

**USGS Wind Energy Impacts Assessment Methodology  
Development Workshop**

**March 20 - 22, 2012**

**Summary of Workshop**

*National Conservation Training Center  
Shepherdstown, West Virginia*

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## Draft Workshop Summary

*See attached for the list of participants and the workshop agenda. The PowerPoint presentations from the workshop will be posted online.*

### **I. Introduction**

The U.S. Geological Survey (USGS) wind energy impact assessment methodology project team welcomed the group and provided background on the workshop. The goal of the workshop – to start the discussion regarding developing a national assessment methodology to quantify impacts to wildlife from large-scale wind energy development – is part of the Secretary of Interior’s New Energy Frontier Initiative. USGS has a history of success with quantitative, probabilistic nationwide assessments. USGS would like to develop an assessment methodology useful to many different organizations, informing new research and policy priorities, and possibly useful to other impact assessment methodologies, because the USGS realizes that wind energy is not the only energy resource with environmental impacts. In order to meet this objective, USGS plans to incorporate the work that has already been done on wind energy impacts. The assessment methodology project is a multi-year effort, and this workshop is the first step in an ongoing scoping effort that USGS plans to conduct, to inform the process from the start.

USGS is requesting the input of the experts present at this workshop and others who could not attend. USGS intends for this workshop to be complemented by future outreach activities, such as small group meetings, individual calls, informational webcasts, and possibly additional workshops.

After introductions (See Attachment 1 for the list of participants), the facilitator reviewed the agenda (See Attachment 2), noted that it is flexible, and emphasized that the purpose of this workshop was not to make decisions, but to start the discussion regarding the assessment methodology and help USGS decide what their next steps should be. Several workshop participants noted the good timing of this effort, as there is a great need for this assessment methodology. However, there was concern about evaluating the impacts of wind energy only, without a comparison with the impacts of other energy sources. There were a number of discussion points regarding how to develop the methodology, including whether USGS would develop a future wind energy build out scenario from which to assess impacts, whether modeling was robust enough to understand impacts, if more analyses were needed, and so on. It was also proposed from the outset that the assessment be flexible enough to be updated over time with new information.

### **II. Presentation of USGS Assessment Methodology**

**Dave Houseknecht of USGS** gave an overview of the methodology that USGS uses to conduct national oil and gas assessments, and presented a comprehensive explanation of their assessments of the undiscovered, technically recoverable oil and gas potential in the United States. He explained the USGS process, including the standing review group that

provides a review and feedback on every assessment. Because there are two different categories of resource accumulations (conventional and continuous), USGS uses two different methodologies that must be compatible with one another so that they can be aggregated to produce comparable and complementary results. Additionally, there are areas with abundant data and areas with hardly any, and these must be aggregated as well. Houseknecht added that the range of uncertainty included in a probability distribution is generally based on the level of knowledge and data available about that geologic basin. The USGS assessments are based upon geologic models, but the assessment input parameters developed from these models are run through statistical programs, so USGS is able to quantify disparate densities and types of data. USGS noted that they think this aspect of their approach may be applicable to this project, although there will be even more complexities involved in the wind energy impacts assessment. Another useful characteristic of the standard USGS methodology is the transparency of the process, both the methodology itself as well as the input parameters.

### **III. Other Approaches to Assessments**

USGS selected a group of workshop participants representing a variety of organizations to give brief presentations, responding to the following questions from their perspective:

- What would an assessment of impacts to fish and wildlife from wind energy development involve?
- What is the scale of your assessment, knowing that USGS is expected to conduct a national assessment?
- How is your assessment integrated locally, regionally, and nationally?
- What species need to be included in a wind energy development impact study?
- How are these species impacted and how can that impact be quantified?
- Are there other impacts, in addition to species take, that should be included (habitat fragmentation, reproduction disruption, invasive species, etc)? How can these impacts be quantified?
- What other questions do you think we should be asking, and how would you respond to those questions?

**Taber Allison of the American Wind Wildlife Institute (AWWI)** provided background on AWWI, a collaboration of wind energy companies and conservation organizations. He referenced the National Wind Coordinating Collaborative (NWCC)'s 2010 summary of research on the impacts of wind energy on birds, bats, and their habitats, and their 2011 methods and metrics guide (Strickland and others, 2011). He stated that a significant percentage of existing research is on raptors. Current research indicates that direct habitat loss is not a major concern with regard to wind energy, although it depends on the habitat and region of the country. Allison also pointed to the U.S. Fish and Wildlife Service's Wind Turbine Guidelines (U.S. Fish and Wildlife Service, 2012), stating that they should be incorporated into the USGS product.

