Exhibit A

Data Quality Issues in the U.S. Fish & Wildlife Service's
Greater Sage-grouse (Centrocercus urophasianus) Conservation Objectives: Final Report (Dated February 2013)

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Executive Summary

The Sage Grouse Conservation Objectives Team Report (COT Report) was prepared by five representatives from the U.S. Fish and Wildlife Service (USFWS) and ten from State agencies in a collaborative effort to develop rangewide conservation objectives for the Greater sage-grouse, and to inform USFWS' upcoming Endangered Species Act (ESA) listing decision. While the COT Report is intended only to serve as a guidance document to federal agencies, states, and others, there are several data quality issues with the report that should be taken into consideration before it used as to guide state and federal conservation efforts for the species. There was no opportunity for public input or comment on the Sage Grouse Conservation Objectives Team Report prior to its release.

The COT report is not a scientific document

The COT Report is not a scientific document, as there are no original data or quantitative analyses used in developing the report, nor is there a comprehensive and unbiased review of *all* of the available scientific literature about conservation of the species. Instead, the COT Report provides a limited and selective review of the scientific literature and unpublished reports on sage-grouse as a basis for its conservation objectives and proposed actions. As a result, outdated information and beliefs are perpetuated in the COT Report.

The COT overstates some threats to sage grouse while downplaying others

The COT Report makes a number of dramatic statements about the status of sage-grouse, such as the need to *"stop the bleeding"* (of projected population declines and habitat losses). The COT Report's approach elevates hypothetical threats that have never been shown to cause sage grouse population decline to the level of real threats, while selectively ignoring well-documented sources of high sage grouse mortality, including predation and hunting. The COT Report's limited and selective evaluation of threats ignores a major body of scientific literature on predation (especially predation by ravens) and experimental data on predator management.

The population predictions used in the COT threats analysis were based on an analysis that contains methodological bias and error

The COT Report's threats analysis, population definitions, current and projected numbers

of males, and probability of population persistence, are entirely based on the paper by Garton et al. (2011). However, there are serious methodological biases and mathematical errors in this paper. The data and programs used in that highly influential paper are not public, and therefore, the results are not reproducible.

The COT's ranking of threats to populations and Sage Grouse Management Zones is subjective

There is no evidence of any reproducible, quantitative methodology used in assigning rankings to threats in each population and sage grouse management zone, or in discussion of specific Priority Areas of Conservation (PAC) in Appendix 1. Instead, the ranking of threats in the COT Report is entirely subjective.

Population trends are to be determined using substandard data and methods

The COT proposes that no credit be received for restoration efforts until there is demonstrated sage-grouse use or positive population trend. The COT Report does not acknowledge the well-documented finding that male lek counts provide only a crude non-random, statistically invalid estimate of population trends. That lack of resolution in the data translates into the potential for *no credit* to be given for restoration and mitigation efforts.

The COT proposes calling out the Air National Guard and other measures to protect sage grouse habitat and hypothetical "connectivity corridors"

The COT proposes to prioritize suppression of fire in sage brush including, *"policy changes that allow access to more fire suppression resources, such as Air National Guard Mobile Airborne Firefighting Units"* to *"immediately suppress fire in all sagebrush habitats."* This includes the suppression of fires in so-called *"identified connectivity corridors."* However, these corridors are hypothetical only and have not been documented in the wild. If implemented, this policy change would represent an arbitrary, capricious, and scientifically unreasonable agency action.

The COT proposes "enforceable temporary measures"

The COT proposes that if adequate regulatory mechanisms cannot be implemented by specific deadlines, *"then enforceable temporary measures should be considered in order to ensure threats will be at least temporarily ameliorated until such time that an effective regulatory mechanism can be implemented."* However, the COT fails to mentions what those "enforceable temporary measures" would include, which agency would be charged with enforcing them, if they would be enforced on private land, or the criteria that would be used to determine if they are an *"adequate regulatory mechanism."* An unintended consequence of the COT Report is that it provides an administrative record which litigants can then use in court to argue that additional regulation is needed for sage grouse or to challenge agencies that have not enacted “enforceable temporary measures.”

The ESA requires that decisions must be based upon best available scientific and commercial data, and not "best available science"

The COT states that, *"All proactive voluntary conservation efforts should use the best available science."* However, to be consistent with the ESA and the IQA, this language needs to be changed to *best available scientific and commercial* ***data***.

The COT uses new, subjective terms to evaluate risks to sage grouse

The COT Report uses new, subjective terms from the *Significant Portion of the Range Polic*y to qualitatively describe the status of populations of a species being considered for ESA listing: *redundancy*, *resiliency*, and *representation*. To this list, the COT added a new, subjective term: *resistance*. None of these terms are quantifiable and all are open to broad interpretation. Others have also recognized this deficiency and have pointed it out to the USFWS.

