environmental impacts of development, and represent an additional key partnership opportunity.

D. Scope of the Land Use Working Group

The Land Use Working Group recognizes that there are numerous current efforts across the West to conserve crucial habitats and wildlife corridors in the face of continued population growth and landscape change. While such programs and projects are laudable, they occur in a localized fashion relative to the vast Western landscape. The Wildlife Corridors Initiative presents a cohesive strategy for applying the information base needed to promote land use practices and decisions that will benefit crucial habitat and wildlife corridors at a more significant scale.

The Land Use Working Group has worked to develop policy recommendations that will build upon the WGA Science Committee's effort to provide a geospatial expression of crucial habitat and wildlife corridor information. Our recommendations promote the integration of crucial habitat and corridor information into government land use decisions at all levels. We believe that the most important land use decisions are made at the local level and by individuals – as such, this working group has also focused on delivering the data, providing the resources, and offering the incentives to support habitat-positive land use decisions by local governments as well as private landowners. At the same time, we realize that knowledge, land use planning, and land management efforts at the local level should continue to help inform governmental decision-making at the state and federal level.

The issues related to land use decisions are covered in many ways by the other working groups. Transportation and land use are closely linked. Science and climate change should and will drive some land use decision-making in the future. Renewable energy, oil and gas and transmission are also closely tied with land use decisions. Urban growth drives new infrastructure. Decisions on land use shape growth in urban and rural areas.

The remainder of this report focuses on specific issues and recommendations that will integrate wildlife information into land use planning and decisions.[1] Governors play a crucial role as their states can provide resources to local communities as well as being the focal point of policy change at the federal and state levels.

II. Policy Recommendations

Issue: Integrating the Results of the Wildlife Corridors Initiative with All Levels of Government

A major challenge to conserving crucial habitat and wildlife migration corridors is the lack of cross-jurisdictional integration and coordination within and among states, local governments, federal agencies, tribal governments and the private sector. Western Governors can be instrumental in more effectively conserving crucial habitats and wildlife corridors for the benefit and sustainability of communities and wildlife resources. The consequences of segregated information, poor communication and integration, and lack of involvement has contributed to increased Endangered Species Act listings, conflicting governmental policies, fragmented habitats, mistrust and polarization.

[1] The Land Use Working Group initially proposed several policy recommendations pertinent to transportation and climate change; however, most of these recommendations were subsequently forwarded on to the appropriate working groups for integration into their respective reports.

Integration is the key way that data will have impacts on government decision-making. The right types of data need to be collected and updated. Data also needs to be inserted into planning processes at the right time. As importantly, data needs to be integrated into the appropriate level of government decision-making. Most land use planning decisions are made at the local level. Even for state and federal lands, local entities are given an important role in indicating what they believe appropriate land uses would be. Integrating information into all levels of government will be one of the most powerful ways of achieving the objectives of the Wildlife Corridors Initiative.

Recommendation:

1. By directing state wildlife management agencies or other state coordination agencies to work strategically, in partnership, with local, state, regional, federal inter-agency and tribal governments, governors can ensure that crucial habitat and wildlife migration corridor information from the decision support system (recommended by the Science Committee and coordinated by the Western Wildlife Habitat Council to be established by WGA) is considered and coordinated in ongoing, cross-jurisdictional land use planning, guidance documents, project plans, and program funding priorities.

Issue: **The Role of Local Governments in Wildlife Corridor Protection**

In most of the West, local governments have borne the responsibility of planning for and approving development within their jurisdictions. In spite of attention to planning at the local level in many areas of the West, significant habitat loss and habitat fragmentation have occurred and continue across the region. Charting a more effective and coordinated course will require significant technical, legal, and financial support for local governments and, most importantly, will require that each jurisdiction shoulder its equitable share of responsibility for wildlife habitat; otherwise, the governments that choose to act will alone bear the burdens of protection.

Local governments face a number of challenges as they seek to protect wildlife corridors and crucial wildlife habitat through their planning efforts and development decisions. Local governments, especially those in rural areas, do not have access to useful information about natural resource values or the staff to adequately analyze the information. Also, because of differences in state law as well as different powers granted to statutory and home rule cities, counties, and towns, it is often unclear whether certain land use tools are available to local governments. In light of the potential lawsuits over authority issues, as well as concerns about the resources it takes to defend land use decisions, local governments often choose to avoid litigation rather than use important planning tools.

Because of these challenges, incorporating the protection of wildlife corridors and crucial wildlife habitat into local governments' planning efforts and land use decisions is done differently in different parts of the West with varying degrees of success, and with some local governments bearing more of the burden than their neighbors.

Recommendations:

2. The Governors should work cooperatively to develop baseline standards or guidelines for the land use practices described in this report that will help ensure the long-term viability and protection of crucial wildlife habitat in all jurisdictions. Further, the Governors

should consider directing their respective state agencies to establish a monitoring program to assess whether application of the land use practices are meeting the goals for protecting wildlife corridors and crucial habitat. In cases where goals are not being met, Governors should consider applying adaptive management strategies.

3. The Governors should work with state legislatures to ensure that state laws provide express statutory authority and requisite funding for local jurisdictions to use a full range of tools (e.g., comprehensive planning, zoning, transferable development rights programs, infrastructure planning, subdivision design standards, stream vegetative buffers, floodplain management, wildland-urban interface management, off-site mitigation programs, and incentive-based measures) that will allow them to balance crucial wildlife habitat with other local needs.

4. The Governors should consider establishing and adequately funding state planning offices to broaden the level of assistance available to local governments and provide access to the information and tools helpful in carrying out land use planning programs. Further, Western Governors should consider empowering their state fish and wildlife agencies or other state coordination agencies to work cooperatively with local governments to provide wildlife-related information and technical assistance pertinent to local land use planning activities, including the preparation of local plans, design of local regulations, and review of local development proposals. Such forms of state planning assistance should be coordinated with local government outreach provided by other state agencies (e.g., transportation, water permitting, and water quality). Cooperative extension service programs should be viewed as additional or alternative sources of state-level planning assistance and support to local governments.

5. Western Governors should consider providing private landowners with technical and financial assistance and incentives, and establish efficient and effective multi-species, multi-habitat conservation banks and recovery crediting programs on private lands in high priority locations that agree with habitat priorities.

6. Western Governors, in cooperation with the WWHC, should consider locating the funding resources necessary to conserve wildlife corridors and crucial habitat that have been identified in the resource balancing process within their state. Governors may want to consider additional federal funding sources such as the Land and Water Conservation Fund, North American Wetlands Conservation Act, Farm Bill, Grazing Reserve Program, and the Farm and Ranchland Protection Program.

Issue: **Addressing Key Factors that Shape Growth**

There is now widespread acknowledgement that we are facing limits to the use of our air, land and water brought about by growth, diminishing supplies and the increasing effects of climate change. Meeting this challenge requires that we make progress towards the development of a comprehensive planning framework that better integrates decision-making at federal, tribal, state and local levels that guides growth (how and where we grow) in a manner that maintains the West-wide vision for economic growth and crucial habitats and wildlife corridors.

In certain instances, it is fundamental that we understand that decisions related to water use, transportation, and energy development, along with our responses to climate change have profound implications to maintaining the ecological cohesion and functioning of crucial habitats and corridors and the ecosystem and economic services they provide. Of particular concern is the use and management of water to meet an increasing and largely urban western population. In addition, our investments in transportation, which can play a critical role in directing growth and decreasing the size of the urban footprint, and federal permitting processes, are too narrow in scope to meet the challenge of guiding growth in a way that considers externalities such as climate change. Transportation planning is a key factor in residential and commercial development decisions that can, in some instances, seriously degrade crucial habitats and wildlife corridors.

A key dimension of sustainable growth includes compact development. At all levels, more compact forms of development reduce natural resource use (i.e. water, land, energy) and greenhouse gas emissions. Promoting compact development should be a major driver of federal, state and local land use policy decisions.

Recommendations:

7. Western Governors should request that the Western States Water Council undertake a systematic assessment of how decisions related to inter-basin and agricultural to urban water transfers, energy development and water storage facilities, impact crucial habitat and wildlife corridors.

8. Governors should consider developing and supporting legislation to recognize water in natural systems as a beneficial use, for purposes of protecting and restoring wildlife corridors and crucial habitat, and provide more voluntary tools that will allow the re-allocation of water for natural systems without harming agricultural water rights, including return flow rights. In states where appropriate, legislation at a minimum should include the right to lease water without forfeiting the right through non-use.

9. Governors should consider adopting policies requiring that local governments planning new development consult with the state water resources agency and the state fish and wildlife agency, to ensure the adequacy of long-term water supply needed to support the functioning of identified crucial habitats and important wildlife corridors is considered.

10. New public infrastructure (e.g., roads, sewer lines, etc.) at the state level should be oriented to direct growth and foster more compact development. Governors should consider whether state funding should be conditioned in part on whether the infrastructure investment will promote more efficient land uses that promote more compact development and direct growth to existing communities. The Governors should consider supporting efforts to condition federal funding for infrastructure related to new development in a similar manner.

Issue: **Finding Funding to Bring Capacity to State and Local Governments**

State and local governments are stretched thin to provide basic services. True integration of fish and wildlife data into land use planning decisions means that agencies will have to go outside of

their narrowly defined roles and become proactive about avoidance and minimization at the onset of their planning processes. Funding is needed to help agencies build the capacity to engage in this manner. Additionally, with the identification of specific priority habitat areas, funding needs to be available to protect them. Often, it will be the responsibility of local entities to conserve these areas as open space.

Identifying funding to support the wildlife habitat initiative will be a challenge, particularly in these days of tight federal, state and local budgets. More creative funding must be identified in order to achieve success. The Transportation and Climate Change Working Group reports outline several potential sources of current, redirected funding as well as new funds. The following recommendation points to additional new potential funding sources that could facilitate the integration of wildlife values into land use planning and development.

Recommendation:

11. Governors should seek creative means to fund the efforts related to this Initiative. This may include: restructuring existing expenditures to become eligible for federal transportation funding programs, supporting federal legislation to allow Department of Defense Readiness and Environmental Protection Initiative (REPI) funds to qualify as state matching funds for programs of the U.S. Department of Agriculture, such as the Farm Bill, use funds generated under federal, state or regional carbon cap and trade programs for the Initiative, and work with state NRCS technical committees to leverage priority actions consistent with the crucial habitats and corridors initiative under conservation programs under the Farm Bill.

12. Governors should consider supporting continued funding of the congressionally established Land and Water Conservation Fund to assist in the implementation of land easement and acquisition priorities as identified by the states. Public acquisition should be made only where there are willing sellers, a need is clearly demonstrated, and affected local governments provide concurrence.

Issue: **Integrating Military Land Use and Border Areas into a Crucial Habitat and Connectivity Conservation Strategy**

Our international borders cross many ecosystems, and the north-south wildlife corridors across those borders help maintain the viability of the habitats and wildlife of the Western states. The integrity of borderland habitat, however, is directly and indirectly degraded by illegal immigration. Illegal border crossing represents an "unauthorized land use" with substantial adverse ecological impacts due to the migrants themselves (e.g., trash accumulation, fire, trampling of sensitive habitats) and the border enforcement response their entry necessitates (e.g., hard fencing, pursuit, road construction).

Continued development near the border further frustrates border security efforts -- and also compromises important habitats and corridors. Prevention of development and protection of open space near the border can help protect important wildlife habitat and help ensure that our border agents have the response space and time needed to intercept illegal immigrants.

***Recommendations*:**

13. Governors should support open space protection near the international borders, and support the application of the Department of Defense base-buffering model to the borderlands.

14. Governors should partner with the border enforcement authorities to reduce the myriad incentives for illegal entry in the United States.

15. Governors should partner with the border enforcement authorities to seek and support strategies for achieving secure borders while maintaining, to the extent possible, permeability for vital ecological functions and wildlife, and protecting sensitive habitats (e.g., through the use of open space protection, vehicle barriers, virtual fencing, remote surveillance technologies).

Issue: **The Department of Defense, a major landowner, has numerous military installations and ranges in the West.** Many of these DoD managed lands, once isolated by sparsely populated communities or surrounded by agricultural or undeveloped open spaces, are now surrounded by urban population centers. Growth adjacent to and around installations and ranges can impact military readiness and result in a lack of open space essential to support species habitats. This increased development near military assets has resulted in an abundance of DoD managed lands with crucial habitat.

Preventing incompatible development and protecting open space around DoD assets will better enhance military readiness and provide contiguous habitat for wildlife. Incorporation of DoD information into planning processes will assist in ensuring that wildlife have integrated wildlife corridors to ensure better habitat survival. One helpful tool is the DoD Readiness and Environmental Protection Initiative (REPI) which provides funding for the military to work with willing landowners; local, state and Tribal governments; and non-governmental organizations to secure conservation easements that will help prevent encroachment upon test and training areas.

16. Western Governors should actively participate in the development and maintenance of Western Regional Partnership efforts as a complement to implementation of state Wildlife Action Plans. This would include engagement in land protection programs such as readiness and Environmental Protection Initiative (REPI) around military installations and ranges, and support of increased federal funding of the program. Early coordination with DoD and DHS should occur to verify consistency with national security objectives.

17. The Western Governor's Association should encourage the Western Extension Directors Association (WEDA) to form a regional task force, in cooperation with WGA & the Association of Fish & Wildlife Agencies and the relevant state agencies, to develop a multi-state program for the purpose of establishing collaboration and coordination of scientific and policy input into conservation and land use planning efforts in the Western states to coordinate and implement the state wildlife management plans in each of the Western states.

18. Western Governors should work to improve the cooperative agency status process (under CEQ guidelines) and encourage all federal agencies to make full use of the cooperative agency provisions with all of the their tribal, state, and local government partners to ensure incorporation of crucial habitat and wildlife corridor information into federal land planning decision and management documents. This effort would also include the identification of barriers that have prevented effective consultation and data sharing under existing MOUs and agreements and work to improve inter-governmental coordination.

WGA Wildlife Corridors Initiative

Climate Change Working Group

June 23, 2008 Draft

I. Introduction

Over the last two decades, a broad consensus has developed among scientists that climate change is an urgent issue needing the attention of policy makers and the public. This recognition has led to growing efforts to curb greenhouse gas emissions through increased attention on alternative energy development and greenhouse gas emission reduction programs. Nevertheless, greenhouse gas emissions continue to increase in most jurisdictions, and societal vulnerability to climate change remains high with changes in the climate system persisting into the future. The adverse impacts from climate change may pose the single-most serious threat to the long-term sustainability of indigenous fish and wildlife populations. As the number of acres of crucial wildlife habitat decreases, connections between landscapes are increasingly critical for the long-term survival of key wildlife species. As landscapes change due to climate change, these connections between critical habitat areas become even more critical. This committee supports the concept of landscape connectivity as a means of improving the long-term viability of wildlife in the American West. To prevent significant loss of wildlife and degradation to ecosystems, management policies must be implemented that support the long-term persistence of species and ecosystem health. Meeting the challenge that climate change poses to our western landscapes requires nothing short of a paradigm shift in how we use science, how we plan, and how we implement conservation strategies across jurisdictional boundaries.

The Western Governors' Association recognizes western wildlife as a vital asset to the region. The Climate Change Working Group's report describes potential impacts on wildlife in a warming climate and proposes management strategies for crucial habitat and wildlife corridors to assure the future of the West's diverse wildlife resources.

Current and Expected Changes

The lead sentence of the IPCC Climate Change 2007 Consensus Report states: "Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice rising global average sea level." The natural world of our American West is changing. Air temperatures in the Pacific Northwest increased through the 20th century, with rapid increases in recent decades and an expected total warming of 3 degrees C over the next century (ISAB 2007[1]:13). These increases

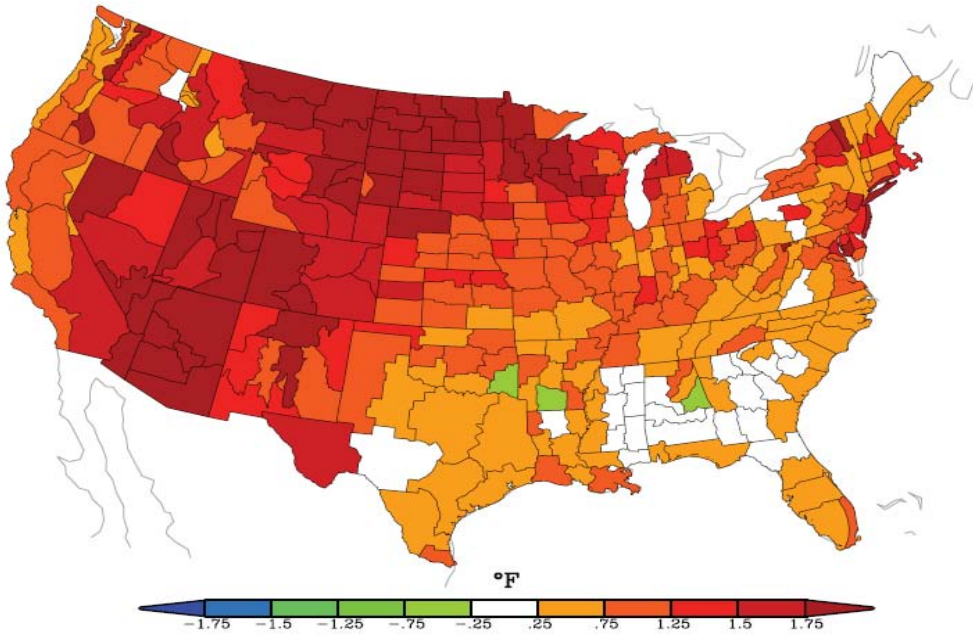
[1] ISAB (Independent Scientific Advisory Board) 2007. Climate Change Impacts on Columbia River Basin Fish and Wildlife. Report 2007-2 to the Northwest Power and Conservation Council. Portland Oregon. 136 pp.

The Independent Scientific Advisory Board (ISAB) is as independent scientific panel that reviews fish and wildlife measures for the Northwest Power and Conservation Council in the Columbia River Basin. The Council represents four Pacific Northwest States and was established by Congress in 1980 in Northwest Power Act legislation with Council members appointed by their respective governors. The ISAB completed their comprehensive Climate Change Report in 2007 using information from the IPCC and updated information from the U of Washington Climate Impacts Group and more recent science.

in temperature are known with high certainty to be human-caused and to be occurring at rates well above background variation (e.g. IPCC 2007, ISAB 2007). Temperature changes of the magnitude predicted may be sufficient to cause massive changes in the West's flora and fauna, as some species decline while others (especially overabundant and invasive species) proliferate. As an example, the expected warming over the next century approaches the amount of warming that has taken place between the last ice age and now.