Allison suggested that lack of data on wildlife and habitat impacts may be less of an impediment than many people think, and perhaps the research community should be focusing on population-level consequences and on identifying which species are truly at

risk from wind energy. He also hopes this methodology will allow for comparisons with other energy sources.

Allison pointed out several sources of data, including E-Bird(<http://ebird.org/content/ebird>). He proposed that it might be useful to discuss this project at the NWCC Wind Wildlife Research Meeting that will be held in November 2012.

**Steve Brown and Mark Monaco of the National Ocean and Atmospheric Administration (NOAA)** explained that NOAA collects considerable data that are relevant to impact assessments: fishery-independent surveys (trawls, longlines, traps, some optical and acoustic data, all generally accompanied by oceanographic data), fishery-dependent data (landings, discards, observer data, logbooks, vessel monitoring system), and marine mammal surveys. NOAA's National Marine Fisheries Service (NMFS) does not collect much data on seabirds, other than observer data on seabird bycatch. On the regulatory side, NMFS designates Essential Fish Habitat for commercial fishery stocks and Critical Habitat for the marine species listed under the Endangered Species Act. Many fishery management plans also include time/area closures for a variety of management and conservation purposes.

The agency's concerns include commercial and recreational fishing, protected areas, surveys and navigation, and the effects of climate change on these. NOAA uses predictive models to show where resources like seabirds are likely to be exposed to wind turbines, and uses a detectability coefficient to incorporate differing levels of knowledge about species. Agency maps indicate the level of certainty in the model's output using different colors. The species habitat suitability modeling work is evolving to address how species' behavior patterns may be influenced by wind energy development.

**Amanda Hale of Texas Christian University (TCU)** discussed the study she is involved with at TCU, in collaboration with Oxford University and NextEra Energy Resources. They are researching the wind energy impacts on birds and bats at the Wolf Ridge Wind Project. They found very limited displacement effects on grassland birds, and in fact there were higher rates of nesting success closer to turbines. She noted that in general population-level data is not available for most species of bats. The group discussed the level of fatalities that is considered to pose a significant risk to a bat population. One participant added that there are dramatic differences in bat fatalities across the country (the East has higher fatality numbers).

**Jay Diffendorfer of USGS** discussed population-level impacts, surface disturbance, and development forecasts in the Rocky Mountain area. He suggested that geographic analyses of habitat loss may be an option when population-level data are lacking. He also encouraged a broader analysis beyond fish and wildlife. He would also like to see efforts to assess impacts from other forms of energy.

Participants discussed the uncertainty around where wind energy projects will be built; unlike technically recoverable oil and gas resources, the factors affecting where projects are built can vary year to year (e.g. energy policies, markets, and transmission). USGS

noted that the economic viability of development is generally incorporated into their models as a secondary assessment, because it is more variable than the resource itself.

**Doug Johnson of USGS** discussed the vulnerability of grassland bird species, which form a group most seriously in population decline and thought to be at risk from wind energy. Data on impacts to grassland birds are sparse; however, because these birds occur at low densities and vary spatially and temporally, studies must look for modest changes in small numbers. The birds also may have a delayed response to changes in their environment, so immediate assessments may not reflect long-term consequences. Rapid Assessment Methodology (RAM), the Information Planning and Conservation System (IPAC), and the Landscape Assessment Tool (LAT) are all examples of tools for assessing wind energy impacts to a broad range of species. Johnson gave examples of various studies, and highlighted the primary information needs, in his view:

- Basic research (not mapping), especially on bat behavior
- Consolidation of site-specific information (e.g. AWWI's Research Information System)
- General understanding of the risk factors (e.g., identify features of migration pathways in greater detail)

**Christy Johnson-Hughes of the U.S. Fish and Wildlife Service (FWS)** provided a brief overview of the FWS guidelines, as well as the Information, Planning, and Conservation System (IPAC), and the Landscape Conservation Cooperatives (LCCs). She suggested that addressing impacts at the national scale is very difficult, and a regional approach may be more reasonable. She stated that FWS has good information on how to quantify impacts, which they can provide to USGS. She also gave a more in-depth presentation on the **FWS Wind Turbine Guidelines**. She provided background on the history and purpose of their development by a federal advisory committee. She focused on explaining the tiered approach to site-specific impacts. The tiered approach is a tool for siting with minimal impacts, and moves from a broad perspective down to a very narrow one. Tier 1 is a desktop, landscape-scale assessment of existing, publicly-available data, to determine the species of concern; Tier 2 is the site characterization (to determine the probability of significant adverse impacts to species of concern at the site(s) in question; Tier 3 describes pre-construction studies; and Tiers 4 and 5 comprise post-construction studies. See [www.fws.gov/windenergy](http://www.fws.gov/windenergy) for more information.