Opened-ended research funding and conflicts of interest

The COT team calls for additional "key research" to resolve "uncertainties" in sage-grouse management and for "effecting sage-grouse and sagebrush persistence." However, without a list of specific questions and how the answers would change management decisions, this is simply a *carte blanche* request for research funding, and subverts a conservation program into a long-term research program with no mention of how the research will be funded or who will decide how funding is to be allocated.

The COT does not evaluate any of its proposed conservation actions under PECE

The COT proposed that sage-grouse conservation strategies undertaken by state agencies should consider using the criteria identified in the *Policy for Evaluation of Conservation Efforts (PECE),* but does not state whether any of its proposed conservation actions meet the requirements of PECE. The USFWS cannot recommend that new conservation measures and regulations be imposed without first ensuring that they meet the PECE requirement.

The COT Report erroneously evaluates threats using a single category for all energy production, despite substantial differences in the type and permanence of impacts

The COT Report does not acknowledge the fact that renewable energy projects have a uniformly permanent impact on the landscape while oil and gas development has a mix of temporary and permanent impacts. Blending these two vastly different types of energy production into one threat category is contrary to the best available scientific and commercial data, and counter-productive to sage-grouse conservation.

The COT Report relies on erroneous information for priority habitat mapping, evaluation of threats, and population risk assessments

This report also highlights a number of problems with the evaluation of threats and population risk assessments in the Colorado Plateau Management Zone, Power River Basin, and associated PACs discussed in the COT Report's *Appendix A - Management Zone And Population Risk Assessments*.

Detailed Review

The Sage Grouse Conservation Objectives Team Report (COT Report) was prepared by five representatives from the U.S. Fish and Wildlife Service (USFWS) and ten from State agencies in a collaborative effort to develop rangewide conservation objectives for the sage-grouse, and to inform the upcoming 2015 Endangered Species Act (ESA) listing decision. A settlement agreement, rather than a transparent public process, determined the date of that decision. Moreover, there was no opportunity for public input or comment on the Sage Grouse Conservation Objectives Team Report.

1) The COT Report is not a scientific document.

1.1) The COT Report is not a scientific document, as there are no original data or quantitative analyses used in developing the report, nor is there a comprehensive and unbiased review of *all* of the available scientific literature. Instead, the COT Report provides a limited and selective review of the scientific literature and unpublished reports on sage grouse as a basis for its conservation objectives and proposed actions. As a result, outdated information and beliefs are perpetuated in the COT Report (i.e. purported impacts are not necessarily representative of actual impacts due to less intensive energy development, newer technologies, and required mitigation measures).

1.2) As this is not a scientific document, it is incongruous that it was submitted for *"scientific peer review."* To date, copies of these peer reviews have been requested under the Freedom of Information Act (FOIA) but have not been made public by the USFWS.

2) The COT overstates some threats to sage grouse while downplaying others.

2.1) The COT Report made a number of dramatic statements about the status of sage grouse, such as the need to *"stop the bleeding "* (of projected population declines and habitat losses). However, the COT Report failed to acknowledge that in the 2010 ESA-listing decision, data from states revealed that there were an estimated 535,542 sage grouse occupying 13 states and provinces in western North America. Moreover, the COT Report omits any mention of hunting as the most well documented source of sage grouse mortality, with a documented 207,433 sage grouse killed between 2001 and 2007, and on-going sage grouse hunting continues to this day. In contrast, proposals are put forth to regulate activities that have never been shown to cause sage grouse population decline. The COT Report's approach elevates hypothetical threats to the level of real threats while selectively ignoring known sources of sage grouse mortality.

2.2) Predation, one of the most well documented threats to sage grouse, was not given adequate treatment by the COT Report. Only one citation was provided by the COT in support of predator management (Hagen 2011). That literature review was an incomplete source of information because:

2.2.1) It did not include all available significant information, including numerous papers that were available on the subject (especially predation by ravens) but were

not cited (these include: Boarman 1993; Boarman 2003; Boarman et al. 1995; Boarman and Heinrich 1999; Boarman et al. 2006; Bedrosian and Craighead 2010; Bui 2009; Cagney et al. 2010; Christiansen 2011; Coates 2007; Coates and Delehanty 2004; Coates et al. 2008; Coates and Delehanty 2010; Conover et al. 2010; DeLong 1995; Heinrich et al. 1994; Moynahan et al. 2007; Preston 2005; Ramey, Brown, and Blackgoat 2011; Snyder et al. 1986, Sovada et al. 1995; Watters et al. 2002; and Webb et al. 2009). One of the most significant research papers that was not cited was Coates and Delehanty (2004). They reported a 73.6% nest success when predators were managed compared to a mean of 42.6% when they were not managed, based on 14 studies from 1941-1997.