Some of the climatic changes of greatest relevance to the protection and management of crucial habitats and wildlife corridors in the Western U.S. are summarized in Table 1. The expected changes include increased climatic variability and increasing air temperatures which will produce increased water temperatures, earlier spring warming, declines in snow pack, longer fire seasons with more frequent and intense fires, earlier snowmelt runoff and peak stream flow, higher frequency of floods, lower natural summer and autumn stream flows, reduced frequency of reservoir refill, decreased aquifer storage, increased duration of summer dry periods, and greater isolation of critical floodplain habitats from active river environments. In addition, the loss of river flows due to climatic changes will alter estuaries by increasing water temperature, changing salinity, and reducing and isolating salt marsh crucial habitats. Warming-induced increases in sea level rise and the frequency of El Nino events and positive Pacific Decadal Oscillation effects will reduce near shore biological productivity.

Figure 1. Average temperatures in 2000-2007 compared to averages for 1901-2000. (Source: Dr. Martin Hoerling, National Oceanic and Atmospheric Administration).



OBSERVED AND PROJECTED CHANGES IN WESTERN US AND IMPACTS TO WILDLIFE				
	20th century changes (+1˚C)	**Future Projections (2020-2029, +1-1.5˚C)**	**Implications for Wildlife**	**Refs.**
Warmer stream temperature		+0.6-1.2˚C	**Reduced survival and reproduction of salmonids;** impacts on cold water fisheries	1,2, 3,4, 5,6, 7,8, 9,10
Warmer winters and spring	+0.1˚C/decade through 20th century; greatest warming in spring and winter	+1-1.5˚C; greater magnitude of warming in winter and spring	Shifting geographic range; increased pest/pathogen outbreaks; temperature-dependent sex determination; **accelerated parasite life cycles and improved pathogen survival**	2,10
Earlier spring arrival	Advancement of spring by 5 days/decade; longer growing season (2 days/decade)	Continued earlier spring arrival	Earlier migrations, nesting, breeding, budburst, flowering; changes in synchrony and inter-species interactions;	10, 12
Streamflow	Peak streamflow 3 weeks earlier than average in existing historical record	Earlier peak streamflow; higher winter/early spring flows; lower summer flows	Higher flood frequency; earlier peak flow; reduced natural summer and autumn flows; reduced frequency of reservoir refill; increase in the duration of summer dry period; floodplain habitat increasingly isolated from the active river environment; reduced habitat and survival for terrestrial and aquatic species	2,10
Snowpack	April 1 snow water equivalent declining 15-30%; earlier snowmelt timing	Generally decreasing snowpack; decreased length of snow season	Reduced habitat for **bighorn sheep, wolverine** and other snow-dependent species; reduced water availability; shrinking alpine habitat;	10
Glaciers	Declines in glacier volume and area across the west	Glaciers in Glacier National Park disappearing by approx. 2030	Impacts on glacier-fed streams and lakes	2,10
Fire	Longer fire season, increased fire frequency and intensity; due to spring/summer warming and earlier spring snowmelt	Even longer fire season, increased fire frequency and severity.	6x more acres burned over last 15 yrs vs. previous 15 yrs; changes in forest species composition; changes in physical forest structure; increases in invasive species;	2,10, 11
Sea level rise	0.7mm/year increase globally over last 40 years.	0.18-0.59 m increase globally [by 2090-2099, not 2020-2030]	Loss of coastal wetlands, salt marshes and other coastal habitats; increased salinization of freshwater; changes in the freshwater-saltwater interface in estuaries; increased storm surges and coastal erosion;	2,10, 13
Sea ice	Some fracture of shelf ice	Arctic mostly ice-free in summer	Loss of critical habitat for polar bear; other arctic ice dependent species	2
ENSO + PDO cycles	Increasing frequency of ENSO and positive PDO events		Changes in off-shore productivity; marine species distributions;	2,14
Ocean Chemistry		Increase in CO2; increasing acidity	Reduces carbonate for shell organisms important as salmon prey	2
Invasive Species	Spreading worldwide; out competing native wildlife	Spreading throughout west	Habitat under climate change more amenable to invasive than native species	2
Estuary		Decrease in flows + sediment transport; increase in water temp.; change to salinity regimes	Reduction in fish and wildlife habitat and populations	2,15

Climatic changes over the 20th century have already had significant effects on wildlife species throughout the American West, and in the coming decade these effects will continue and intensify (Root et al. 2005). Shifts in the geographic patterns of wildlife habitat use and movement with increased annual temperatures already have been documented. Two well-known western butterflies(Edith's checkerspot and sachem skipper), many western bird species, and hundreds of other species, are shifting their range limits several kilometers poleward or several meters upward in altitude per decade (Parmesan and Gailbraith 2004, Crozier 2003, Parmesan and Yohe 2003, La Sorte and Thompson 2007, Hitch and Leberg 2007). These range shifts are significant not only because they disconnect species from their food sources (or prey from their predators) but also because changes in wildlife distributions alter the strong sense of place that people have in the West.

Shifts in the timing of wildlife mating, migration, and other life-history traits (phenological shifts) will continue to occur as climate conditions change, and these shifts will lead to potential mismatches between wildlife and their food sources or other habitat attributes. The evidence for the phenological shifts already underway is not based on isolated examples. A majority of 677 species studied show trends toward earlier spring breeding, flowering, budburst, or seasonal migration (Parmesan and Yohe 2003). Across species and studies, spring phenology has advanced 5.1 days per decade, with larger shifts at higher latitudes where warming is exacerbated (Root et al. 2003). As with shifting distributions, changes in phenology can lead to important changes in species interactions. For example, amphibians that produce eggs and move to breeding ponds based on temperature and moisture will encounter mismatches between breeding phenology, pond drying, and arrival at the pond. These mismatches, in turn, will lead to changes in types of plants and animals present and alterations in aquatic nutrient flow (Beebee 1995, Wilbur 1997).

Climatic changes in the West increasingly will restructure the composition of wildlife populations as some species adapt and proliferate while others are displaced or die out, and the changes increasingly will alter the functions and values of crucial habitats and wildlife corridors. The effects on wildlife will manifest at the level of whole communities (e.g. sagebrush-steppe, high alpine, wetland, stream, lake) as well as at the level of individual species. Also, temperature and precipitation changes are facilitating the northward expansion of exotic and invasive species and pests (such as the pine beetle) that can cause major shifts in the types of plants and animals present. An example of the impacts of invasive exotic species that will significantly impact native wildlife and habitats includes the impacts of cheatgrass and West Nile Virus on the sagebrush steppe ecosystem. Currently, over 100 million acres of the Intermountain west are infested with cheatgrass, which alters the fire cycle and can lead to the total loss of sagebrush within the infested area. West Nile Virus outbreaks have devastated local populations of sage grouse, and accumulated evidence suggests sage grouse have little or no resistance to the virus (Walker et al.2004, Clark et al. 2006, Walker et al. 2007)..

The combination of a vegetative and viral invasive will challenge our ability to maintain and restore sage grouse across the West. It will be a formidable challenge to detect key stressors on the tens of thousands of native wildlife species and discrete populations across the American West and develop appropriate management responses to maintain the ecological, aesthetic, economic, and ecosystem services and values that they provide.

Providing focal attention on particular species or plant and animal communities (see Mills 2007) is an efficient means to describe the expected changes to western habitats from climate change. Focal species or community types that are most appropriate targets for evaluating climate change effects on crucial habitats and wildlife corridors include those that are highly vulnerable, those that have a high public profile, those that are strongly interacting in their effects on species and ecosystems, and those for which data exist across time and space. The choice of focal species and communities should weigh these criteria, potentially giving more weight to those that fulfill multiple criteria.

Described below for illustrative purposes are documented and projected effects on one focal community type and four individual species groups: wetlands, fish, waterfowl, bighorn sheep, wolverines, and wildlife diseases.

Wetland and Riparian Communities

Wetland and riparian systems are an example of a focal community type providing a wealth of ecosystem services that are vulnerable to changing climatic conditions. In the West, human population, private land ownership, and overall land development (including multiple dams) are situated largely within wetlands and along rivers, lakes and streams (ISAB 2007). Riparian and wetland habitats in the Western U.S. comprise less than 2% of the landscape yet provide habitats for greater than 80% of wildlife species (McKinstry, Caffrey, and Anderson; 2001). Riparian wetlands, located along rivers and streams, typically contain cottonwoods, willows, and shrubs such as birch and alder and are natural corridors utilized by a variety of wildlife, providing food and shelter. Wetlands associated with riparian corridors also help to attenuate and store floodwaters, provide a source of recharge during low flow periods, and filter sediment contributions to streams and rivers (Manci and Schneller-McDonald, 1989). Additionally, coastal and estuarine wetlands provide important wildlife habitat and corridors, flood and pollution control, and buffers against sea level rise and storm surges. Isolated and intermittent wetlands also provide crucial habitat and corridors for wildlife. Climatic changes that alter precipitation patterns and river flows are likely to directly endanger these biodiverse areas.

Fish and Other Aquatic Species

In the Western U.S., many fish species are economically important, of high profile due to endangerment, have cultural significance to Native Americans, and are strongly interacting members of their biological communities. Most native salmon and trout, for example, are closely adapted to patterns in stream flow and temperature (Brannon et al. 2004). As streams and rivers continue to warm, and runoff occurs earlier and becomes more variable, predictable effects on physiology, body growth, growth efficiency, reproduction, and survival will collectively challenge the ability of some populations and species to persist (Ficke et al. 2007).

All freshwater life history stages of cold-water fish are expected to be impacted by climate destabilization. For example, a greater frequency of flood flows is likely to scour fish nests ('redds'). Increased winter water temperatures will accelerate time of embryo emergence and out-migration of juvenile salmon and trout at a smaller size where they will be more susceptible to predation losses and may reach saltwater and rearing areas at an inopportune time for optimum survival. Further, warmer temperatures cause stream water to retain less oxygen, a vital factor for all aquatic species. As one specific example of these effects operating simultaneously,

juvenile survival and migration success in Snake River Chinook and other salmon has been strongly linked to temperature and flow regimes (Crozier and Zabel 2006, Keefer et al. 2008, Connor et al. 2003;Young et al. 2006).

These conditions will increase pre-spawning mortality, impact-limited energy reserves, proclivity to disease and potentially damage vital gametes (Goniea et al. 2006; McCullough 1999; Clabourgh et al 2007; High et al.2006; Geist et al. 1997; Keefer et al. 2005.) Also, the outcome of competitive interactions (e.g. between native west slope cutthroat and invasive brook trout) has been shown to be temperature-dependent. Collectively, these changes occurring across species will lead to changes in composition of aquatic communities, with some species, especially exotics, prospering at the expense of native species. Bull trout, an ESA listed species, may be particularly vulnerable to the effects of climate change, especially when coupled with population fragmentation due to land use and disease issues (Rieman et al. 2007). Expected loss of bull trout habitat in the Columbia Basin as a result of climate destabilization is estimated to range from 22% to 92% (ISAB 2007). Also of concern are other western trout species, which may decline by 60% or more in some regions (Kelcher and Rahel 1996, Rahel 2002); with the most vulnerable being native trout species that are either "species of concern" or are listed on the Federal or a State threatened and endangered species list.

Estuarine life histories are also likely to be impacted by climate destabilization. About 168 million juvenile and 1.7 million adult salmon and steelhead use the Columbia River estuary habitat (NOAA Fisheries 2007). Human development, especially the presence and operation of upriver dams, has already caused reduction of Western U.S. estuarine habitats. For example, Sherwood et al. (1990) estimated that 33,000 acres of critical salmon habitat that was historically present have already been lost in the Columbia River estuary. Bottom et al. (2005) estimate that macrodetrital inputs into the Columbia River estuary, vital to fish food webs have already decreased by 84%. Decreases in flows, and sediment transport and increases in water temperature and changes to salinity regimes from climate changes will further reduce and fragment salmon habitat and stress remaining populations (NOAA Fisheries 2007; ISAB 2007). Reduced flows could lead to increased anthropogenic impacts on critical habitat such as increased dredging (ISAB 2007). Hood (2005) estimated that the a sea level rise as a result of climate change between 18 and 32 inches and would reduce rearing capacity for juvenile salmon in the Skagit Delta of Puget Sound by 211,000 to 530,000 fish.

Ocean conditions necessary for optimum salmon productivity are also predicted to change from climate destabilization, although the magnitude of the change is uncertain at this time (ISAB 2007). With the warming of sea surface temperatures, projected at 2.7 degrees F by 2040, marine habitat for salmon will likely shift northward while salmon predators now in southern areas will move in areas off the coastline of the Western U.S. (Welch 1998). Climate changes could also increase the prevalence of El Nino and positive PDO conditions impacting coastal upwelling and food chain production (ISAB 2007). Reduced food sources would reduce juvenile survival and could cause adults to return to spawn at smaller sizes with less energy reserves and reduced gamete weight.

Waterfowl

Waterfowl are an example of a vulnerable group of species that are tightly linked to climatic regimes and that also have a high profile due to their biological and social and economic importance in the Western U.S. Temperature and precipitation determine the abundance and duration of crucial wetland habitats and waterfowl corridors, and directly influence waterfowl reproduction and population size. Reductions in wetlands due to climate change, coupled with continuing wetland draining and conversion of grassland nesting habitat to row-crop agriculture, will reduce options to assure waterfowl persistence. Overall, waterfowl populations in the prairie pothole region are predicted to be cut in half by 2050 as a result of climate changes (Sorenson et al. 1998), a severe economic blow to states that depend on revenues from sport hunting to support local economies.

The Central Valley of California has one of the world's largest concentrations of over-wintering waterfowl in the United States (Heitmeyer et al 1989). In California, nesting and brood rearing habitat may become more limited as precipitation decreases with increasing temperatures, as is predicted in the prairie pothole region (Sorenson et al 1998). Ultimately, this will cause decreased recruitment as birds shift out of optimal nesting habitats (e. g. Ward et al 2005), and a decrease in over-wintering populations.

Bighorn Sheep

Bighorn sheep are an example of a focal species that is highly vulnerable to the adverse impacts of climate change on its crucial habitats and corridors (Epps et al. 2004). Their habitats frequently are discontinuous and at climatic extremes in desert mountains and canyons and in alpine areas of higher mountain ranges. Consequently, bighorn sheep commonly exist in numerous relatively small subpopulations (e.g. many numbering <100) that are notably vulnerable to extinction. Changes in the distribution of desert bighorn sheep in the 20th century (shifts to areas of higher elevation and greater precipitation) are consistent with climate change. Management will need to address the factors including disease and infrastructure development that will make corridors and crucial habitats increasingly impermeable and inevitably limit the species' ability to further shift its range and survive climate change.

Wolverine

Snow is generally regarded as an important component of the wolverine's seasonal habitat requirements (Banci 1987, Hatler 1989, Magoun and Copeland 1998) and is considered an obligate component of reproductive denning habitat for wolverines (Magoun and Copeland 1998) as it may aid in kit survival by providing thermal benefits (Pulliainen 1968, Bjärvall et al. 1978) and protection from predators (Krott 1960, Pulliainen 1968). If wolverine productivity is linked to the availability and quality of reproductive den sites, snow cover that persists throughout the denning period may be critical to wolverine reproduction. The distribution of spring snow cover has also been shown to be concordant with year-around wolverine habitat associations (Copeland et al. in prep) as well as an effective spatial model in defining movement corridors based on genetic relatedness (Schwartz et al. in prep). As such, the distribution of spring snow cover appears to define a bioclimatic niche for the wolverine, the distribution and productivity of which may be adversely impacted by global warming (Gonzalez et al. in prep).

Infectious disease organisms

Infectious disease organisms are a focal group of species that will be greatly affected by climate change and that strongly interact with, and influence the size of, plant and animal populations. For example, increased temperature, humidity and rainfall generally accelerate parasite life cycles and improve pathogen survival (Harvell et al. 2002). New species interactions, caused by wildlife range shifts in response to warming (Parmesan & Yohe 2003), will lead to new disease exposures (Brooks & Hoberg 2007), while latitudinal and altitudinal shifts in insect vectors bring a suite of new diseases (Kovats et al. 2001).

Climate change seldom acts alone on wildlife populations but rather operates synergistically with other stressors, including habitat fragmentation, roads, development, and disease. These synergistic interactions increase uncertainty and complicate actions to mediate climate change effects, but also offer hope that treatment of other stressors will help alleviate the negative effects of climate change.

For many species of concern there is little chance of successful adaptation to climate change through the genetic processes of natural selection because they have been fragmented into relatively small and often isolated subpopulations in which random genetic drift is likely to overwhelm the ability of natural selection to act (Mills 2007:227). In many other cases, the pace and extent of climate change is so accelerated that it will overwhelm a species' capacity for evolutionary change (Barnosky and Kraatz 2007). In cases in which evolutionary change, movement or phenological shifts by wildlife are not possible, species will be lost unless active management is able to create new habitat or actively manage existing threats to current habitat.

The most efficient responses to mitigate the effects of climate change on crucial habitats and wildlife corridors will be those that focus on facilitating persistence and movements in current populations.

II. Barriers and Recommendations

A. Introduction

The goal of Section II is to explore the barriers to identifying and maintaining wildlife corridors in the face of climate change and to provide recommendations for overcoming them. However, it is important to first acknowledge several factors underlying these barriers that are more fundamentally related to climate change issues in general. These are factors that hinder our understanding of climate change and the translation of that understanding toward improved policy and decision-making.

Complexity of the issue

Climate change science, with the numerous interactions and feedbacks (air, water, biological systems), is difficult to simplify. Scientists often present information that is too technical for many people to grasp. Solutions to climate change are similarly complex, requiring an array of policy and technological approaches to be incorporated into both short and long term planning. There is no silver bullet or simple technological fix for this issue, which causes many people to feel overwhelmed. For instance, as we account for climate change impacts, areas that are not currently occupied by species (and therefore not considered "crucial" under the WGA definition) may become crucial.

"Uncertainty" of the science
Scientific uncertainty is often incorrectly equated with ignorance or an absence of information on which to make decisions. Identifying uncertainty is inherent in the scientific method; the very nature of science is exploratory. No other issue is a source of greater confusion for decision makers and the public. Although society routinely takes risks that carry an array of uncertain outcomes, climate change science seems to be held to a different standard. The result has been a widespread and pervasive "wait and see" approach to management and policy. Unfortunately, no action in the face of climate change is a decision that may carry the greatest risk. While policy makers and managers prefer to use past experience to guide future planning, with regard to climate change, the past is not necessarily a reliable guide for the future. Structured decision-making frameworks for long-range planning under a range of plausible (but uncertain) futures are available, but have not yet found mainstream application in conservation communities.

Scale of the problem
Climate change is a global phenomenon. Furthermore, many of the most important effects of climate change will not be felt for several decades. Both of these facts make it difficult for mangers and planners to address climate change. The issue is often perceived as too large or too far off to be managed, when more tenable and more immediate threats need to be addressed.

B. Science and Knowledge Barriers & Recommendations

Barriers

Effectively managing wildlife corridors and crucial habitat in a changing climate requires first and foremost that adequate species and habitat data are available and that we understand the fundamental ecosystem processes that occur on the landscape and in the waters. This section focuses on the science and knowledge barriers that limit our ability to identify crucial wildlife habitat, and design and implement wildlife corridors, so that we can successfully integrate science into conservation strategies that support persistence of healthy wildlife and ecosystems in the face of climate change.