**Emily Bjerre of FWS** gave a presentation on their eagle program. She emphasized the importance of bringing the decision and policy-makers into the process early on, as many questions that may seem purely technical may actually be policy-related. She suggested that while there are plenty of data gaps, USGS can get a great deal of use out of the expert knowledge that is available.

**TJ Miller of FWS** explained that his wind-wildlife experience is primarily related to permitting wind facilities for listed species, including developing habitat conservation plans (HCPs) as a method of obtaining a permit under Section 10 of the Endangered Species Act. He is currently involved in drafting the Midwest Wind HCP, with 19 wind

energy companies, states, and regional staff at FWS. This HCP is being developed for all of FWS Region III, covering 8 Midwest states. HCPs estimate the potential impacts on a particular group of “covered” species from the proposed action. The HCP specifies minimization and mitigation measures, as well as monitoring and adaptive management, that allows FWS to permit “take” (kill, harm, or harass) of the covered species (as long as the taking is incidental to and not the purpose of the proposed action).

The facilitator mentioned another effort, the Great Plains Wind Energy HCP, also with 19 wind companies involved. The American Wind Energy Association (AWEA) is helping to support both of these regional HCPs. These HCPs offer insights into modeling build out scenarios, estimating impacts, and developing mitigation strategies at the regional level.

**Bob LaBelle, Mary Boatman, and David Bigger of the Bureau of Ocean Energy Management (BOEM)** gave a presentation on BOEM’s overall approach to impact assessment of offshore wind development activities and programs. Starting with a “Worldwide Synthesis” study of known environmental effects from wind, wave and marine current energy development, BOEM used this information to inform a Programmatic EIS that addressed potential impacts from a new national offshore renewable energy program mandated by the Energy Policy Act. The agency regulates and monitors activities ranging from site assessment, through construction and operations, to decommissioning. BOEM is developing protocols for baseline studies and monitoring of projects and activities, as well as identifying Wind Energy Areas offshore for subsequent leasing. Studies target avian compendiums, socio/economic factors, bats, marine mammals, and assessing impacts from noise and other impact agents. National Ocean Policy initiatives support marine multiple use scenarios and planning.

**John Moore and Sally Butts of the Bureau of Land Management (BLM)** gave background on the related efforts that BLM is working on (largely through their Renewable Energy Coordination Offices), specifically their Rapid Ecoregional Assessment (REA). BLM sometimes uses “species guilds” to assess impacts to similar types of species. It was noted that BLM permits account for cumulative impacts.

**Jason Ransom of the National Park Service (NPS)** gave a presentation on NPS responsibilities and priorities. NPS has a legal obligation to protect their lands against an external development threat that is “direct, specific, and credible” and which “relates to a fundamental value... of the park.” Priority areas and science needs that he identified are visual simulations (surface lights on offshore infrastructure); impacts on avian and bat species; scenario planning; and landscape conservation.

**Dale Strickland of WEST, Inc.** responded to the questions posed to the group. He encouraged USGS to incorporate a tiered risk-based approach to their assessment, similar to that described in the FWS Guidelines and the NWCC Methods and Metrics guide, into their analysis. He suggested that the USGS start their assessment by focusing on identifying species/populations where there is a reasonable risk of population-level demographic effects. Subsequent tiers should help confirm whether this risk is significant

or not. He gave an overview of several case studies showing how this approach can be used in practice, and ways that it might be applicable to the USGS project. He listed some of the species and types of impacts that are of greatest concern with wind energy development and made suggestions on how these impacts might be quantified.