2.2.2) Hagen (2011) found fault with most studies that reported a positive effect from predator management rather than providing an impartial assessment. Only a single paragraph in Hagen (2011) was devoted to *"Predator Control as a Conservation Tool."*

2.2.3) Subsequently Hagen (2011) concluded that the effectiveness of managing predation on sage grouse was generally in the short term (although no long-term studies exist).

2.3) Additionally, the COT Report dropped the ranking of predation as a threat in Priority Areas for Conservation (PAC) in the final version of its report using the following rationale, *"Though threats such as infectious diseases and predation may be significant at a localized level, particularly if habitat quantity and quality is compromised, they were not identified by FWS as significant range-wide threats in our 2010 warranted finding (75 FR 13910)."* This statement, however, misrepresents the fact that the 2010 decision devoted three pages to predation as a threat to sage grouse, and that predation is a documented threat to numerous local sage grouse populations (see papers cited above). Therefore, predation needs to be included in any objective and complete analysis of threats to sage grouse.

2.4) The COT Report, like the NTT Report, treated this threat as a byproduct of human activities or habitat modifications that can be regulated. However, as noted in a review of the NTT Report, it is clear that *"such passive control will do nothing to reduce the immediate and long-term threat of high raven populations. In the same way, the NTT [and COT] Report's recommended conservation measures fail to address the fundamental fact that predators, such as ravens (a major predator on sage grouse eggs and broods), are heavily subsidized by humans, to the point where they exceed historic levels in some areas by as much as 1,500%. In such cases, management of some predator populations, especially where predators like ravens are abundant and sage grouse mortality is high, is needed to ensure that sage grouse populations are not depressed by a known and easily mitigated source of mortality."*

2.5) The COT Report's dismissal of the management of predators (because it only has *"been effective on local scales for short periods, but its efficacy over broad ranges or over long timespans has not been demonstrated"*) fails to mention that it was not attempted on a regional scale until 2012, when the USDA-APHIS Animal Damage Control began controlling ravens in landfills across southern Wyoming using the avicide

DRC-1339 at the request of the Wyoming Game and Fish Dept. (Wyoming Game and Fish 2012a, USDA/APHIS/Wildlife Services 2013). Large raven populations were found to cause a variety of health and safety problems at landfills and industrial sites, and the food subsidy that ravens gain from these also resulted in a higher than natural population density. Large-scale raven control at those sites was implemented after extensive research and review of the literature and data (Wyoming Game and Fish 2012a, USDA/APHIS/Wildlife Services 2013).
If the USFWS relies on the COT Report's limited and selective evaluation of threats, it would be ignoring a major body of scientific literature on raven predation and experimental data on predator management.

3) The population predictions used in the COT Report's threats analysis were based on an analysis that contains methodological bias and error.

3.1) The COT Report's threats analysis, population definitions, current and projected numbers of males, and probability of population persistence, are entirely based on the paper by Garton et al. (the 2009 and 2011 versions of this paper are virtually identical). It is the most frequently cited paper in the COT Report and the basis of population predictions in the USFWS 2010 listing decision, where it was cited it 62 times. Other scientists who have reviewed Garton et al. (2009, 2011) have reported serious methodological biases and mathematical errors in that paper (see reviews commissioned by the Colorado Division of Wildlife and summarized by CESAR 2012; copies of the reviews and report by CESAR are attached). It is unconscionable, and indicative of an inadequate peer review and editorial process, that all of the reviewer comments were ignored by the USFWS in the 2010 listing decision and in the final published version of Garton et al. (2011). The data and programs used in that highly influential paper are not public, and therefore, the results are not reproducible.

4) The COT Report's ranking of threats to populations and Sage Grouse Management Zones is subjective.

4.1) There is no evidence of any reproducible, quantitative methodology used in assigning rankings to threats in each population and sage grouse management zone (Table 2), or in discussion of specific PACs in Appendix 1. Instead, the ranking of threats in the COT Report is entirely subjective.

4.2) The ranking of threats in the draft COT Report was initially determined by a vote count of opinions of COT members, with the treats ranked from A through H, depending upon the presumed "severity" of the threat and how "imminent" the threat was (Table 1, below). "Unknown" was a category used in both reports for the cases of inadequate information. In the final COT report however, the ranking system changed. In most, but not all, cases the draft COT threat rankings of A to D (or *"substantial, imminent"* to *"moderate, non-imminent"),* and F to G (or "widespread, low severity" and "slight threat", were collapsed in the final COT Report of "Y" (or *the "threat is present and widespread"*). The draft COT Report threat ranking of "E" (or threat *"localized,*

substantial" was made equivalent to "L" (or *"threat present but localized*") in the final COT Report. And a draft COT Report ranking of "H" (or "unthreatened") became "L" (or *"threat present but localized").*