Data and Information
Building a well-connected network of lands to protect wildlife into the future will require many types of data, such as current native species distributions, behavior, and habitat requirements, regional estimates of how the climate will change, as well as estimates of how native species and habitats will respond to changing climate. Downscaled climate-change projections used to project shifts in vegetation and individual plant and animal species distributions will help to provide estimates of species and systems future response to climatic change. These data are actively being collected, processed, and generated by experimental, observational and modeling studies. Necessarily much of the planning for connectivity will take place with limited knowledge about specific implications of climate change for particular species and habitats, suggesting that existing data and tools be fully explored.

There is a need for regional process models. Hydrologic models will be required to identify the predicted changes to snowpack, runoff, streamflow, and frequency, duration, and severity of drought. Fire models will be needed to project potential changes in fire regimes. Ecosystem and vegetation models can be used to project potential changes in habitat. Habitat models and population models can be used to project potential responses of species and populations to climate change. Finally, new developments in wildlife science—ranging from satellite telemetry to genetic sampling – can be used to illuminate how and where animals move across the landscape and waters.

Integration Across Multiple Scales

Climate change challenges us to develop unprecedented broad, coordinated, and interactive management of state, federal, and private lands and waters. Developing a scientific underpinning to support these efforts will require research, monitoring, and synthesis of results at landscape scales. Also, because different animals have different habitat requirements, different dispersal capabilities, and will respond differently to climate change, a connected network of protected lands will have to address these species-specific differences. At present, information about wildlife movement, corridors and migration is generated by discrete, relatively modest projects that tend to focus on a single species and a specific management issue. While there is a strong history and culture of collaboration between individual state, federal wildlife agencies, tribes and regional universities in pursuing these objectives, research projects that cross state jurisdictions are usually limited to high profile, endangered species (e.g., grizzly bear and salmon recovery teams).

Targeted Monitoring

Once a baseline can be established for an ecosystem, a biological resource, or an important ecological process, consistent measurement and analysis of select focal species, communities, and/or processes is required to evaluate the trend of its health. Such monitoring is central to successful adaptation. Analyzing data on monitored focal species, communities, and/or processes are necessary to gauge the success (or failure) of management actions, and determine whether a change in management is required. Monitoring will be required to assess changing species distributions and abundance, changing phenology, and changing arrivals and departures of migrants. Currently, there is no consistent monitoring program design across the multiple states and other relevant jurisdictions. Existing programs within individual jurisdictions provide inadequate support for either systematic monitoring efforts or comprehensive data analysis and dissemination.

Science and Knowledge Recommendations

***Issue*:** Climate change is already having an impact on native species and ecosystems in the West. The ecological, socioeconomic, and cultural consequences from the loss of species and ecosystem services due to certain further climate change will be profound. The substantial existing data on both wildlife and climate impacts needs to be organized, focused and expanded to support science-based projections for appropriate management actions.

***Recommendations*:**

6. The Governors should establish through WGA's Western Wildlife Habitat Council (WWHC) a Wildlife Adaptation Advisory Council (WAAC). The WAAC should be a regional collaborative among state and federal agencies, academics, and science-based NGOs . The WAAC should facilitate regional and state climate-impact assessments that will provide state agencies with the necessary assessments of the effects of climate change on wildlife and wildlife habitat. The assessments should rely on the most appropriate climate models and analyses, such as the ongoing North American Regional Climate Change Assessment, as well as stimulate new information through a range of research activities. The assessments should specifically include: 1) establishing basic climate-change sensitivities for species and systems and 2) modeling the responses of physical and biological systems to climate change. Modeling hydrologic, fire, vegetation, and species' responses to climate change will require analyses at scales relevant to management decision-making. For many systems, and for aquatic systems in particular, this will mean developing relatively fine-scale datasets that capture local processes such as hydrology. One of the primary goals of the WAAC is to identify regional habitat priorities that incorporate the impacts of climate change that can be included in state and local agency decisions. Specifically, the WWHC and WAAC should consider the following actions:

a. Convene a multidisciplinary task force, including paleo-ecologists, biologists, climate change scientists, and WAAC representatives, to work with each state to determine specific targets of individual fish and wildlife species, ecosystem services, or ecological processes for which climate change affects on crucial habitat and connectivity should be assessed.

b. With the states, based on the multidisciplinary task forces findings, species specific, expert task forces should be convened . The task forces will analyze ecological and climate data on current and future trends for their targets, identify further strategic data needs designed to fill knowledge gaps related to connectivity and response to climate change, and suggest adaptive management strategies that link management actions to the projected longer-term response of the targeted fish and wildlife species or processes.

c. With the states, the WAAC should develop a methodology for assessing emerging information from state and regional climate change impact assessments and conveying such information to states for possible adjustments to State Wildlife Action Plans .

d. With the states, the WAAC should develop coordinated monitoring programs to assess response of the targeted species or processes to management actions and support active adaptive management.

e. With the states, the WAAC should synthesize, coordinate, prioritize, and implement target-specific wildlife climate adjustment recommendations, including development of a request for proposals to address research gaps and

knowledge development.

f. The WAAC should promote distribution of tools to the States, and sponsor workshops where practitioners can share lessons, learn new approaches, and stimulate further improvements.

g. Working with the states, the WAAC should develop a strategy for funding short-term task forces and long-term interstate research and monitoring efforts. This might include federal sources such as NSF and CCSP, foundations, and private sources.

7. Western Governors should consider establishing a regional climate change adaptation information clearinghouse relevant to wildlife corridors and crucial habitat . This includes data and analysis tools, visualization and interactive mapping tools, and state-of-the-art tools to integrate climate predictions with current and future wildlife corridors and crucial habitat. The clearinghouse would provide stewardship of data with respect to data quality and archiving metadata. It would also include policy level information dissemination about statewide and multi-jurisdictional policies and analyses that have been developed. The information in the clearinghouse will be continually updated to represent the evolving science and policy lessons learned. Such a clearinghouse will ensure that decision-makers can access the best and most up-to-date scientific and policy information.

C. Funding and Financial Barriers & Recommendations

Assembling the necessary data and information to protect wildlife from adverse effects of climate change requires adequate funding mechanisms and prioritization of research. State and federal agencies, with their respective wildlife partners, have only recently engaged in discussions with regard to incorporating climate change into their fish and wildlife perspective. This section outlines some of the barriers that hinder progress on this front.

Barriers

Existing Funding Mechanisms

Many state wildlife agencies do not receive general fund appropriations, but rely on permits and fees for the vast majority of fish and wildlife management operations. Wildlife agencies primarily receive funding from sales of hunting, fishing and trapping licenses, as well as other harvest-related stamps and tags. The Sportfish and Wildlife Restoration Program (SWR) provides funding that is derived from a federal excise tax on certain types of hunting, shooting, fishing and watercraft products and are distributed to each state based on a formula that considers land areas and hunting-fishing license sales. These funds are directed at programs and activities that further the conservation of those species. In general, states have seen significant reductions in the sale of hunting and fishing licenses over the past ten years that have led to decreased funding for SWR programs. Other federal funds, such as State Wildlife Grants (SWG), are linked to the implementation of the State's Comprehensive Wildlife Conservation Strategy

(CWCS). The SWG Program provides federal money to every state and territory for cost-effective conservation aimed at preventing wildlife from becoming endangered. These programs continue the long history of cooperation between the federal government and the states for managing and conserving fish and wildlife species. SWG funding is annually appropriated by Congress and has varied significantly since 2001.

Although these programs have and continue to provide the primary funding sources for fish and wildlife conservation in the United States and are best suited to respond to climate change, current funding levels are inadequate and inconsistent to provide the necessary resources for States to adequately research, monitor and implement mitigation actions on a landscape scale. Little to none of the billions of dollars that the Federal government spends every year in research and development is dedicated for evaluating ecosystem impacts and responses by wildlife to climate change or habitat conservation and manipulation studies. Approximately 10% of the total research expenditures are directed to research in the environmental sciences that includes Atmospheric, Oceanographic, Geological and Environmental science disciplines. The Departments of Energy and Commerce and the National Science Foundation receive the bulk of this annual funding.

***Issue*:** There is insufficient funding available at any level of government to support the planning and implementation of conservation designs for the purpose of fish and wildlife corridor protection and establishment, as well as other aspects of fish and wildlife adaptation to climate change. Development of secure revenue streams and mechanisms to ensure funding is directed to activities that are effective and strategic in contributing to wildlife adaptation to climate change is essential.

Recommendations:

3. Western Governors should consider supporting establishment of new revenue streams to support wildlife adaptation to climate change in any relevant climate change legislation, such as carbon cap and trade or carbon tax legislation, that may be enacted by the U.S. Congress. The legislation should establish a permanent appropriation that will be made available to federal, state, territorial, and tribal natural resource agencies, and that will provide federal matching funding to local communities and states to maintain or re-establish landscape connectivity through protection of crucial habitats and corridors by means of conservation leases, easements, or acquisition based on the priorities identified through Recommendation

4. Governors should consider prioritizing state funding to encourage local initiatives and investments in maintaining or re-establishing landscape connectivity to support wildlife adaptation to climate change.

5. The Governors should consider directing their fish and wildlife agency directors to include, as part of prioritizing state grant requests from federal sources such as the Cooperative Endangered Species Conservation Fund, projects that maintain or re-establish landscape connectivity to help threatened or endangered species adapt to the impacts of climate change.

D. Provide Incentives for Climate Change Adaptation on Private Lands

Issue: Conservation of crucial habitats and wildlife corridors is increasingly threatened by fragmentation of public and private lands. This landscape fragmentation will be exacerbated by the impacts of climate change, which will result in a decreasing and shifting mosaic of habitats of varying quality. Successful approaches to conserving this dynamic landscape must be flexible and must prioritize habitat based on its importance for wildlife adaptation to climate change. Because private lands will become increasingly important to maintaining wildlife populations in the face of climate change, greater use of incentives will be required to encourage voluntary protection and management of key crucial habitats and wildlife corridors by private landowners.

***Recommendations*:**

6. Western Governors should urge Congress and state legislatures to enact legislation that would create greater incentives for individuals and land trusts to assist adaptation by species of concern to climate change on private lands through establishment of tax incentives in the form of credits, deductions, and exclusions for private landowners who voluntarily undertake measures to protect and restore crucial habitat and wildlife corridors on their lands.

7. Western Governors should consider encouraging flexible and voluntary landowner conservation of habitats needed by wildlife to survive climate change impacts through requests for administrative changes by USDA and statutory changes by Congress in federal Farm Bill conservation programs. Western Governors should encourage USDA, acting through the State Technical Committees, to give priority to crucial habitats and wildlife corridors in administering these programs, and to award increased bonus points, higher rental rates and other benefits to assist wildlife in becoming more resilient, adapting to, and surviving the impacts of climate change.

8. Western Governors should work with Congress, as well as regional and state climate change mitigation efforts, to develop protocols for market-based regulatory mechanisms that are established to mitigate climate emissions to give additional weight for purchase of carbon offsets that enhance or conserve crucial habitats and wildlife corridors for purposes of wildlife adaptation. To encourage enrollment of crucial habitats and wildlife corridors in offset programs, Governors should direct state agencies and state-based registries to provide outreach and technical assistance to private landowners.

9. In protecting and managing lands and waters identified through Recommendation 1 to maintain or re-establish landscape connectivity, Governors should provide greater support for state and local use of voluntary, flexible term easements and leases and for resources to help landowners adaptively manage working lands that occur within crucial habitats and wildlife corridors. Additional, innovative, voluntary approaches to assist wildlife adaptation to climate change should be developed with public input.

E. Policy and Institutional Barriers

Policy and institutional barriers are independent of scientific or economic issues that prevent

entities from taking effective action. These are the obstacles that hinder response to the challenge of climate change within the agencies and institutions that are largely responsible for managing our nation's resources. In the following section, we identify particular institutional barriers applicable to planning for wildlife corridors in the context of climate change.

Barriers

Institutional momentum
Current institutional structures and policies are not sufficient to allow timely protection of crucial habitat and wildlife corridors across jurisdictional boundaries in the face of climate change. Changes in climate will likely reduce the opportunities available to maintain crucial habitat and wildlife corridors, and the location of these habitats and corridors will likely shift over time in ways that may not be predictable. Current institutions and policies do not foster timely action to protect existing crucial habitat and wildlife corridors across jurisdictional boundaries or to prevent foreclosing options to conserve habitats that may become crucial or serve as wildlife lack of institutions and policies that support landscape scale planning, timely action, and future adaptation to changing wildlife patterns.

Inflexible conservation policies
Because future social and economic stability are important societal goals, current legal structures that support stability may limit the flexibility needed to respond to climate change. State and federal conservation policies are not sufficiently flexible to accommodate current uncertainty and changing information about climate change impacts, including spatial shifts in the location of crucial habitat and wildlife corridors. The need for flexibility in future planning to account for uncertainty magnifies the importance of existing barriers to effective conservation action, including jurisdictional boundaries and the slow and incremental nature of institutional change.

Disconnect between science and decision-making
There is currently a high degree of disconnect between the state of knowledge of climate change science and its translation to resource management and policy decisions. As we develop strategies for managing ecosystems in the context of climate disruption, a strong statement from leadership will be required to mandate and fund bridge-building between climate change science and land management policy so that decisions are informed by the best available science.

Federal, state and tribal entities own and manage a substantial portion of the Western landscape. These lands and waters contain crucial wildlife habitat, corridors and linkage areas that could, if properly planned, increase resilience for native fish and wildlife in the face of a changing climate. Incorporation of climate change in federal, state and tribal land, water and infrastructure planning and decision-making is critical to effective climate change planning.

***Recommendations*:**

10. Governors should consider charging their state fish and wildlife agency directors, acting through the Western Association of Fish and Wildlife Agencies, to ensure coordination among the western states, tribes, and with associated federal and territorial natural resource agencies, in planning and carrying out strategic, watershed and landscape scale adaptation activities to maintain or re-establish connectivity. These activities should be

conducted in accordance with State Comprehensive Wildlife Conservation Strategies and other fish and wildlife conservation strategies, including the National Fish Habitat Action Plan, the North American Wetlands Conservation Act, Partners in Flight plans, coastal zone management plans, regional fishery management plans, and recovery plans for threatened and endangered species.

11. The Governors, through WGA, should recommend that CEQ provide guidance to federal agencies concerning NEPA documents seeking cooperation with state agencies, other federal agencies and Indian tribes. The goal is coordinated planning in light of a changing climate, and to provide consideration for corridors and crucial habitat for wildlife, particularly for declining or imperiled native species.

12. WGA should recommend that the Secretaries of Interior, Agriculture, Commerce, Defense and Transportation, the Administrator of the EPA, and the Chair of Federal Energy Regulatory Commission (FERC) direct their agencies to adopt plans and regulatory standards and make infrastructure investments that protect wildlife corridors crucial habitats in light of a changing climate.

13. Governors should consider directing state agencies to work with state wildlife agencies and others to provide technical assistance and planning programs to help local governments manage development in ways that provide the best opportunities to protect corridors and crucial habitat needed by wildlife to remain viable in a changing climate.

14. Governors should consider a review of state laws and policies to determine if they provide adequate information to local governments about wildlife corridors and crucial habitats in light of climate change and economic balance, and Governors should necessary changes in law or policies to require that state programs and local planning consider the information provided by Recommendation 2 th their decision making processes.

15. Western Governors should encourage and support prioritized, collaborative hydrologic strategic planning and active adaptive management efforts by federal, state, and tribal water and wildlife managers, and should encourage those agencies to adopt specific response measures to address anticipated hydrologic changes within their respective hydrologic basins and watersheds of concern.

16. While awaiting results from comprehensive hydrologic climate change modeling and strategic planning efforts, Governors should consider seeking adoption of an appropriate suite of measures within their state to maximize water conservation, including some or all of the following: a) pricing structures that manage demand and encourage water reuse; b) stepped-up enforcement of state water laws requiring efficiency in water delivery and use; c) mandatory water conservation measures; d) review of basin and inter-basin water compacts to assure maximum water conservation; e) shifting storage rights to instream uses; f) establishing water banks for instream uses; g) targeting un-contracted storage for instream water uses; (h) ensuring state water laws are flexible enough to allow for

dedication of water rights to instream uses; and i) shifting crop portfolios from water intensive to less intensive water use.

17. Western Governors, with federal and tribal partners, should consider carefully examining the need, feasibility and impacts of creating additional water storage capacity in Western river basins for the benefit of fish and wildlife. Existing storage should be examined first with respect to current water management and the potential for beneficial modifications for fish and wildlife, including temperature control operations and structures at upper basin main-stem and tributary storage reservoirs to reduce elevated temperature regimes resulting from climate change that are detrimental to aquatic resources.

18. Governors should consider developing a cross-agency State Invasive Species Strategy, if one does not already exist, which is focused on prevention, early detection and effective control of invasive species that could adversely affect wildlife adaptation to climate change through modification of crucial habitats and corridors, and they should implement these Strategies in coordination with other states to achieve greater economy of scale and enhance the likelihood of success. To complement these efforts, Governors also should support adequate funding for federal invasive species efforts.

Western Governors' Association
Wildlife Corridors Initiative

Oil and Gas Working Group Report

December 2007

I. BACKGROUND

Western states are made up of a patchwork of federal, state, tribal, local government and private lands that support robust development and ecologically intact landscapes—essential assets to economic vitality and quality of life in the West. Change is occurring in the region at a pace that is difficult for decision-makers at all levels to track and accommodate. This rapid change is happening on many fronts, including unprecedented population growth and associated land-use impacts, energy development to meet growing demands and reduce dependence on foreign supplies, and new transportation infrastructure. Possible climate change poses further challenges for the region, with scientists projecting greater climate extremes, including increases in drought.
These fast-paced changes are resulting in notable landscape impacts—including habitat loss and habitat fragmentation—ultimately impacting the West's wildlife and aquatic resources.

In February 2007, The Western Governors' Association (WGA) unanimously approved policy resolution 07-01, *Protecting Wildlife Migration Corridors and Crucial Wildlife Habitat in the West.* This resolution describes the importance of wildlife corridors and crucial habitat and identifies the existing and potential conflicts between energy development and these important wildlife resources. Further, the resolution asks the Western states, in partnership with important stakeholders, to identify key wildlife corridors and crucial wildlife habitats in the West and make recommendations on needed policy options and tools for preserving those landscapes. To implement the resolution, WGA launched the *WGA Wildlife Corridors Initiative*, a multi-state and collaborative effort to coordinate stewardship of wildlife corridors and crucial habitat.