**Bonnie Ram of Ram Power LLC** gave a presentation focused on high-level issues and the need for comparative and integrated analyses between types of energy development and types of impacts for decision makers and stakeholders. She and another participant mentioned relevant comparative analyses by the New York State Energy Research and Development Authority [(qualitative), Environmental Bioindicators Foundation Inc. and Pandion Systems Inc., 2009] and the National Research Council [(quantitative), National Academy of Sciences, 2010]. She pointed to the significant amount of research done in Europe on offshore wind energy risks and benefits. She also noted the distinction between risks (includes assessment of probabilities and uncertainties) and impacts (typically excludes probability of occurrence and uncertainties). She also raised a concern that focusing exclusively on habitat and wildlife issues alone may be reflective of a risk *du jour* type of approach or a partial assessment of the risks from wind deployments (i.e., there are other types of risk, such as visual impacts, noise, air/water quality, and cultural resources).

#### **IV. Possible Process for USGS National Impact Assessment**

USGS presented a possible way to apply some of the input received during the first day of the workshop to a USGS-style impact assessment (described below), and invited feedback. Participants offered their individual views. It was noted by one participant that clearly, one of the initial challenges is that the agencies and organizations have different vocabularies and different regulatory frameworks, each with their own definitions, terminology, and purview. Developing a glossary will be a critical component of this project.

USGS reemphasized the components and characteristics of a USGS energy assessment, explaining that politics, site-specific information, decisions, and “drill here” or “build here” maps are not included.

*A potential initial framework for this assessment could be the following (translating USGS terms into wind/wildlife terms):*

Level 1:	Basins/provinces	=	Wind Resource Areas greater than Class 3
Level 2:	Assessment units	=	Species-specific assessment units
Level 3:	Outputs	=	Demographic and habitat effects

A possible process for assessment impacts could be:

- Choose wind resource area
- Choose potential species in area to present to expert panel to help decide which should be assessed
- Panel makes a recommendation



- Assessor gives final presentation, with input from panel of experts

Participants discussed the USGS initial option for connecting wind-wildlife data to a quantitative USGS-style assessment. While many participants agreed that this approach was worth thinking about because of the value of assessing probabilities and range of uncertainties, one meeting participant raised the concern that the project should not attempt to assess the impact on a migratory species based on a single wind resource area, but rather, across the life history of the species (which may be spatially disparate). Other participants also disagreed with using the wind resource area as the equivalent of the “basin” of study, because this would likely obscure the details of widely varying degrees of impact. A different option might be using Landscape Conservation Cooperative units, eco-regions, or National Ocean Plan regional divisions. It was stated that a national-scale assessment (which can be composed of multiple regional assessments that are aggregated) will not include a fine level of detail.

There also remained the question of how to define “impacts.” Many in the group suggested focusing on significant population-level impacts, although there are not a lot of population-level data for many species. There was also discussion as to whether or not part of the methodology should be directed at measuring indirect impacts. It was noted that assessing the probabilities of impacts would be a very valuable contribution from this project, and needed to better inform decision makers and stakeholders.

The question was raised as to whether the USGS will assess only potential negative impacts. It was suggested that consideration should be given to both positive and negative impacts of wind energy to wildlife and habitats, or if not, be explicit and transparent that it is not addressing any benefits.

## **V. Breakout Groups and Plenary Discussion of Possible Approaches**

The group split into two to discuss individual participant views on what the assessment unit should be, and what questions the assessment should address. Then they returned to the plenary, reported on their group’s discussions, and began a dialogue on options for how to develop the USGS impact assessment.

The first group discussed using eco-regions as the assessment unit (for both onshore and offshore), noting that NOAA already has defined eco-regions, in addition to the various onshore landscape and eco-region designations that have been established. This group also emphasized the need to keep species and their habitat tied to one another; and to focus on population biology. The second group suggested using species as the assessment unit, preferably species guilds.

### Possible Questions for the Assessment to Address (from the Breakout Groups)

- How many wildlife and fish populations are going to be affected? What are the species of concern?
- If there are negative impacts, is there any cause and effect?
- How do we measure impact by species?
- What data are available on a per species basis?

- What are the data gaps that fit into research needs?
- What are data telling us about their predictive ability?
- What build out scenarios should be used?
- Are there minimum monitoring requirements for pre- and post-construction studies?

After the full group reconvened and reported on their discussions, it was suggested by one participant that a possible approach could be to use the list of species of concern from the FWS Guidelines, and conduct Tier 1 analyses on these species to see which might experience population-level impacts. For those that are likely to be of the greatest concern, additional modeling could be done, using the 20% by 2030 report's build out scenario.

It was noted that a Tier 1-type analysis of specific species (using the overlap of their range with medium-to-high level wind resource areas) could be aggregated up to a regional or national assessment. Data could be collected for a species population, but reported by eco-region, thus providing flexibility as well as detail (when it is available). Several participants pointed out that even if there are only sufficient data to do a high-level analysis on a small percentage of the species of potential concern for wind energy, it would be a very valuable indication to policymakers of the need for additional research.

## **VI. Case Example of Proposed Approach for a Population-Level Assessment: the Piping Plover**

The group discussed possible steps for an impact assessment on the piping plover, a federally endangered species. The group focused on one of the three populations of piping plover, the Great Plains population. The area of concern is considered to include about 5 percent of the population range, comprising their breeding habitat and a few areas where migration may bring the birds into contact with wind projects (although there is a high degree of uncertainty surrounding those areas). The group wondered what other information could be used as inputs, such as weather-related flight patterns, NatureServe data, or data on stopover sites. It was suggested that this assessment will likely be primarily model-driven. The facilitator noted that there are several models being developed for the regional HCPs to assess impacts based on an estimated future build out for their respective regions.

Another question raised was the possible indirect impact of birds avoiding wind energy projects, and whether this behavior could have negative consequences at the population level (although it helps them avoid collision). It was pointed out that exposure to wind energy projects due to overlap between a species range and a high wind area does not directly correlate to impacts: there are likely many other factors affecting the vulnerability and resiliency of species.

One of the workshop participants asked if it would be possible to use an analog for some of the species with little to no data. Several participants responded that they have found using surrogate species to be unsatisfactory because there are too many differences between species. One participant stated that they have sometimes used surrogates, but

very cautiously. Another analog could be using data on impacts from structures other than wind turbines, and the response from the group was largely that this does not work, and that there is a fairly good amount of data specifically on turbines.

The group discussed the next step in the analysis, the consequence of the exposure and vulnerability. There was serious doubt that the consequence can be quantified. A population model could be used at this point in the process to assess the likelihood that the population would be significantly affected. There was some question about whether data would be meaningful at that scale, however. One participant stated that population-level impacts from any predicted wind energy development will be minimal. Bats are likely the only exception. Part of the reason for such minimal population impacts is that a high annual fatality rate is the norm for bird populations, and they have a high degree of resiliency.

## **VII. Presentation and Discussion of Revised Process Steps**

The facilitation team provided a revised draft proposal for discussion (See Attachment 3), laying out possible process steps for the impact assessment methodology based on input from the workshop up to that point. They divided the proposed process into two phases: one set of steps to develop a methodology to assess the impacts of current wind energy development, and the second to develop a methodology to assess impacts under a future build out scenario. They requested that the group focus on evaluating the draft framework rather than the details and variables that could go into it. It was noted that this is intended to be an impact assessment methodology, not a risk assessment.

In discussing the first set of steps for current development, it was noted that since data are gleaned from a limited number of existing projects, it reflects only a certain percentage of the current build out. Information would need to be extrapolated to the full build out, and then extrapolated again for future build out. The group also reviewed and discussed the second set of steps for assessment of future build out. It was noted that the inclusion of indirect impacts is inferred in this process, but perhaps should be more explicitly stated.

Participants discussed two general approaches, which had also been discussed previously throughout the workshop: one that starts with species and aggregates up to ecosystems, the other starting with ecosystems and translating that to species. It was noted that starting with species might allow greater flexibility to report the data in multiple ways, and could retain greater resolution in the data. It was also pointed out that agencies don't have specific jurisdiction over ecosystems as they do over species.

The group agreed that the indirect impacts of wind energy development are likely to be the most significant, and these need to be addressed regardless of the approach, even if they can't always be linked to species-specific impacts. The USGS process could define the habitat-species relationships in order to enable modeling. The ecosystem approach could incorporate habitat indicators such as habitat fragmentation and loss, and deforestation, and could translate those into impacts to fish and wildlife (likely to species guilds, not specific species).

The facilitator confirmed that the draft process steps can be a tool for USGS to use, but it is not intended to reflect consensus of the group, and it is not a USGS document.