As a first step in this initiative, the *Oil and Gas Working Group (OGWG or Working Group)* was convened to develop recommendations for including wildlife values into oil and gas decision-making in areas identified as wildlife corridors and crucial habitat. The Working Group used definitions for "crucial wildlife habitat" and "wildlife corridors" approved by the initiative's Steering Committee in consultation with scientists and state fish and wildlife agencies.[1]

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[1] ***"Crucial Wildlife Habitat"*** *describes any particular range or habitat component, but describes that component which is the determining factor in a population's ability to maintain and reproduce itself at a certain level over the long term.*

"Important Wildlife Corridors" *are avenues, routes, or other areas that provide natural, relatively undisturbed connectivity on a seasonal or longer time frame to, between, or among important/crucial core habitat areas used by animal species (occasionally plant species) that require relatively large blocks of habitat and/or are wide-ranging.* ***Wildlife corridors*** *sometimes join naturally or artificially fragmented habitats and serve to maintain or increase*

State Wildlife Action Plans

State Wildlife Action Plans (Action Plans or Strategies) were developed recently by each state and approved by the United States Fish and Wildlife Service. The action plans are a useful starting point for assessing the wildlife resources in each state. These plans are an important resource for understanding some of the species and habitats in greatest need of conservation throughout the West. Each state's plan not only assesses species and habitats of particular interest but also identifies threats and actions that can lead to long-term conservation and help prevent additional listings of species as federally threatened or endangered. Although habitat types and species vary greatly throughout the West where oil and gas development occurs, the plans do identify wildlife and related habitats that are of concern to many Western states.

For example, the Montana, Wyoming, Colorado and Utah Comprehensive Wildlife Conservation Strategies list the Greater Sage Grouse and/or the Gunnison's Sage Grouse as a species in greatest need of conservation. Sage grouse are obligate residents of the sagebrush ecosystem, usually inhabiting sagebrush-grassland or juniper sagebrush-grassland communities. Sage grouse are considered an important measure of the health of the larger sage shrub-land habitat because of their sensitivity to change. Conservation of sagebrush habitats is not only crucial to Sage Grouse, but also to other species that are part of this wildlife community, such as mule deer, antelope and various nongame species.

One common thread cited as a conservation concern to sagebrush habitat in most of the strategies is oil and gas development and the potential for development to fragment remaining sagebrush habitats.

For example, the New Mexico strategy discusses oil and gas development in the following way:

> "Energy development infrastructure, including roads, tanks, equipment staging areas, compressor stations, shops, pipelines, power line corridors, associated traffic, and human activity have the potential to affect wildlife more than just the wells themselves. For example, when impact zones surrounding each well pad, facility, and road corridor begin to overlap, habitat effectiveness is reduced over a much larger contiguous area. Development at this level reduces the ability of wildlife to use the habitat. Mule deer in particular are precluded from accessing their winter ranges."

As oil and gas development expands, these Action Plans could serve as a foundation for identifying crucial habitats throughout the West that are in need of conservation.

The Intersection of Wildlife Corridors and Crucial Habitat with Oil and Gas

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*essential genetic and demographic connection of populations of one to many species, and/or maintain objective wildlife numbers by providing access to crucial (limited) habitat. Further, **wildlife corridors** are often, but not always, narrow connections that may not be fully and routinely occupied by species of interest but serve to ensure that such species are able to use disconnected tracts of habitat that serves—by themselves, or collectively—all life processes.*

Development
Care in early stages of planning oil and gas development is important to avoid damage that can take decades to overcome. The Governors' policy resolution specifically identifies the importance of crucial habitats and corridors to healthy wildlife populations and recognizes the need to mitigate the impacts of energy development on these important resources. The reason behind the Governors' focus is clear -- both energy development and wildlife are crucial to a healthy economy and high quality of life in the West. Therefore, accommodating oil and gas development, while minimizing impacts to wildlife habitat, is essential.

Healthy ecosystems and abundant wildlife are an important economic driver
Open spaces support a diversity of wildlife and fish habitat. Wildlife-associated recreation brings important economic benefits to communities throughout the West. Small communities in particular benefit from the revenue that comes with tourism, hunting and fishing, and other forms of outdoor recreation. Retail tax revenue for many small towns is provided to a large degree during the key hunting and fishing seasons. In the contiguous Western states, more than 43.6 million people participated in hunting, fishing or wildlife watching in 2006, spending almost $33.6 billion.[2] This revenue is dependent on significant, reliable wildlife populations, which in turn depend on quality habitat and corridor movement.

A 2006 Outdoor Industry Association report compiled data that demonstrates the importance of outdoor recreation. Nationwide, 45 million people go camping, 33 million people fish, 56 million people hike, and 66 million people engage in wildlife viewing. In the Rocky Mountain West, 13 percent of the population fishes, 6 percent hunt and 31 percent participate in some form of watching wildlife (*2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation*). This reflects strong support for the open space and healthy ecosystems that either directly or indirectly make these activities satisfying. The natural beauty and landscapes create a quality of life in the West that attracts new residents who bring significant talent, economic activity and jobs to the region.

Oil and Gas from the West — Important to the Nation and the Western Economy
The United States' economy substantially depends on the use of fossil fuels, such as oil and natural gas, as its main energy source to power our nation's transportation, technology and basic manufacturing needs. World events and growing demand have applied sustained pressure to increase domestic production.

In 2005, the U.S. consumed 21.9 trillion cubic feet (Tcf) of natural gas and 7.9 billion barrels of oil, with a record 9.16 million barrels per day of motor gasoline. According to the Energy Information Administration (EIA), natural gas consumption is projected to increase by 18 percent in 2030 to 26.1 Tcf per year. If left unchecked, U.S. consumption

[2] U.S. Fish & Wildlife Service. 2007. 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation, State Overview. The states included in this figure are Arizona, California, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Texas, Utah, Washington, Wyoming

of petroleum-based liquid fuels will climb to more than 26 million barrels per year in 2030. These projections could be lowered if there are concerted efforts to conserve energy, as Western Governors have advocated as part of their Clean and Diversified Energy Initiative and in their upcoming report on Transportation Fuels for the Future.

To meet this demand, energy development—especially natural gas—is growing rapidly in different areas of the West. Today, one half of the natural gas consumed in the United States comes from wells drilled in the last five years. Production of natural gas in the Rocky Mountain States has increased 69 percent since 1996, making this region the largest domestic source of natural gas production.

This growth is likely to continue because of the size of the resource in the West. It is estimated that the Intermountain Region holds 284 Tcf of technically recoverable natural gas—enough gas to provide all of America's current household energy needs for 60 years. The region also contains one-third of all U.S. gas reserves for the lower 48 states. Department of Energy forecasts show the region is poised to expand to 40 percent of the lower-48 states' onshore production by 2025.

- Sixteen of the nation's largest fields are located in the Rocky Mountains.
- Geologists speculate that as much as 400 million barrels of oil lies beneath the Bakken resource area in Montana and North Dakota.
- The San Juan Basin in Colorado and New Mexico is the nation's largest natural gas field.
- Wyoming and New Mexico rank second and third in the nation in proven natural gas reserves.

State Governments and the Economy Depend on Income from Oil and Gas

The U.S. is the world's largest energy producer, consumer and net importer. In 2006, the oil and gas industry pumped $542.1 billion into the U.S. economy, amounting to 4.2 percent of the gross domestic product. It also contributes to the economic vitality of the region.

Revenues derived from state taxes and royalties to states and counties are significant; many states and local governments rely on energy development for an important share of their revenues.

There are major benefits of oil and gas production for the region, but some of the public and private lands that have the greatest potential for natural gas production also have crucial habitat and corridors important for wildlife. Finding ways to meet the energy needs of the nation while also recognizing the importance of crucial habitat and wildlife corridors is a challenge that involves cooperation at all levels of the public and private sector.

Stakeholders

The Oil and Gas Working Group reflects many of the stakeholders that are involved in the issue. Land management decisions respecting development and habitat management can also influence practices on adjacent federal, state, tribal and private lands. The interrelationship is a driving factor behind the need to coordinate management actions

across multiple jurisdictions. Key stakeholders that need to be involved in these discussions are:

- **State governments -** State governments, through their state fish and wildlife agencies and oil and gas commissions, serve as a bridge between the public/private and local/federal dynamics of decision-making. State governments also usually have the most easily accessible data on wildlife resources. They work continually to update and improve those data, and have laid out their explicit priorities for wildlife conservation in Wildlife Action Plans. States also have the responsibility for decision-making for energy development on state and private lands.
- **Federal land management agencies -** The Bureau of Land Management (BLM) and the U.S. Forest Service (USFS) are responsible for decision-making on energy development on federal public lands. These agencies are working to ensure oil and gas resources on public land can be developed in a timely manner to meet the country's energy demands. They also are charged with analyzing, mitigating and monitoring the impacts of energy development. Additionally, the U.S. Geological Survey contributes important data on both wildlife and oil and gas potential that could assist federal agencies in managing resource development.
- **Tribes -** Energy and biological resources are contained on tribal lands, giving tribes an opportunity for substantial economic benefits from energy production on lands that may also be ecologically and culturally sensitive. Some tribes have hunting, gathering and ceremonial rights to public lands. Tribes need to be included in energy development decisions on public lands to ensure their treaty and other interests are met.
- **Local government -** Counties, municipalities and conservation districts have various authorities relevant to private and federal lands, such as law enforcement, fire protection, zoning, and water and soil quality. They play an important role as a voice of their constituents for both economic development and wildlife conservation. Counties can be particularly dependent on revenues from agriculture, recreation, hunting, fishing and oil and gas to provide services to their citizens.
- **Private land owners -** Ecosystem health and agricultural production are key to the future of the West and are the life-blood of the rural economy and culture. Private lands are part of the matrix of wildlife habitat and energy development. Landowners often are impacted by energy production yet are not always involved in the decisions that affect them. The impacts of energy production create challenges and opportunities for landowners, and they must be integral to relevant decision-making processes.
- **Industry -** Production companies and their service providers vary in size. They all share a need for timely decisions from government so they can proceed with timely development to meet financial goals and commitments. In some cases, changes in technology create options for industry to minimize impacts. The crucial aspect is a full understanding of the technological and economic viability of these technologies.
- **Sportsmen and Conservationists -** Sustained ecosystem health is a shared mission of sportsmen and conservation groups. Some conservation groups are at

the forefront of mapping and analyzing ecosystems, and sportsmen and conservationists frequently serve as partners to industry and all levels of governments in their efforts to conserve habitat and mitigate impacts.

II. ISSUES AND RECOMMENDATIONS

(organized by theme rather than priority)

Introduction

This report makes specific recommendations for integrating protection of crucial habitat and corridors into oil and gas development in the West. The Oil and Gas Working Group identified five major areas for discussion and policy recommendations:

*1. The opportunities and needs for improvement of how the **federal-leasing and well-permitting processes** account for wildlife corridors and crucial habitat.*

Development of both new and existing oil and gas leases can create conflicts with other resource values and stakeholder preferences. Because NEPA is intended to disclose information, not engage stakeholders in advanced planning, it is not the right regulatory process to address the special needs of crucial habitat and wildlife corridors. The imprecise regulatory process can lead to delays and denials of proposed development that can adversely affect mineral owners. Conversely, it also can result in sensitive areas being leased without the benefit of pre-planning. Historically, proposed development plans have not been coordinated across the landscape, considering all land status. Land use plans are difficult to modify in a timely manner to reflect new data that can create a more informed decision-making environment. Also, in crucial habitat and wildlife corridors, the BLM is required to balance established lease rights with other resource values.

*2. Using **monitoring** of impacts to wildlife as an essential input into decisions*

Monitoring helps achieve management objectives. Inadequate monitoring leaves decision-makers uninformed of whether they have achieved their desired objectives and can leave parties with few informed choices for improving actions. Poor monitoring can have serious consequences for both wildlife and development. Without appropriate monitoring, significant wildlife resources could go unnoticed. In the most extreme situation, significant impacts could result in a listing as a threatened or endangered species or prevent the recovery and delisting of a protected species. Also, protocols and collection practices vary. This prevents data from being the foundation for broad understanding and can lead to unsatisfactory policy outcomes.

*3. Improving the **capacity** (or staff and financial resources) of the state and federal governments to be able to plan for and address the impacts of oil and gas production*

Increased oil and gas activities across the West have strained the capacity of fish and wildlife professionals to manage and conserve all crucial habitat and wildlife corridors, particularly on private land since their jurisdiction is limited. On public lands, the lack of staff to manage wildlife can lead to slower permit processing and compliance reviews and inadvertently brings inconsistent approaches to fish and wildlife mitigation and

restoration. This means an uncertain environment for industry and missed opportunities to conserve fish and wildlife.

*4. Utilizing **incentives** as tools to promote effective actions from industry and private landowners*
In some cases, incentives can be used in place of mandates and requirements to encourage actions by industry and private landowners that strengthen habitat and corridors, promote early planning for wildlife values, and promote better mitigation and remediation of areas being developed. Creation of incentives can involve stakeholders in a way that accounts for their needs—driving solutions that are more sustainable.

*5. Maximizing the use of **tools** that help inform decision-making*
Making informed decisions about impacts in and around crucial habitat and wildlife corridors requires new tools. Decision-makers at all levels of the government and the private sector can benefit from geospatial tools that can identify areas of potential conflict between wildlife needs and oil and gas potential. While very useful, these Geographic Information System (GIS) maps are surprisingly hard to produce because of inconsistent data protocols and gaps in data.

1. FEDERAL OIL & GAS LEASING

The two primary agencies administering Western public lands are the Bureau of Land Management (BLM) and the U.S. Forest Service (USFS). The leasing process for federal onshore oil and gas resources begins with a landscape-level inventory and evaluation of lands within an administrative unit. This analysis identifies which federal oil and gas resources will be available for leasing, and what stipulations, if any, are needed to protect resources if the lands are eventually leased. These determinations involve a careful balancing of federal land managers' broad multiple-use objectives under the “Federal Lands Policy and Management Act” (FLPMA).

New Leases
Normally, leasing analysis is contained in the applicable land-use plan, which can be a Resource Management Plan (RMP) for BLM, or a Land and Resource Management Plan (LRMP) or Forest Plan in the case of the Forest Service. Where existing planning documents do not address leasing availability or appropriate lease stipulations, land managers may need to prepare supplemental documents. Documentation of the leasing analysis is subject to periodic revision and may need to be supplemented or amended to reflect new information or changed conditions. Developing plans and plan amendments can be long processes. Making some planning decisions more efficient through abbreviated processes may allow more information to be incorporated earlier into plans and benefit oil and gas operators through faster decisions.

The leasing determination and associated balancing of uses is a federal action that often triggers (NEPA) requirements. Once an area has been classified as available for leasing, lands may be leased as interest and market conditions warrant. It is important to note that “No Surface Occupancy” (NSO) stipulations that preclude surface activity, but allow the

extraction of minerals, must be attached to a lease prior to its sale. Otherwise, the stipulation's potential benefits in protecting crucial wildlife areas and migration corridors are forfeited. Once an area is leased and a lessee decides to pursue development, an "Application for a Permit to Drill" (APD) is filed, which triggers additional NEPA review. Finally, if exploratory efforts result in an economically viable discovery, the lessee may propose full-field development, which also may be subject to the requirements of NEPA.

Current federal processes, particularly land-use planning and associated NEPA analysis, use currently available information to assess the needs of crucial wildlife habitat and corridors.

A patchwork of existing lease ownership of surface lands (including tribal ownership) creates a complex relationship that must be addressed to protect crucial wildlife habitat and corridors. This patchwork of federal, state, tribal and private land ownership common to the Western United States can complicate both wildlife management and oil and gas development. Improving communication and coordination among adjacent land-management agencies should improve management consistency, benefiting wildlife managers, oil and gas operators, landowners and users. Governors are uniquely positioned to lead efforts that facilitate early understanding of crucial habitat and wildlife corridors in the specific instance and special considerations *before* leases are considered.

Public participation in land-use planning and the associated NEPA process is an integral component of federal land management. Many nongovernmental interests are highly informed about important values that will be impacted by decisions. Governors can work with federal land managers as cooperating agencies and can help facilitate earlier and more effective communication among interested parties, thereby acting as an effective bridge between interests. The earlier such interests are brought together, the easier it is to develop constructive solutions to wildlife issues. While such collaboration requires a significant early investment in time, it can pay dividends later on in terms of reduced controversy, litigation, and delays.

Issues:

#1: Understanding of the special needs of crucial habitat and wildlife corridors should be established before leasing. This includes clear identification of crucial wildlife habitat and wildlife corridors that might need special consideration prior to new oil and gas leasing and development decisions.

A. ***Recommendation:*** *To minimize positional and reactive communication, land managers should emphasize pre-planning communication and the sharing of information. Best available data and effective consultation processes need to be available prior to leasing for key decision-makers.*
B. ***Recommendation:*** *Western Governors should direct their respective state fish and wildlife agencies, in coordination with federal land-use agencies, to identify*

wildlife corridors and crucial habitat and develop the collaborative conservation strategies necessary to sustain these sensitive areas through a transparent, public process taking into account the preferences of private landowners as necessary.

C. ***Recommendation:*** *Western Governors should emphasize to the federal agencies the importance of mitigation sequencing (avoid, then minimize, and only then compensate off-site for impacts) in developing leases in crucial habitat and wildlife corridors. Governors also should encourage their own wildlife agencies to emphasize mitigation sequencing as cooperating agencies in federal processes.*
D. ***Recommendation:*** *Western Governors should request the Secretaries of the Interior and Agriculture to assess, and implement where appropriate, a policy of site-specific NEPA analysis before offering new federal lease parcels in the areas that the states deem to be wildlife corridors and crucial habitats.*
E. ***Recommendation:*** *Western Governors should request the Secretaries of Interior and Agriculture develop and implement a mandatory, well-defined and inclusive consultation process with the states before new parcels are offered for lease to ensure that leasing does not occur in either the identified wildlife corridors or crucial habitats or that appropriate protective stipulations, including NSO, are applied.*
F. ***Recommendation:*** *Western Governors should request the BLM and Forest Service to engage affected landowners in the process as early as possible with a transparent means for their input.*
G. ***Recommendation:*** *Western Governors should direct their state wildlife agencies to identify geographic areas where there is a heightened concern because of conflicts between leasing and/or development and crucial wildlife habitat or corridors. Where state wildlife agencies and federal land managers do not have adequate information about these areas to develop stipulations that adequately avoid or mitigate impacts to crucial wildlife habitat or corridors, individual Western Governors may want to consider requesting short-term postponement of leasing decisions affecting these areas while the requisite information is obtained.*

Existing Leases

Higher demand and price environments coupled with improvements in technology have allowed the oil and gas industry to get production from reservoirs that were previously infeasible or uneconomic. Some of these areas are within existing leases and have important wildlife corridors or crucial habitats.

Many mature fields are experiencing down-spacing of wells to more efficiently recover remaining hydrocarbons. In many instances, there is a corresponding increase in infrastructure required to drill, transport and process the hydrocarbons in a more densely drilled reservoir. Directional drilling and multiple-completion technology can lessen habitat fragmentation impacts to wildlife, but in some cases there are technical or economic limitations to these technologies.