### **VIII. Overview of the AWWI Landscape Assessment Tool and Research Information System**

Taber Allison gave a presentation on the Landscape Assessment Tool (LAT) and the Research Information System (RIS) being developed by AWWI. The LAT is based on collaboration with The Nature Conservancy (TNC), and is intended for preliminary evaluation of an area for possible project siting. The tool is not intended for the evaluation of a project site, however. The source of most of the data in the LAT is the USGS gaps analysis, which developed species distribution models. TNC then evaluated many of these. The data focuses on “species of concern” as defined in the FWS Guidelines. The data used for bat species is based on range maps. Allison stated that any additional data sources or other suggestions are welcomed.

The RIS is currently in a pilot phase. The tool is intended for both risk and impact assessments. It includes pre- and post-construction data collected through the process of siting, constructing, and operating existing wind energy projects. AWWI will develop a protocol for providing the necessary detail to consumers of the product as well as the necessary protection to providers of the data. Eventually, AWWI would like to link the LAT and RIS tools.

### **IX. Conclusion**

USGS requested that the group send them information or contacts after the workshop that they think would be useful to the USGS effort. USGS plans to follow up with many of the participants, and others who did not attend the workshop but who are also experts in the field. USGS plans to review the input they receive and then decide on specific next steps for moving forward with the project, including potentially setting up webinars, small expert groups, and additional workshops. USGS confirmed that they have been asked to develop the methodology for the national assessment in three years. They currently have funding for the first year of work.

Final comments from participants included a reminder that wind energy development in the Great Lakes has different issues and impacts than both onshore and offshore. USGS stated that they have been considering Great Lakes to be in the “onshore” category. BOEM also added that offshore impacts were not discussed in great detail by the group during this workshop and they are very different from onshore impacts, so will require additional attention later. BOEM also shared that they have made great strides in looking at the impacts of offshore wind energy development, so perhaps complementary efforts should be evaluated, rather than USGS doing both on- and off-shore.

### **X. List of Questions and Recommendations from the Workshop**

*NOTE: These lists are not exhaustive; there are other questions and recommendations woven throughout the summary above which are not captured here.*

## **Questions**

- How to define “impacts”
- What are the wildlife impacts of noise from wind energy facilities?
- What is the equivalent of the geologic basin (and the USGS assessment unit): the wind resource or an ecological unit./eco-region or the biological impact to a particular species? Or “species guilds”?
- What would the quantitative outputs be?
  - o Hectares/acres of habitat lost
- Will the USGS methodology address positive impacts?
- Will the USGS methodology address non-federally protected species?
- Will the USGS methodology address future as well as existing impacts?  
(Assumption is yes)
- How to define the species for consideration/species of concern?
- Is the USGS assessment essentially going to “roll up” existing data? (Is that the value added?)
- Does this assessment include impacts from transmission? (the regional HCPs discussed previously cover the connector lines to the point of interconnection with the main transmission grid)
- How to report fatalities?
- How to assess at the population level (which was recommended) given existing data?

## **Recommendations**

- State agencies (and AFWA) should be contacted during the scoping of this assessment. Much of the existing data are from them.
- It may not be feasible to use an assessment unit that is smaller than an eco-region or an LCC, because it wouldn’t take into account all the impacts on a species
- Focus on population biology/population-level impacts/demographics, and include habitat effects in this as much as possible (a problem is the lack of population-level data and lack of methodology for tying habitat impacts to population impacts)
- Consider developing a list of all (agency-based?) landscape/eco-region designations
- Main data needs:
  - o Basic research (not mapping); especially on bat behavior (noise impacts are also a big unknown)
  - o Consolidation of site-specific information (e.g. AWWI’s Research Information System)
  - o General understanding of the risk factors (identify features of migration pathways in greater detail)
  - o Sensitivity Analyses
- Incorporate or review the following resources/tools:
  - o FWS Wind Turbine Guidelines
  - o NWCC Updated Methods & Metrics guide
  - o E-Bird

- DOE’s updated “20% by 2030” report (Karin Sinclair can provide)
- Rapid Assessment Methodology (RAM) - BLM
- Information Planning and Conservation System (IPAC) - FWS
- Landscape Assessment Tool (LAT) - AWWI
- Research Information System (RIS) - AWWI
- Impact assessments being conducted for the Great Plains Wind Energy HCP – AWEA
- NYSERDA assessments (2009, and current ongoing mapping project with which K&W is involved)
- NRC (National Research Council). (2010). Hidden cost of electricity: Unpriced consequences of energy production use. Washington: National Academies Press
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**List of Attachments:**

- 1) List of Workshop Participants
- 2) Workshop Agenda
- 3) Possible Process Steps 03-22-12