The uncertainty of access to existing federal leases can affect business decisions, and may accelerate development on adjacent non-federal leases with equally important wildlife values.

Expiring, undeveloped leases that occur within identified crucial habitat and wildlife corridors offer the federal agencies an opportunity to evaluate future leasing availability of these parcels in light of new information. To adequately protect wildlife resources, accurate resource data must be shared across administrative boundaries, and leasing decisions should be considered in light of new information concerning crucial habitat and wildlife corridors.

#2: Where there are existing leases and resource management plans, there currently is little opportunity to bring new understanding to aging land-use decisions. In addition, there are limited opportunities to modify federal oil and gas leasing and development decisions to address the needs of crucial wildlife habitat and corridors.

- ***A. Recommendation*****:** *Western Governors should encourage a collaborative effort to define and map migration corridors and crucial habitats involving land managers from the private, state, tribal and federal sector. Interstate consideration should be given to this effort.*
- ***B. Recommendation:*** *Western Governors should direct their respective state fish and wildlife agencies to conduct annual meetings for state and federal agencies to do crucial wildlife-habitat and corridor map-sharing. These annual meetings should produce information regarding identified crucial habitats and wildlife corridors and review whether existing stipulations are adequate. If current stipulations are not adequate, the annual meetings should work to outline appropriate stipulations or a process to determine what stipulations are appropriate. These wildlife corridor/crucial habitat maps and other products should be provided to the federal land-management agencies early in the planning process for LUP revisions and for any site-specific field plans.*
- ***C. Recommendation****: To build on the improved crucial habitat and migration corridor information from the annual meetings described above in Recommendation 2.B., the Western Governors recommend that the BLM and USFS formally assess and communicate to the appropriate Western Governor how they will utilize this new information and what, if any, changes are needed to current land use plans to ensure adequate protection of newly mapped corridors or crucial habitat. If LUP changes (revisions or amendments) are needed, these should be handled through existing agency processes to determine the level of NEPA documentation and public involvement necessary.*
- ***D. Recommendation:*** *Once wildlife corridors and crucial habitats are mapped, as appropriate, the WGA recommends the immediate analysis of ongoing oil and gas development to identify and prioritize areas of overlap with imminent conflict.*
- ***E. Recommendation:*** *Western Governors should direct state oil and gas conservation commissions (as appropriate), state land offices, state environmental regulatory agencies, and state fish and wildlife agencies to*

jointly lead a collaborative effort that includes private landowners, federal land managers, tribal governments, and land users to accomplish two goals: identify the reasonable foreseeable development in these priority areas, and secondly, agree on appropriate avoidance, minimization, on-site and off-site compensation and monitoring strategies to be implemented across land status and at various scales, but only with the concurrence of the affected private landowners and the federal land-use agency.

F. ***Recommendation:*** *Western Governors should consult with the federal land-management agencies to:*

- *Amend federal LUPs to incorporate the recommendations of these collaborative groups for existing leases and new leasing in priority areas.*
- *Review stipulations and mitigation plans during LUP revisions for areas of less intensive development, taking into account any new scientific-based information.*

G. ***Recommendation:*** *Western Governors should convene a task force to research options for federal lease trades and/or buybacks as a tool for oil and gas companies to consider where existing leases are identified in crucial habitat and wildlife corridors. It is recommended that this task force research, but not be limited to, the following:*

- *identify the instances when leases and buy-backs are beneficial tools;*
- *identify the barriers (legal and otherwise) that exist regarding trades and/or buybacks of federal leases;*
- *develop mechanisms for assessing the site-specific, financial or other benefits of using trades and buy-backs;*
- *identify ways to determine the fair-market value of the mineral leases subject to trades;*
- *make recommendations for establishing a mechanism for determining potential losses of both federal and state revenue resulting from the federal lease buyback;*
- *make recommendations for establishing a mechanism for determining potential gains or losses of revenue to the state from the result of a federal lease trade;*
- *research options for potential sources of funding from which buybacks would be executed.*

H. ***Recommendation:*** *Western Governors should work with the Secretaries of Interior and Agriculture to continue the practice of ensuring the timely preparation of a field development NEPA analysis consistent with existing laws and regulation.*

I. ***Recommendation:*** *Western Governors should request that, as part of the NEPA process, federal land-management agencies explicitly analyze the impacts to wildlife corridors and crucial habitats that are likely to result from oil and gas leasing or oil and gas development. Through these NEPA processes, agencies should specify how they will avoid or minimize impacts to wildlife corridors and crucial habitat.*

J. ***Recommendation:*** *In order to adequately compensate for impacts that cannot be avoided or minimized, Western Governors should direct their state fish and game agencies to take the lead to develop criteria and guidance for on- and off-site, compensatory mitigation, including when and where it should be applied or not applied.*

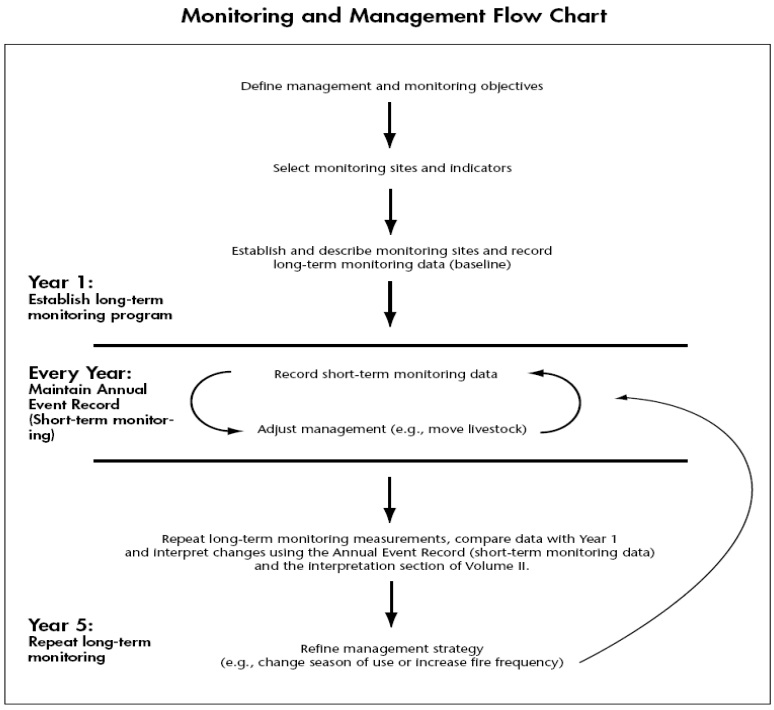
K. ***Recommendation:*** *Western Governors should identify or support conservation incentives that encourage companies not to develop in areas identified as crucial habitat or wildlife corridors. This may include financial or operational incentives.*

2. MONITORING

Monitoring can be defined as "the orderly collection, analysis and interpretation of quantitative data to evaluate progress in meeting management objectives." The reason to monitor is to determine whether management actions are achieving their objectives. If not, the actions need to be adapted and monitored again for effectiveness. Monitoring should enable the determination of whether stipulations and conditions of approval are working, and then specifically to gauge how an activity (e.g., drilling, construction, site reclamation, etc.) is impacting wildlife. If specific impacts are not understood, they cannot be mitigated.

Often, monitoring is viewed as a "tail-end chore" offering few benefits. This mentality must change to recognize the importance of monitoring in improving efficiency and facilitating better-informed decisions. Failure to monitor impacts of development could result in land use management that decreases future oil or natural gas development activity. Without monitoring, wildlife resources could be impacted to a level that would prevent their recovery or result in a listing as a threatened or endangered species or costly mitigation measures being continued unnecessarily.

Long-term monitoring that is designed to document landscape-scale changes in the overall condition of the land and the wildlife populations includes soil structure, plant cover and wildlife response. Short-term monitoring allows early course correction, if needed. Often, it proves critical to interpreting exactly what mechanism prevented a longer-term action from working.



Monitoring Manual for Grassland, Shrubland, and Savanna Ecosystems: Volumes I & II, Jeffrey E. Herrick; Justin W. Van Zee; Kris M. Havstad; Laura M. Burkett; Walter G. Whitford, 2005 , University of Arizona Press

A quality monitoring program is directly related to the development of a quality project plan.
The monitoring analysis needs to result in adaptive management strategies that “run both ways,” yielding better stipulations and protection. On the other hand, it should also allow more revised stipulations or the elimination of unnecessary stipulations.

Collaboration among agencies (including local governments and conservation districts) and industry on monitoring design should be a consideration. Determining and establishing what to monitor should involve both management agencies and local governments to set policy and direction for the management team. This participation increases confidence in the participants of the monitoring results. Many of the federal land-management plans are retaining cooperators as an oversight group for implementation. This is the most effective group for oversight because of their involvement in the project development and their stake in the outcome. Because of their investment in the management outcomes and the monitoring processes they are intent on having the plans succeed.

Project developers should be directly involved in monitoring with appropriate agency oversight. They should develop an assessment on whether the project is accomplishing wildlife management goals. If the data acquired by project developers follows established protocols, the information should be used in assessing and developing modifications in land use management. Cooperation and open discussion are critical. Once the initial adaptive management is implemented, continued monitoring is the way to ensure it is working. If not it is the way to allow quick and appropriate adjustments.

Issues:

#1. Lack of adequate institutional support and funding.

A. Recommendation: *Western Governors should investigate potential changes in federal or state policy through legislation or other means to divert general federal and state onshore oil and gas revenues to support monitoring activities by federal and state agencies.*

B. Recommendation: *Western Governors should support a policy to include language throughout the NEPA process, including records of decision that identify the parties responsible for monitoring.*

#2. Lack of consistent, universally accepted monitoring protocols that can be used by all partners for monitoring activities.

A. Recommendation: *Western Governors should convene an interdisciplinary technical committee with the charge to develop consistent, widely endorsed monitoring protocols that can be used by all partners for monitoring activities. These protocols must include three components: baseline, short-term, and long- term inventories.*

#3. Lack of effective storage, management, and sharing of monitoring data across jurisdictions to facilitate adequate project analysis, landscape analysis and adaptive management.

A. Recommendation: *Western Governors should support efforts to develop a monitoring and project data storage and management database that could be utilized by multiple jurisdictions (such as being conducted by WLCI and JIO).*

3. BONDING

Closely linked with monitoring is the subject of bonding, or assuring financial responsibility for reclaiming development sites. To ensure adequate reclamation, government agencies need assurances that sufficient financial resources are available for reclamation.

Issues:

#1: Release of bonds can occur before adequate reclamation has been achieved.

A. Recommendation: *Western Governors should convene a task force to determine if existing rules, regulations and policies, including compliance and enforcement, are adequate and effective in preventing the release of acreages from bonds prior to achieving sufficient reclamation. The task force should also determine if existing rules, regulations and policies dictating bond amounts are adequate and recommend needed changes.*

4. INCENTIVES

When oil and gas development is being contemplated or is occurring, opportunities may exist at the landscape scale to provide greater protection for wildlife corridors and crucial habitat than is required by laws and regulation. Furthermore, actions taken on federal and state lands could increase impacts to private lands and water. Consequently, incentives are needed to provide mitigation opportunities – financial or otherwise – that can be applied toward the voluntary protection of crucial habitat or wildlife corridors. To inspire more effective, timely and coordinated consideration of wildlife values, incentives should be provided to key parties, particularly private landowners, grazing allotment owners, oil and gas companies and conservation groups. Incentives should also be considered when "lessons learned" in habitat restoration or improvements are implemented.

States should develop and apply appropriate incentives to provide greater protection of wildlife corridors and crucial habitat than is required by law and regulations. Examples of incentives include:

- *Create certainty for the oil and gas industry. Certainty for the oil and gas industry means that if they participate in projects that effectively relieve pressure on crucial habitat and wildlife corridors, the mineral lessee will be allowed to access the lease in a timely and predictable manne.;*
- *Create incentives, on a case-by-case basis, for oil and gas companies to voluntarily implement habitat enhancement projects in crucial wildlife and migration corridors beyond the current federal requirements.*
- *Provide additional ability for joint planning and negotiation before energy production commences;*
- *Provide greater development flexibility to agencies and mineral developers who are willing to voluntarily offer financial incentives to landowners and permittees for implementing stewardship practices that benefit wildlife habitat;*
- *Recognize that actions taken on federal and state lands could increase impacts to private lands and water, develop incentives – financial or otherwise – for private landowners to take action to protect crucial habitat or wildlife corridors or to provide other mitigation opportunities on their private lands.*

5. TOOLS

In order to address cumulative and individual impacts of energy development, tools must be identified that help accomplish short- and long-term goals in wildlife, fisheries and habitat protection. The implementation of geospatial formatting for regionally sensitive habitat areas is one tool to be considered. Using this format, tools can include a variety of maps, spatial analysis, remote sensing technologies, and sensitivity models, as well as examining successful and unsuccessful examples of projects that utilized these tools to help facilitate management decisions. These tools help to visualize the landscape-level cumulative effects of surface disturbance and to identify critical information gaps that require additional surveys, models or research.

The lack of a regionally comprehensive and coordinated geospatial data overlay system of critical wildlife and fisheries habitats and corridors, as well as oil and gas

development, hampers state and federal agency management decisions. Variations from state to state, among federal agencies, and between federal and state agencies add to this challenge. There is an insufficient current view (and no mechanism to maintain a geospatial picture) of the overlapping and often competing needs of oil and gas exploration and development; crucial habitats and migration corridors; and the spatial distribution of private and public lands.

A variety of federal, state, academic and non-governmental organizations are developing geospatial products that relate to energy and wildlife. At this time, it is a challenge for agencies and industry to collate or compare these products. There is also a need to identify new technologies and approaches to help understand the conflicting resource needs and the cumulative impacts of natural and anthropogenic changes.

Issues:

#1. Lack of detailed data that is compatible across jurisdictions limits the utility of maps and other geospatial tools for analysis in the short term.

- ***A. Recommendation:*** *Maps that utilize both USGS data on oil and gas potential and state wildlife data can be compiled quickly if needed. This can also be used as a base for future efforts. Western Governors should use such maps (if more refined data are not available) as a first step in identifying areas of potential conflict and, therefore, those areas that warrant greater attention.*
- ***B. Recommendation:*** *Western Governors should direct the Science Committee of WGA's Wildlife Corridors Initiative to develop protocols that will facilitate the comparison of map products in terms of quality of data, resolution and scale. The Science Committee should identify the critical map layers needed by the Governors to make informed management decisions. This will allow compilation on a landscape scale so that states can make informed decisions on land use.*

#2. Incompatibility of data formats and protocols has prevented the production of universally accepted maps that reflect the latest understanding of corridor and habitat needs within the region. Variation occurs between federal agencies, state agencies, tribal governments, universities and conservation groups both within and among the states.

- ***A. Recommendation****: Western Governors should appoint a single coordinating entity within each state to guide data collection and analysis using a single set of protocols. This entity should work with federal and state agencies, industry and non-governmental organizations to collate landscape-scale maps that identify crucial habitats and migration corridors; on-going and projected energy development; key energy and mineral reserves; and land ownership. In this manner, the data layers can be used by the Governors to determine particularly sensitive habitats for protection or, conversely, those areas that are less vulnerable to development impacts.*
- ***B. Recommendation:*** *Lead entities from each state should convene periodically to develop a regionally integrated data regime and increasingly refined set of maps that overlay oil and gas potential (or activity) with crucial habitat and wildlife*

corridor information. Periodic updating should be required to ensure that continued monitoring efforts inform future decision-making.

C. ***Recommendation:*** *Cooperation from oil and gas companies in specific high-priority areas should be fostered in order to integrate information into an oil and gas overlay without compromising proprietary data.*

#3 **The Bureau of Land Management serves as the primary assembler of data on its lands, but it is not funded adequately to develop a comprehensive database and maintain it on a regular basis.**

A. ***Recommendation***: *Western Governors should request the Secretary of Interior make data monitoring and sharing a higher priority of BLM field and pilot offices.*

B. ***Recommendation:*** *Western Governors should work with the Secretary of the Interior to ensure that BLM offices have sufficient GIS resources, including staffing, to provide the acquired map layers in a usable format and on a timely basis. These map layers should be integrated into the resource management planning system and be used in decision-making. BLM data also should be made available to the companies, state governments and the public.*

C. ***Recommendation:*** *Western Governors should work with the Secretaries of the Interior and Agriculture to implement the Energy Policy Act of 2005 by establishing a joint geographic information mapping system that tracks surface resources across landscapes.*

#4. A lack of demonstrations where success and failure are analyzed has meant that valuable learning is not necessarily shared within and among the states, the BLM and industry.

A. ***Recommendation:*** *Western Governors should initiate a process (either as part of the Wildlife Corridors Initiative or afterwards) to analyze projects that have utilized geospatial and other tools, and provide a discussion of new approaches and tools that could be used.*

6. CAPACITY

Building capacity for producer assistance, stakeholder awareness and wildlife protection.

Limited state, federal, tribal and local resources are making it more difficult to regulate and oversee increased oil and gas development activities across the West and determine if the impacts are occurring on wildlife corridors and crucial habitats. This results in slower permit processing and compliance reviews and encourages an inconsistent approach to fish and wildlife mitigation and restoration that can be confusing to industry and less effective for fish and wildlife protection. Increasing agency staffing and resources will promote more expeditious, effective and broadly accepted outcomes by allowing agencies to perform more thorough planning and reviews.

Issues:

#1 – Coordination, communications and awareness.
Conflicts between development and wildlife may be diminished through more inclusive, consistent and timely coordination, communications and stakeholder awareness. Greater capacity is needed among industry, state, federal, tribal and local agencies, and private interests to facilitate improved coordination, communications and awareness.

A. ***Recommendation:*** *Western Governors should convene regular forums that assess the coordination and communication relevant to oil and gas development that includes appropriate representatives from industry, state and federal regulatory agencies, local governments, tribes, and private interests, including landowners, conservation organizations, sportsmen groups and agriculture.*
B. ***Recommendation:*** *Western Governors should encourage the federal and state leasing authorities to develop improved and consistent public notifications; increase public access to information on wildlife corridors and crucial habitats; and deploy better communication tools, such as Web sites, newsletters and other publications.*
C. ***Recommendation:*** *Western Governors should encourage relevant state, local and non-governmental stakeholders to gain a better understanding of the NEPA process through training that focuses on linking planning and NEPA.*

#2 – Increased financial resources.
There is a need for additional financial resources for federal, state, local and tribal agencies to increase personnel and operational budgets to better engage in environmental planning and reviews, leasing processes, compliance and enforcement, as well as fish and wildlife research, monitoring and restoration activities.

A. ***Recommendation:*** *Governors should request increases in federal funding for federal agencies that administer mineral leasing permits and manage fish and wildlife resources, and agencies responsible for compliance and enforcement.*
B. ***Recommendation:*** *Governors should promote creation of federal or state trusts available to fish and wildlife agencies in order to ensure broad scale fish and wildlife restoration and protection and help ameliorate the long-term and cumulative impacts of energy development on fish and wildlife populations and habitats across the West.*

#3 – Monitoring and research.
There is a need to increase capacity to produce and disseminate reliable biological information, including monitoring, research and mapping related to fish and wildlife crucial habitats and corridors as they relate to oil and gas development.

A. ***Recommendation:*** *Governors should seek increased state and federal funding to the United States Geological Survey (USGS), state agencies and universities to conduct coordinated research that measures the effects of oil and gas production on wildlife corridors and crucial habitats.*

B. ***Recommendation:*** *Develop increased capacity with new resources to monitor, analyze and disseminate reliable biological information as identified in Section III-Monitoring.*
C. ***Recommendation:*** *Each state should assure that adequate resources are made available for state-wide corridor identification, mapping and prioritization and to assure they are developed consistently across state boundaries in the West.*

#4 – Development and retention of expertise.
There is a need to address the increasing attrition of fish and wildlife professionals with knowledge and experience in oil and gas planning, leasing, development and mitigation.

A. ***Recommendation:*** *Western Governors should encourage the development of workshops for professionals, state university curricula for students and other educational opportunities that provides information about the interrelationships between oil and gas development and fish and wildlife resources to develop a broader and more educated workforce.*
B. ***Recommendation:*** *Western Governors should work with the Association of Fish and Wildlife, Agencies (AFWA), The Wildlife Society and the American Fisheries Society to create an oil and gas management certification for fish and wildlife professionals. The certification would help assure recognition and acceptance of their fish and wildlife experience across all sectors of employment, including government, industry and academia.*

WGA Wildlife Corridors Initiative Report

APPENDIX—Science Committee

A.1 Additional Clarification of Crucial Habitat and Important Wildlife Corridors

Wildlife corridors are lands that support seasonal migration, recolonization after local extirpation, demographic stability, gene flow, and range shift in response to climate change. Corridors can include:

1. Connections that may not be fully and routinely occupied by species of interest but serve to ensure that such species are able to use disconnected tracts of habitat, and,
2. Habitat that serves as permanently occupied stepping-stones to facilitate multi-generational movement between larger habitat areas.

We operationally defined crucial habitat as including (a) the main population centers (as defined by each State) or the most limited seasonal range that determines how many animals can be sustained of the species; (b) areas important for biodiversity or groups/guilds of species in each State; (c) water bodies important to wildlife species; and (d) priority habitats identified in the State Wildlife Action Plans, the State Natural Heritage Program, or Ecoregional Assessments led by The Nature Conservancy. We operationally defined important wildlife corridors as significant seasonal migration paths and other areas the State recognizes as important for genetic and demographic connectivity.

A.2 Economic Benefits of Wildlife

The following figures for annual expenditures by the public on fishing, hunting, and wildlife watching are from the 2006 National Survey of Fishing Hunting and Wildlife Associated Recreation which is published by the U.S. Fish and Wildlife Service every five years. Agency budget figures were compiled from a variety of sources.

	TOTAL FISHING HUNTING AND WILDLIFE WATCHING EXPENDITURES	STATE FISH AND WILDLIFE AGENCY ANNUAL BUDGET	NET BENEFIT FROM FISHING HUNTING AND WILDLIFE WATCHING	PERCENT RETURN ON INVESTMENT
Alaska	$ 1,255,020,000	$ 172,855,100	$ 1,082,164,900	626
Arizona	$ 2,275,589,000	$ 92,601,600	$ 2,182,987,400	2,357
California	$ 7,975,145,000	$ 447,025,000	$ 7,528,120,000	1,684
Colorado	$ 2,972,516,000	$ 80,823,555	$ 2,891,692,445	3,578
Hawaii	$ 373,777,000	$ 103,131,255	$ 270,645,745	262
Idaho	$ 921,984,000	$ 77,150,600	$ 844,833,400	1,095
Kansas	$ 838,316,000	$ 59,564,719	$ 778,751,281	1,307
Montana	$ 1,129,300,000	$ 86,182,417	$ 1,043,117,583	1,210

	TOTAL FISHING HUNTING AND WILDLIFE WATCHING EXPENDITURES	STATE FISH AND WILDLIFE AGENCY ANNUAL BUDGET	NET BENEFIT FROM FISHING HUNTING AND WILDLIFE WATCHING	PERCENT RETURN ON INVESTMENT
Nebraska	$ 639,981,000	$ 69,468,766	$ 570,512,234	821
Nevada	$ 916,183,000	$ 83,840,672	$ 832,342,328	993
New Mexico	$ 822,115,000	$ 36,108,500	$ 786,006,500	2,177
North Dakota	$ 269,151,000	$ 27,445,556	$ 241,705,445	881
Oklahoma	$ 1,424,671,000	$ 46,453,567	$ 1,378,217,433	2,967
Oregon	$ 1,995,580,000	$ 127,200,000	$ 1,868,380,000	1,469
South Dakota	$ 549,770,000	$ 65,627,775	$ 484,142,225	738
Texas	$ 9,924,444,000	$ 371,305,937	$ 9,553,138,063	2,573
Utah	$ 1,288,534,000	$ 75,901,446	$ 1,212,632,554	1,598
Washington	$ 3,055,034,000	$ 154,950,396	$ 2,900,083,605	1,872
Wyoming	$ 1,078,978,000	$ 60,929,862	$ 1,018,048,138	1,671
TOTALS	**$ 39,706,088,000**	**$ 2,238,566,722**	**$ 37,467,521,278**	

A.3 Protocols for Information Delivery to Support the WGA Wildlife Corridors Initiative

The following set of protocols were sent to each State Fish and Wildlife Agency, NatureServe and the State natural heritage programs to request data sets for evaluation by the Science Committee:

This effort has a near-term objective and a long-term goal. The near-term objective is to produce a preliminary information base and associated mapping capability to illustrate current knowledge and mapping of crucial habitats and important corridors on the landscape of the 19 western states of the U.S., including Alaska and Hawaii. The long-term goal is to describe a process by which this type of information can be consistently compiled and maintained in an enduring, dynamic information system to support landscape-level analysis of how land uses intersect with significant wildlife and habitat features.

For the contiguous states, the intent is for the information and related mapping to be relatively seamless and indicative of ecological context. For all states, it is intended that the analysis area be buffered sufficiently to illustrate important ecological connectivity with surrounding area (other state or international). The products of all efforts are intended to be informative in ready identification of especially sensitive areas that warrant further review and evaluation with respect to the full array of prospective land uses. As such, resultant mapping will illustrate areas for consideration, not areas for automatic prescriptive or prohibitive controls. Specific treatments of any land area will be determined through the further resource evaluation that is stimulated by the distinct intersection of a land use or uses with the wildlife and habitat resources identified. Ultimately, the information, analytical capabilities, and maps are expected to refine the landscape illustrations and the resultant specificity of planning perspectives.

Near-Term Protocol

During the time frame of November 2007-June 2008, a western states information base will be compiled and illustrated that displays the current state of our knowledge of crucial wildlife habitat and important wildlife corridors. This effort will be based on state-by-state judgments of what areas of the landscape qualify within the scope of definitions above.

- Each state fish and wildlife agency, in conjunction with pertinent cooperators, will perform the necessary data compilations and/or analyses to prepare and deliver the standard information sets, in standard form, requested in this protocol. This includes compiling and integrating relevant data sets from the federal government, conservation groups, and academia. WGA recognizes that not all of the data requested will be available from all of the states. Indeed, being able to identify gaps in data is a crucial aspect of the Science Committee's work, in order to develop recommendations for filling gaps and ultimately building the mapping tools that we envision.
- All submitted information will be compiled by WGA with the assistance of ESRI, displayed for Science Committee evaluation, and evaluated to identify data gaps that could be feasibly addressed with individual state agency staff. This work will occur between November 2007 and May 2008. In June, the maps will be presented to the Governors along with recommendations for improving the maps and for filling data gaps. After the June Governors' meeting, WGA will begin implementation of the recommendations for improving the maps and filling data gaps.
- All 19 states in the WGA will be involved in compiling information by these protocols. However, for interim example products, emphasis will be placed on using the area encompassing Montana, Wyoming, Colorado, New Mexico, and Utah.

Each state wildlife agency is requested to meet the following protocols and deadlines:

- By November 28, each state is asked to provide WGA a point person for contact and data compilation
- By December, 20, 2007, pilot states of CO, NM, UT, WY, & MT should prepare and submit the information sets described in Attachment 1 to this protocol
- By January, 21, 2008, all other states should submit those information sets with applicable Federal Geographic Data Committee (FGDC)-compliant metadata, in a format described below
- All data should be submitted to the ESRI Contact, Heather Paskevic, hpaskevic@esri.com, 303-449-7779 x8282, via FTP, e-mail attachment, or digital media
- Respond to any queries from ESRI contact during January – February 2008 to clarify information submitted and fill identified data gaps as possible
- Provide comment on draft west-wide information illustrations during March – April 2008 in preparation for finalizing the final products of the near-term protocol

Requested Fields for short-term analysis (due by December 20th, 2007)

For all data, provide field definitions and metadata. For spatial data, it is critical to provide spatial projection. See details related to format of data under 'Form' section of document below.

Crucial Habitat

1. Provide information set for perennial and sensitive ephemeral water bodies meeting crucial habitat definition. (Figure 3.b)

2. Provide information set for vegetation communities that are conservation priorities identified in Comprehensive Wildlife Conservation Strategy for the state. (Figure A.1)
3. Provide information set of crucial habitat areas identified in Comprehensive Wildlife Conservation Strategy for the state (e.g., areas identified as high priority locations to support one or more species of interest). (Figure 3.a)
4. Provide information set of crucial habitat areas identified in The Nature Conservancy Ecoregional Assessments for the state (e.g., 'portfolio' areas of high significance identified to efficiently support biodiversity within each ecoregion). (Figure 6)
5. Provide information set of crucial habitat areas identified as "potential conservation areas" identified through statewide inventories of the Natural Heritage programs.
6. Provide individual information set for crucial habitat tracts for each of the following pilot list of species that occur in your state:
    - Elk (Figure A.2)
    - Mule Deer (Black-tailed Deer may be shown as separate information set) (Figure A.3)
    - Bighorn Sheep (Rocky Mountain and Desert subspecies may be separate information sets) (Figure A.4)
    - Black Bear (Figure A.5)
    - Mountain Lion (Figure A.6)
    - Sage Grouse (Figure A.7)
    - Pronghorn (Figure A.8)
    - Marmots
    - Burrowing owls (Figure A.9)
    - Leopard frogs (Figure A.10)
    - Black and white-tailed prairie dogs (Figure A.11)
    - Long-billed curlew (Figure A.12)

Important Wildlife Corridors

Provide information set of any tracts meeting the "important wildlife corridors" definition. The vector or shape file for each important wildlife corridor will have at least two attributes, namely Type and Priority Level. The three Corridor Types are

1. Seasonal Migration Corridor for mammals (such as seasonally migratory elk, mule deer, or pronghorn). These should be depicted as polygons, as available including attribute on months of usage.
2. Generalized linkage areas for genetic and demographic connection for multiple species between mapped crucial habitats. This reflects a situation in which the state has identified general areas where connectivity between crucial habitats is needed, but lacks a detailed analysis identifying the exact shape of the area to be conserved as a wildlife corridor. Each such wildlife corridor should be mapped as a straight-edged polygon that includes the area within which future analysis will identify a specific corridor. The WGA policy workgroups may propose future analyses (corridor designs) as an appropriate mitigation for certain types of projects within Generalized Corridors.
3. Specific Corridor for genetic and demographic connection for multiple species between mapped crucial habitats. This reflects situations in which the state has a detailed corridor design identifying specific areas predicted to facilitate gene flow and movement of focal

species. Each such wildlife corridor should be mapped as a polygon that may include multiple strands to serve various focal species. Some states may not have any Specific Corridors.

Form of Data Submission

- Provide all information sets above in a projected coordinate space.
- Submit all information sets above as shapefiles (.shp) including the .prj file, or in personal or file-based geodatabase format including the .prj file (projection file) for each dataset.
- Provide compliant metadata for all information sets to the degree it is available. Metadata should be consistent with Federal Geographic Data Committee (FGDC) standards. Specific metadata that is requested, at a minimum:
    - Abstract
    - Attribute descriptions
    - Spatial reference
    - Data author and contact information
    - Clarify assumptions that are made in the models produced
    - Date of data (or relevant time period of the data)
    - Data permission (can we use and share this data?)
- Data should be submitted in vector format but supplementary raster data will also be accepted.
- The map of important wildlife corridors should not include areas that are simply a highway right-of-way crossing a mapped crucial habitat area. The WGA policy group will make appropriate recommendations to conserve or restore connectivity for all transportation projects through a crucial habitat area.

Supplemental information

Any specific data files, in any original form (with associated metadata), may be submitted that are germane to the metadata for derived information sets described above

We recognize at this stage of information development that some crucial habitats and wildlife corridors will not be mapped using this operational definition, and that the maps based on this procedure may include some areas that do not meet the definition of crucial habitat and wildlife corridors. NOTE: By January 21, 2008, the Science Committee will identify, solicit and compile other relevant data sets (beyond states).

Figure A 1. Priority vegetation communities from the State Wildlife Action Plans (SWAP), Colorado, New Mexico, Utah and Wyoming data are based on USGS-GAP terrestrial ecosystem types.

Figure A 2. Crucial habitat for elk. Source: State fish and wildlife agencies.

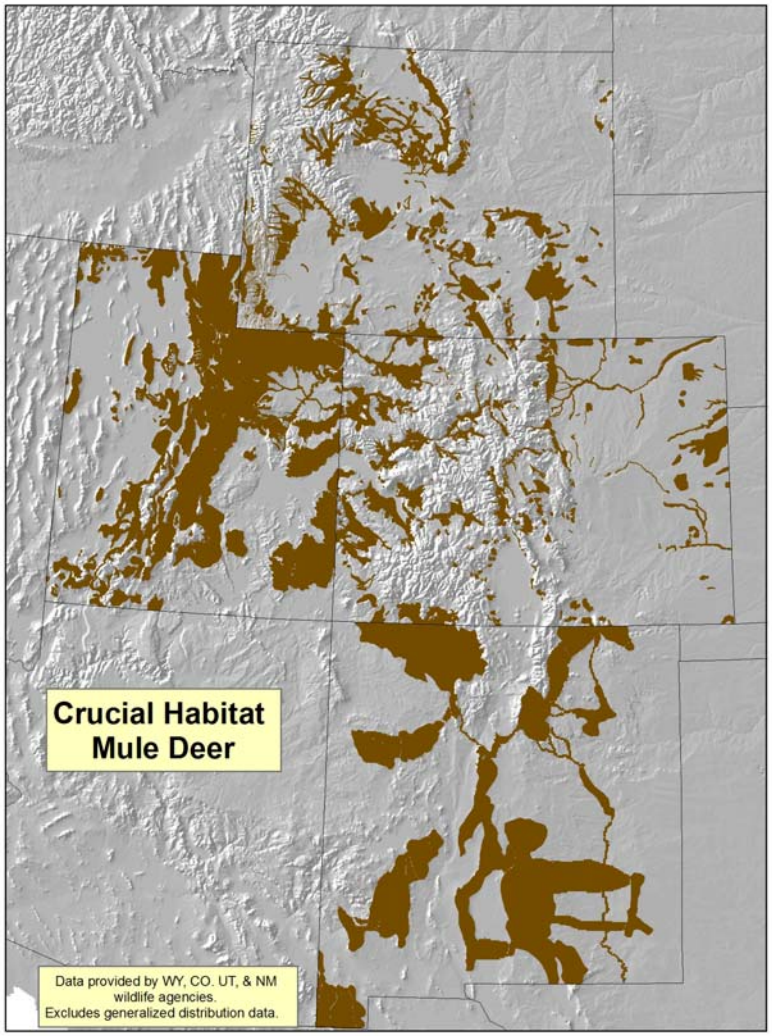


Figure A.3. Crucial habitat for mule deer. Source: State fish and wildlife agencies.

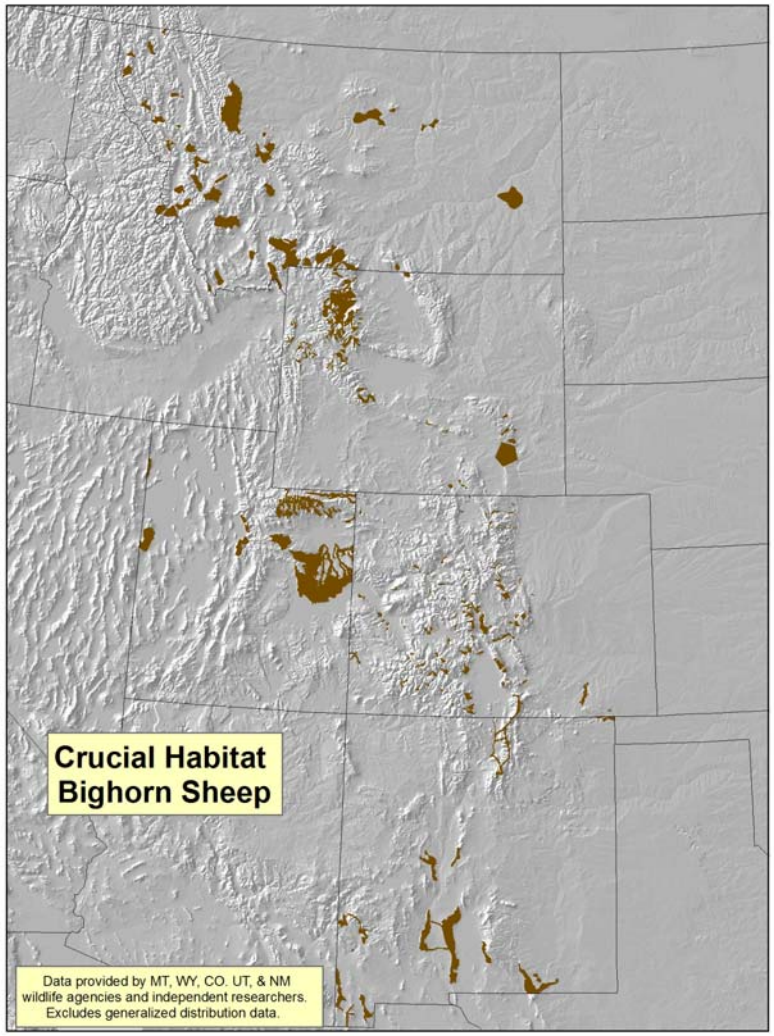


Figure A.4. Crucial habitat for bighorn sheep. Source: State fish and wildlife agencies.

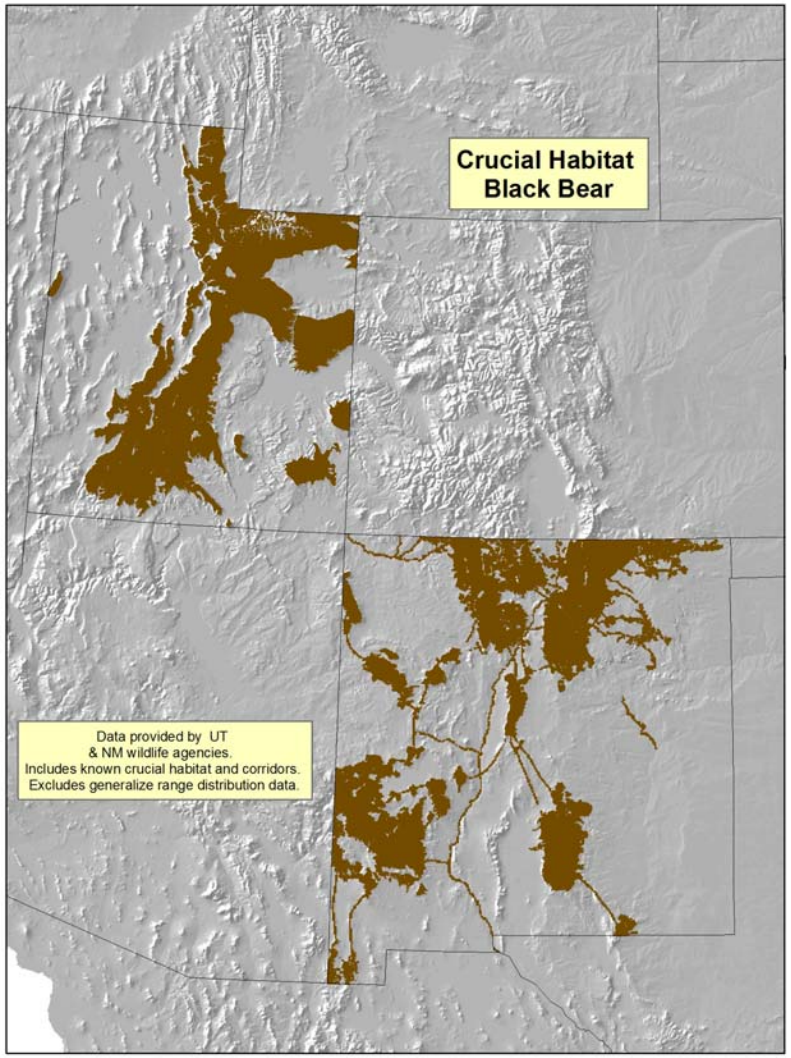


Figure A.5. Crucial habitat for black bear. Source: State fish and wildlife agencies.

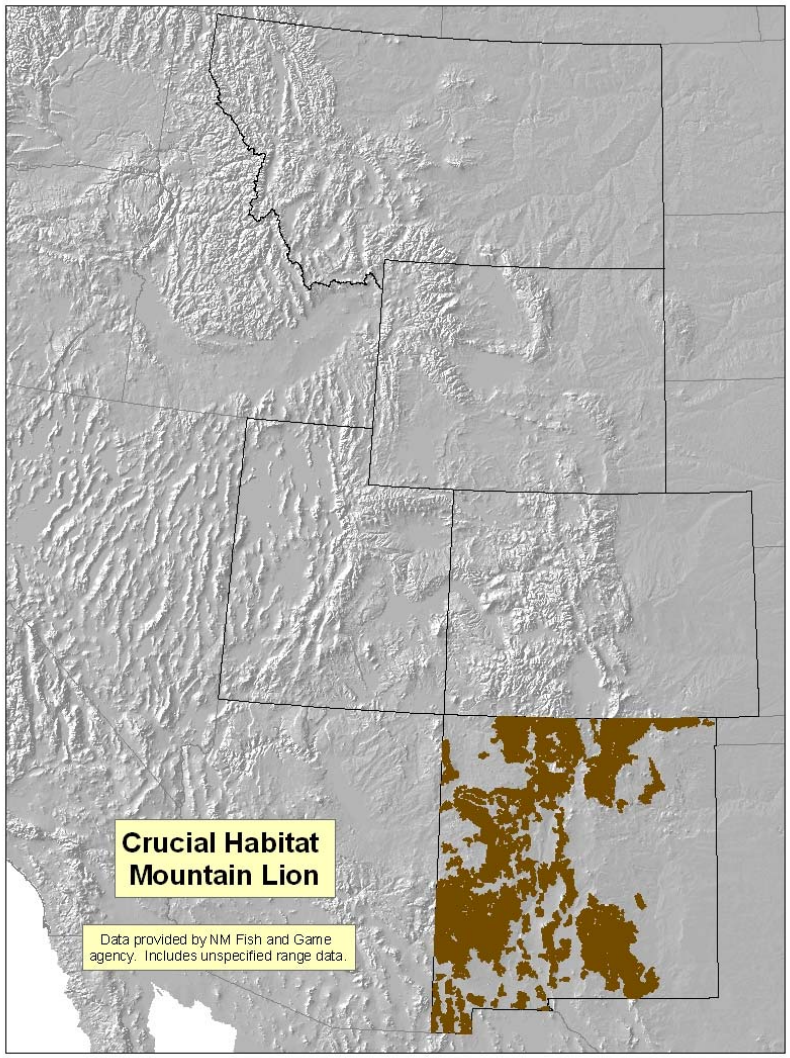


Figure A.6. Crucial habitat for mountain lion. Source: State fish and wildlife agencies.

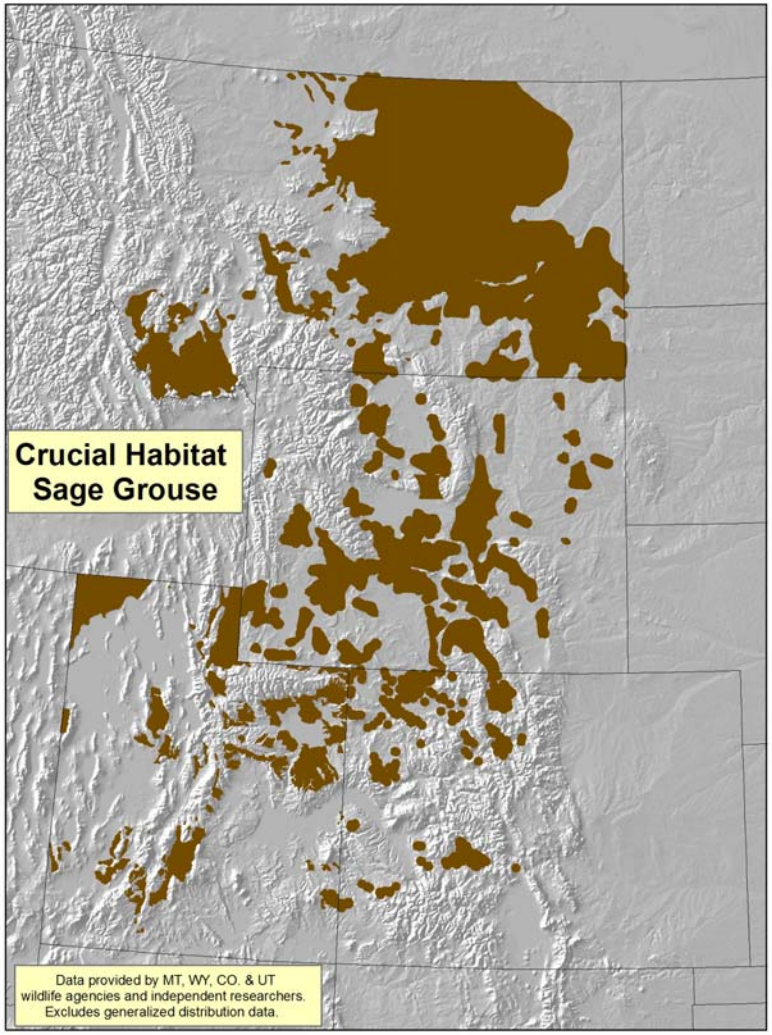


Figure A.7. Crucial habitat for Sage Grouse. Source: State fish and wildlife agencies and State natural heritage programs.

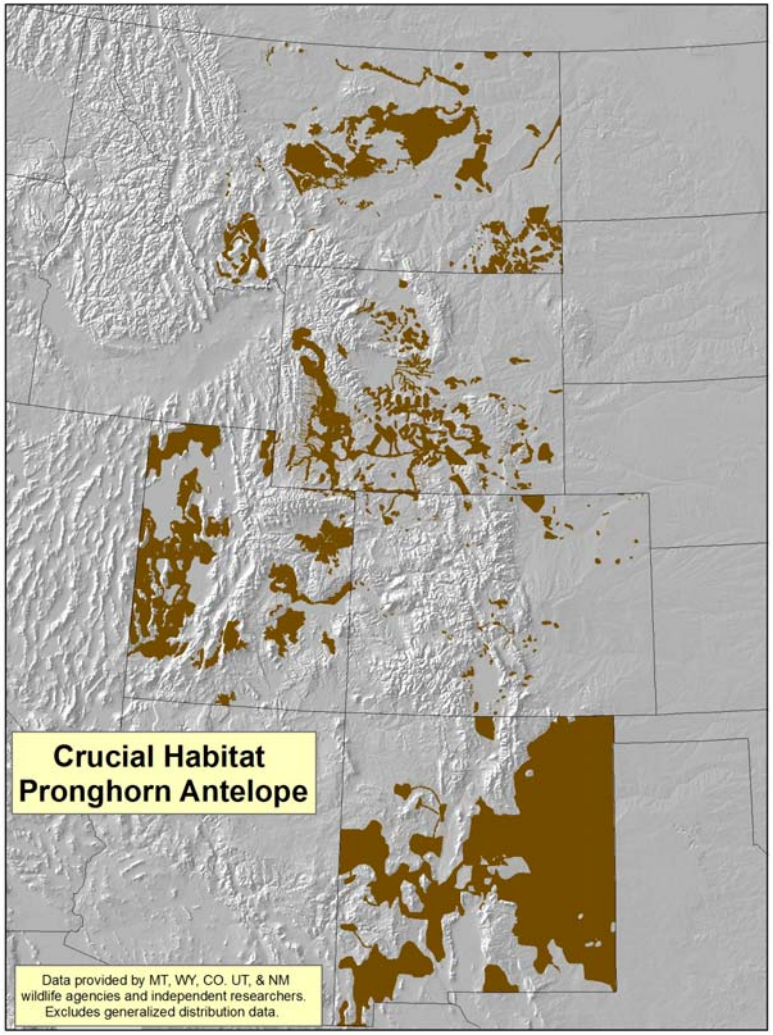


Figure A.8. Crucial habitat for pronghorn antelope. Source: State fish and wildlife agencies.

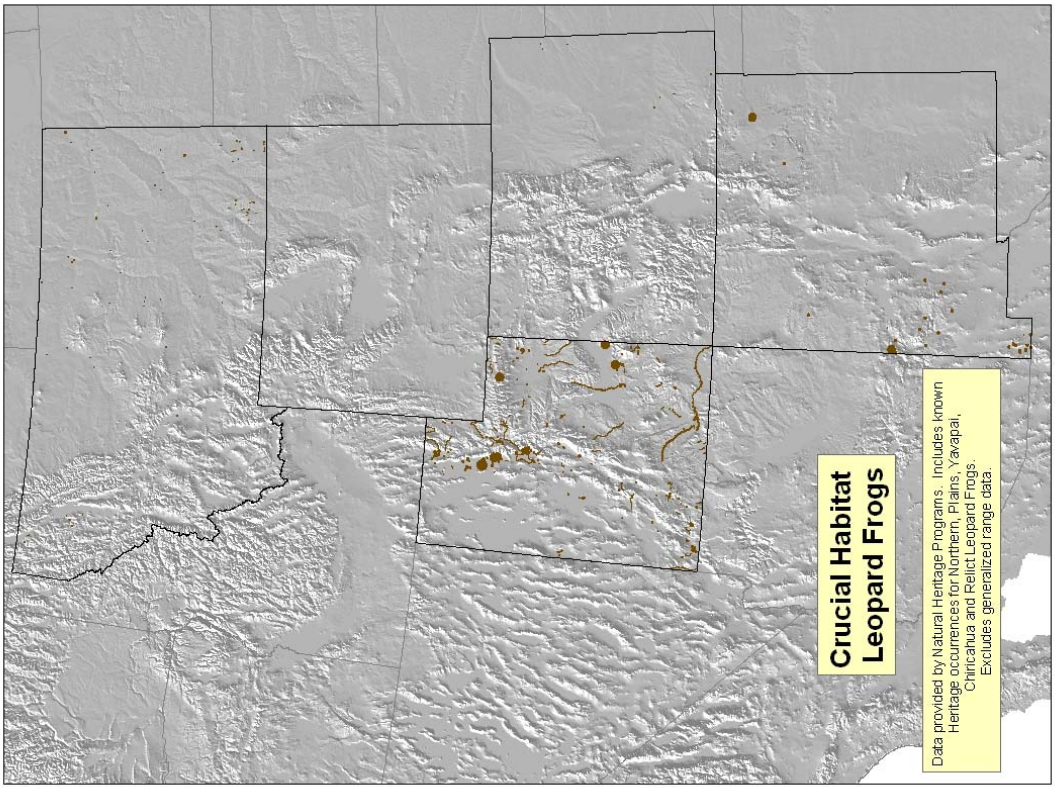


Figure A.10. Crucial habitat for leopard frog. Source: State fish and wildlife agencies and State natural heritage programs.

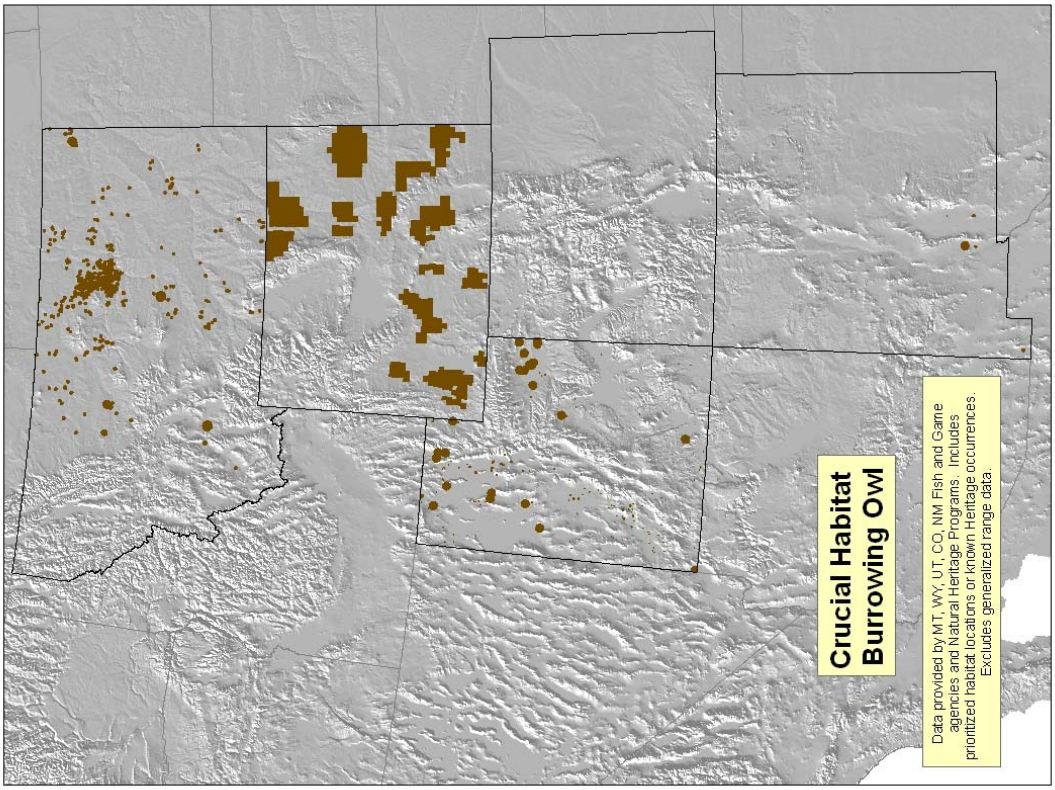


Figure A.9. Crucial habitat for Burrowing Owl. Source: State fish and wildlife agencies and State natural heritage programs.

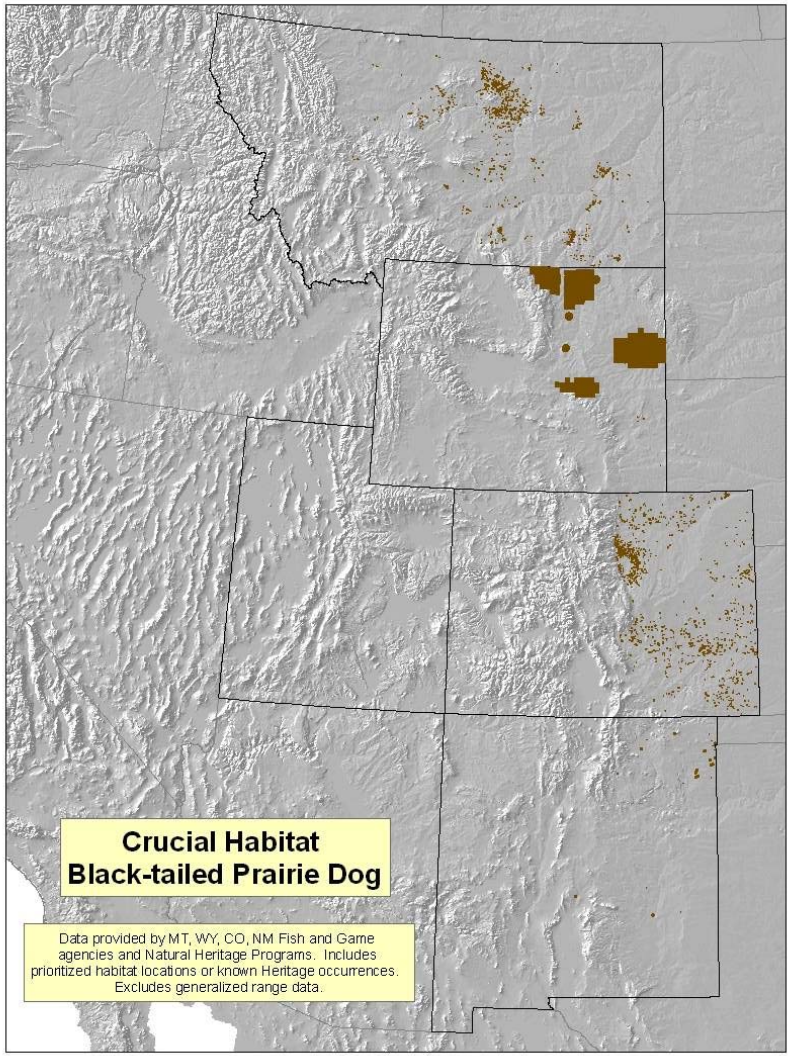


Figure A.11.a. Crucial habitat for black-tailed prairie dog. Source: State fish and wildlife agencies and State natural heritage programs.

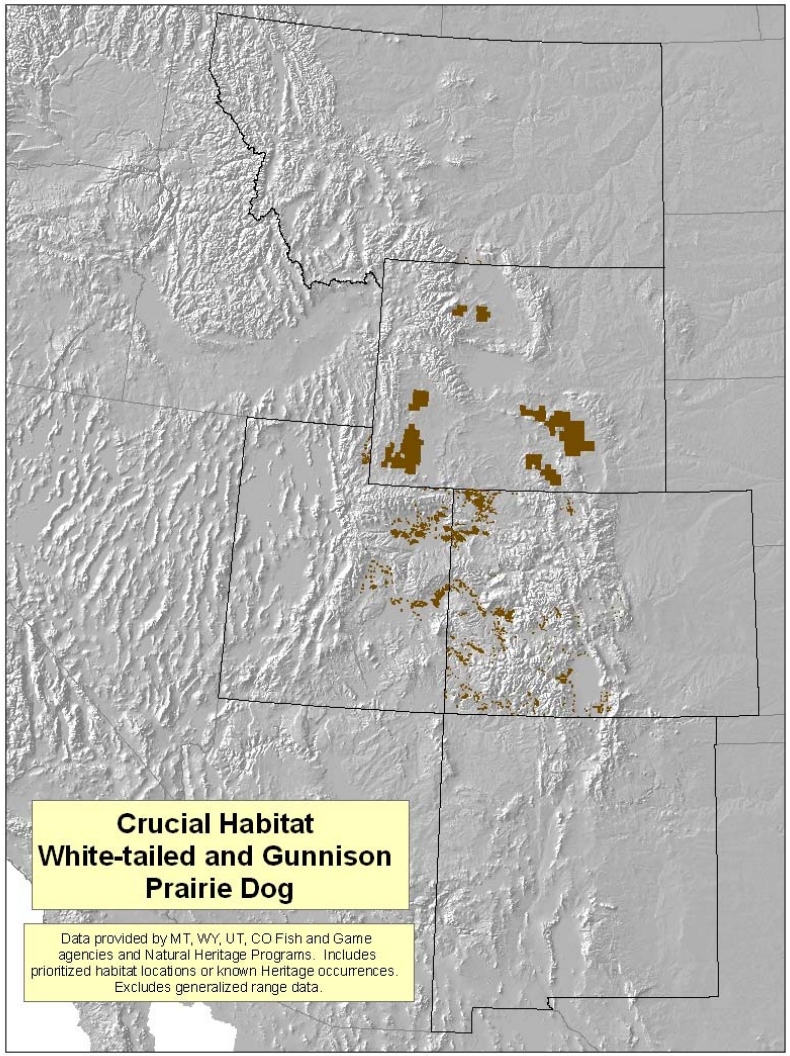


Figure A.11.b. Crucial habitat for white-tailed prairie dog. Source: State fish and wildlife agencies and State natural heritage programs.

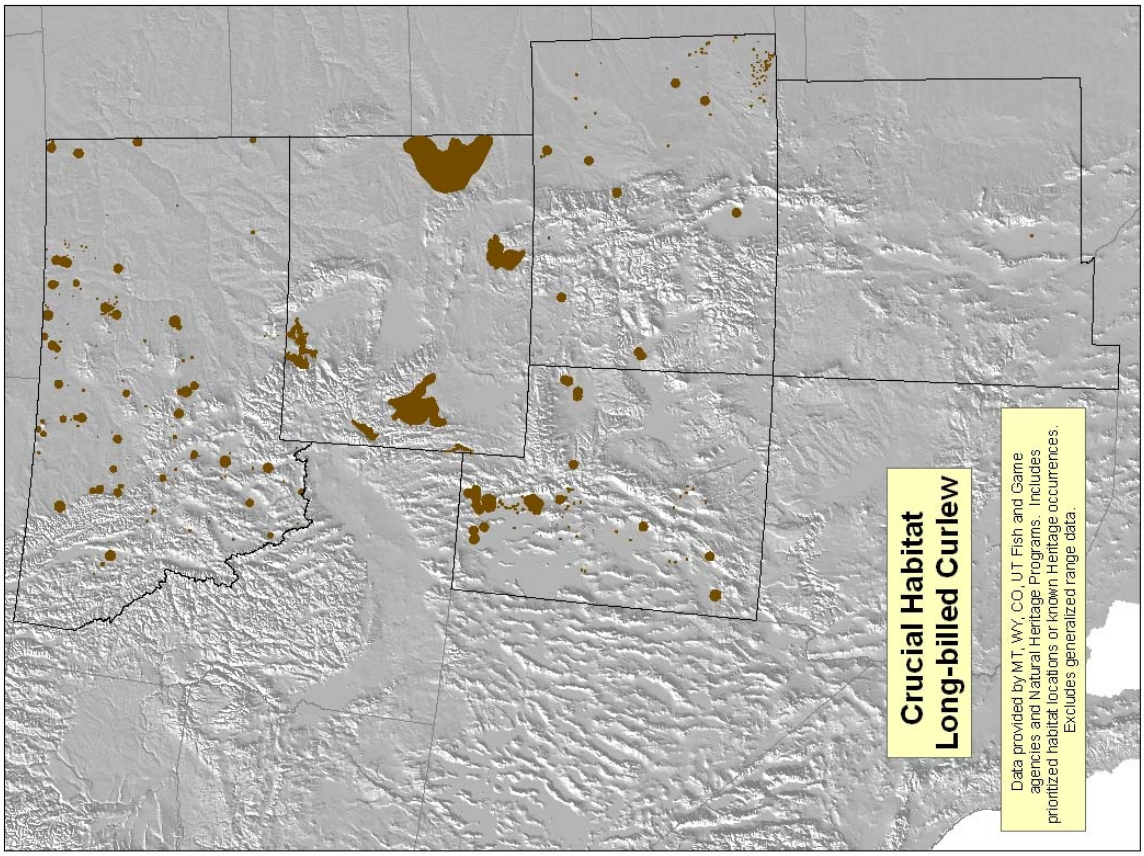


Figure A.12. Crucial habitat for Long-billed Curlew. Source: State fish and wildlife agencies and State natural heritage programs.

A.4 INSERT CONTACT INFORMATION FOR DATA SOURCES

A.5 Types of Information that Should Be Developed Using Consistent, Long-Term Protocols

Wildlife of Conservation Need - Regional efforts have clarified criteria for identifying species of conservation need, generally falling into categories of 'big game' and 'at-risk' non-game. Regional listings of these species may now be consolidated and kept current through standing committees of experts.

Wildlife Populations - For all species of conservation need, characterization and mapping of individual populations, or population segments, require standards for consistent data gathering, processing, and management. Expertise within wildlife agencies and State Natural Heritage Programs are well suited to maintain these standards.

Wildlife Habitats - Similarly, the past and current range for species, and well as more precise characterization and mapping of habitat requirements (e.g., winter range, summer range, connecting linkages) - regardless of the presence of wildlife populations - form a primary input to planning decisions. These data require standards for consistent characterization, field data gathering, processing, and management.

Ecosystems and their components - Maps that consistently characterize upland, wetland, and aquatic ecosystems, as well as their components – such as vegetation type and structure, or hydrography – are essential inputs to characterizing landscapes and aquatic resources. In many instances, ecosystem concepts and maps are used in planning processes as a 'coarse filter' to support the majority of common species in a given region. Recent progress in this type of mapping can be seen at regional scales through federal agency partnerships (e.g., USGS Gap Analysis Program, inter-agency Landfire, TNC freshwater classification, etc.). For example, the combined GAP and Landfire efforts have produced moderate-high resolution maps of 180+ vegetation types and vegetation structure, consistently developed across the West (Alaska and Hawaii are in progress). The ongoing maintenance of these mapped data will require commitments from across public and private sectors.

Condition of landscapes and watersheds - Maps of infrastructure**,** land use patterns, point-source pollution, location of invasive species infestations or insect/disease outbreaks, and other factors can be used to characterize relative condition of lands and waters from the perspective of wildlife. For example, inter-agency Landfire effort is producing regionally-appropriate maps of fire regime conditions to support strategic, decision making regarding management of fire-dependent ecosystems, and the species affected by fire-suppressed conditions. Another recent example of an integrated model of landscape condition was the 'human footprint' map developed to characterize regional landscape conditions for area-sensitive wildlife species. This is a rapidly developing area of applied research that would greatly benefit from regional coordination and data standards.

Landscape Linkages - Methods and tools for mapping wildlife movement and understanding the relative significant of landscape linkages is another rapidly advancing area. Inputs typically include data sets mentioned elsewhere in this document, but may also utilize

information on demography, home range, and other aspects of animal behavior derived from field observation. New effort is needed to further develop and evaluate the several methods and tools (e.g., "least cost path" and "current flow" methods), then establish data standards. Additionally, methods are needed to better characterize the relative importance of each identified corridor as landscape conditions change.

Managed Lands - Maps depicting major ownership boundaries in both public and private sectors are essential for representing land management regimes in place (e.g., grazing allotments; wildlife habitat manipulations), as well as their underlying policies (e.g., management guided by a state wildlife area plan, or conservation easement). Given the dynamic nature of land ownership, policy, and management, a decentralized network of institutions is needed for data gathering, maintenance and distribution. The USGS Gap Analysis Program, several State Natural Heritage programs, and other public and private institutions currently work in this area with varying levels of coordination.

Climate Change - While in many cases difficult to predict, climate-driven changes in ecological processes and land/water uses will undoubtedly collide with some already-scarce habitat needs of wildlife. Climate change forecasting is rapidly advancing, but most models depend upon the network data collected from climate stations throughout the country. These data enable a variety of climate change simulations, some of which have been developed by Western State and federal climatologists. More precise and accurate simulations will decrease uncertainty associated with forecasting as it relates to wildlife habitat needs and the interactions of changing climate and land/water uses.

Energy Resources - Maps depicting development potential and current infrastructure for mineral (e.g., uranium), petroleum, water, wind, geothermal, biofuel, and solar energy resources are of great utility to wildlife conservation planning, and all could benefit from data standards and protocols for data sharing.

Land Use - Commonly available maps of land use are derived from national/State land cover maps (e.g., 1993 and 2001 National Land Cover Data) and are limited in the number of classes. Mapping additional land use classes (e.g., at 10-30m spatial resolution) over time would provide improved forecasting of land use change. Current urban-rural growth models utilize census information, road networks, and land use maps to forecast land use change relevant to wildlife conservation.

Transportation - Similarly, long-term transportation plans, short-term plans, current roads of all sizes and information on known traffic volume are essential inputs to wildlife conservation planning. Coordination with State Departments of Transportation is essential here. In addition, maps depicting potential/actual wildlife under/overpasses, along with data related to wildlife usage of these, is essential to adaptive management and strategic infrastructure investments.

A.6. Research and Planning Methods that Should Be Developed Using Consistent Protocols

Conservation Goals - Conservation goals may be stated in a variety of ways, from *'no net loss'* goals to detailed numerical objectives relating to population viability and species recovery. Scientific research is essential to clarify ecological constraints, but policy makers must ultimately balance societal risks vs. benefits. These tradeoffs may be expressed in conservation goal statements – and the ultimate designation of "crucial wildlife habitat." The science (both

ecological and political) of stating goals continues to advance, and there is a need to share evolving procedures and results across the region.

Identifying Crucial Wildlife Habitat - A variety of technical procedures are in use for identifying and prioritizing wildlife habitat, from manual map overlays (of nearly all mapped layers identified above) or expert workshops, to use of sophisticated computer algorithms that can integrate large volumes of mapped data to identify efficient combinations of places to meet multiple habitat goals. Many of the latter algorithms have added benefit in supporting rapid development of alternative conservation scenarios, assisting with prioritization schemes, and allowing efforts to be completed in a more repeatable and transparent manner. As this continues to be a rapidly evolving field, there is a need to share methods, tools, and outcomes regionally.

Management Guidelines - As was previously stated, the products of these efforts are intended to identify areas that warrant further review and evaluation with respect to proposed land uses. As such, there are numerous opportunities to document and share guidelines for compatible management regimes given common land use proposals and crucial wildlife habitats (e.g., best practices for certain forms of energy development in certain types of wildlife habitat).

Documenting Knowledge Gaps - Nearly all planning processes clarify needs for information and highlight deficiencies in current knowledge. It is therefore essential to have systems to capture this information to focus resources on essential new research and enable adaptive management of wildlife.

Monitoring - Adaptive management is founded on the scientific notion that we can measure our actions to evaluate both our implementation and its effects. This requires protocols and data standards, and institutional commitments for follow-through.

Training - As planning processes become more complex, and staff and other conditions change, there is increasing need for training activities to share lessons learned and maximize opportunities for effective wildlife conservation.

WGA Wildlife Corridors Initiative Report

APPENDIX—Energy Working Group

Appendix A:

Strategies for Reducing Renewable Energy and Transmission Impacts to Wildlife

This Appendix contains examples of strategies that could possibly be used to mitigate impacts of renewable energy and associated transmission on wildlife corridors and crucial habitats. These strategies are "for information only", and were not vetted by consensus of the working group nor should be viewed as recommendations of the working group.

The development of strategies to mitigate impacts of transmission lines and renewable energy sources to wildlife lags significantly behind our efforts to understand the impacts, themselves. However, recent studies have suggested that the following strategies may be useful for reducing risks in certain circumstances:

1) Collisions may be reduced by decreasing the operating time of problem turbines or wind resource areas. Critical shutdown times could be seasonal (e.g., during migration periods) or based on inclement weather or nighttime periods when visibility is reduced.

2) Power lines should not be constructed through or within 1 km of known historical high-water marks of wetlands, through dry basins known to hold water intermittently, or through heavily used waterbird migration routes (Malcolm 1982). In cases where power lines must cross flyways, an attempt should be made to mask the lines with structures such as bridges (McKenna 1976). Power lines should be buried where possible and corridors established where power lines can be congregated to reduce their proliferation (McKenna 1976).

3) Design and maintenance characteristics of roads and structures may indirectly contribute to higher bird fatality rates by increasing prey densities. Prey densities appear to be highest at disturbed sites such as roads and turbine pads, the latter of which would exacerbate collision risk. Reducing prey populations within the vicinity of wind turbines might reduce high-risk foraging activities for raptors. Suggested methods include county-sponsored abatement programs, reduced grazing intensities, and revegetation with higher-stature plants that pocket gophers and ground squirrels tend to avoid. Hence, Integrated Vegetation Management (IVM) plans should be developed and followed. However, the effects of a widespread control programs need to consider the effects on other wildlife, such as protected species that prey on ground squirrels or depend on their burrows for nesting and cover habitat. Widespread use of rodenticides or other measures to remove prey may be controversial and costly. Thus, the feasibility of more benign habitat modification measures—such as manipulation of annual grassland grazing practices or conversion to perennial grassland which can be a major function of IVM—may be worth studying.

4) Facilities that are built with larger, more-efficient turbines require fewer roads and have a greater amount of space between them. Construction of underground distribution lines greatly reducing the likelihood of wire collisions and electrocutions. (Undergound distribution/transmission lines are not fault free, meaning they have to be maintained which means tearing up the ground again and again which can have negative impacts to wildlife and its habitat)

5) Lighting of tall structures appears to contribute to avian fatalities by attracting birds. Thus, illuminating aerial structures to increase visibility to aircraft increases bird fatalities. Migratory species, especially those that migrate at night, appear to be most susceptible to collisions, especially when visibility is impaired by inclement weather. Solid or blinking red lights seem to attract birds on foggy, misty nights more than white strobes, which may flash every 1–3 seconds. Preliminary research suggests that the longer the duration of the "off" phase, the less likely a light is to attract birds. This is a requirement for towers and may be need examination to address wildlife mortalities.

6) Tower placement is a site-specific phenomenon, but several key conclusions have been found. First, irregularly spaced turbines might increase fatalities because birds try to negotiate the apparent gaps between turbines. Second, turbines placed close to the edge of ridges show higher fatality rates because raptors often hover in such locations. Third, turbines placed near gullies have higher fatalities because birds often use these locations as flight paths. Thus, locating wind farms away from migration corridors, cliffs, and ridges utilized by raptors to gain altitude may help to reduce the risk of collisions. Similarly, the construction of "dummy" turbines may deter bats from being attracted to working turbines, thereby reducing their mortality.

7) Motion smear, which makes the blade tips of wind turbines appear transparent at high speeds, increases the risk of collisions. Studies suggest that a single, solid-black blade paired with two white blades (inverse blade pattern) may be effective at reducing visual smearing of blades. In addition, a rectangular attachment to the outer tip at right angles to the long axis of the blade may also help to increase the visibility of blades that have a very narrow profile when approached from the side. However, the visibility and practicality of these attachments has not yet been evaluated (Hodos 2003). In short, although effective visual treatments could provide a cost-effective method to reduce risk from turbines, laboratory and field tests of treatments to make turbine blades more conspicuous to raptors and other birds are needed.

8) Avoid ground disturbance activities in the floodplains containing occupied breeding habitat with related timing restrictions

9) Avoid the use of loud machinery within ¼ mile of Protected Activity Centers (PAC) during the breeding season.

10) When feasible, schedule line maintenance activities after the breeding seasons or defer activity to a later date to as to not disturb breeding/nesting areas.

Appendix B: Studies on impacts on wildlife from energy development. Note: these are listed for the convenience of the reader. This Appendix contains examples of references and studies containing further information on past what is outlined in the report body. These recommendations are "for information only", and were not vetted by consensus of the working group nor viewed as being supported by consensus of the working group.

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Research needs

Note: Excerpted from Morrison 2006 Bird Movements and Behaviors in the Gulf Coast Region - Relation to Potential Wind Energy Development.

- The priority research objective is to quantify seasonal occurrence, abundance, and location of bats and birds. Specifically, research should focus on the following issues.

- The location, magnitude, and timing of movements of raptors during fall migration. Although "hawk watch" locations and data sets are available, they are few in number and should be substantially expanded to gain a better understanding of the extent of raptor migration.
- The location, magnitude, and timing of movements of bats and birds during spring and fall migration.
- Identification of locations where rare and endangered species (bats and birds) occur during breeding and nonbreeding periods.
- Identification of any special environmental features that could concentrate bats and birds (e.g., roosting caves for bats, riparian areas for birds). Surveys should be conducted to identify any potential bat roosts, foraging areas (e.g., open water), locations of concentrated bird activity (e.g., springs, riparian areas), and other environmental features that could concentrate bats and birds near proposed wind facilities

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Information on Centralized Solar facilities and their siting:
[**An Analysis of Siting Opportunities for Concentrating Solar Power Plants in the Southwestern United States,**
http://www.cdphe.state.co.us/ap/comanche/commentsbeforehearing/glustrom2-concentratingsolar/SouthwesternSitingAnalysisforConcentratingSolarPlants.pdf]

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