Table 1. Comparison of threat rankings from Table 2 of the draft and final COT Reports.	
Draft COT Report	**Final COT Report**
A = Substantial, Imminent	Y = threat is present and widespread
B = Moderate, Imminent	Y = threat is present and widespread
C = Substantial, non-imminent	Y = threat is present and widespread
D = Moderate, Non-imminent	Y = threat is present and widespread
E = Localized, Substantial	Y = threat is present and widespread
F = Widespread, Low Severity	Y = threat is present and widespread
G = Slight threat	Y = threat is present and widespread, or L = threat present but localized
H = Unthreatened	L = threat present but localized, or N = threat is not known to be present
U = Unknown	U = Unknown

4.3) The COT Report does not present any data that could be used in a rigorous evaluation of the threats. There is no evidence that any quantitative methodology was used to assign rankings in the final COT Report such that an independent reevaluation of the rankings would be reproducible. Moreover, these new rankings were not consistently applied. For example, the new ranking of "L" (*"threat present but localized*") in the final COT Report was applied to the Wyoming Basin population for the threats of mining, and conifers, even though the previous category was "H" ("unthreatened"). This arbitrary reassignment of threat ranking between drafts elevated the perceived threat level to this population and others. Similarly, the final COT Report assigned the previous threat category of "G" ("slight threat") to either "Y" (*"threat is present and widespread"*) or to "L" (*"threat present but localized*").

If threats are to be evaluated objectively for each population, then data and reproducible methodologies are required, rather than subjective assessments used in COT Report.

5) Population trends are to be determined using substandard data and methods.

5.1) The COT proposes that no credit be received for restoration efforts until there is demonstrated sage-grouse use or positive population trend. However, the COT says nothing about: 1) how many years of monitoring will be required to show positive trends, 2) how much of a population increase would be required, 3) how these data would be

adjusted for natural population fluctuations and the uncertainty of statistically invalid trends estimated from only counting males at a nonrandom sample of leks.

5.2) Of the three issues above, the most critical one that the COT does not acknowledge is the fact that male lek counts provide only a crude, non-random, and statistically-invalid estimate of population trends. These issues are well documented (Walsh et al. 2004; WAFWA 2008). Statistically robust alternative methods exist for estimating population trends (i.e. the sentinel lek count method or stratified random sampling, as proposed and tested by Garton et al. 2007); however, the COT makes no mention of this superior method or alternatives. The continued use of this substandard method for gathering data and estimating population trends compromises the ability of any interested party to objectively evaluate the effectiveness of conservation measures undertaken to benefit sage grouse. That lack of resolution translates into the potential for *no credit* to be given for restoration and mitigation efforts (because the resolution is inadequate to determine if these conservation measures result in positive changes to sage grouse populations).

6) The COT proposes calling out the Air National Guard to protect sage grouse habitat and hypothetical "connectivity corridors."

6.1) The COT proposes to: *"Implement policy changes that allow access to more fire suppression resources, such as Air National Guard Mobile Airborne Firefighting Units"* to *"immediately suppress fire in all sagebrush habitats."* This includes the suppression of fires in so-called *"identified connectivity corridors."* However, these corridors are hypothetical only and have not been documented in the wild. If implemented, this policy change could represent an arbitrary, capricious, and scientifically unreasonable agency action. Moreover, such a misallocation of resources could elevate the protection of sagebrush above the health and safety of humans. It is also contrary to the Air National Guard's stated peacetime mission, which is to, *"provide protection of life, property and preserve peace, order and public safety."*

6.2) The COT also recommends other agency actions to prioritize suppression of fire in sage brush, without evaluation of the annual cost or the degree to which they would compromise the protection of human health and safety. These actions would unreasonable if they do not explicitly put human health, safety, and property first. The proposed actions include:

> *"b. Re-allocate fire response resources (crews, equipment, etc.) to important sage-grouse habitats. Identify where resources are lacking and provide those resources to decrease response time to fires in sage-grouse habitats."* With firefighting resources unquestionably stretched thin across the western United States, it is both unreasonable and irresponsible for the COT to propose that these critical resources be allocated to protecting sage-grouse habitat.
>
> *"c. Establish defensible fire lines in areas where: (i) effectiveness is high, (ii) fire risk*

is likely, and (iii) negative impacts from these efforts (e.g. fragmentation) are minimized. Avoid use of any vegetative stripping in healthy, unfragmented habitats, unless fire conditions and local ecological conditions so warrant." This is another unreasonable and irresponsible COT recommendation. Wildland fire containment primarily occurs as a result of cutting firelines (removing vegetation) with machinery and hand tools, except in cases where natural features such as roads, or in rare cases, wetline can be used to contain the fire or set backfires.

"d. Carefully consider the use of backfires within PACs to minimize the potential for escape and further damage to sage-grouse and sagebrush habitats." This is another unreasonable and irresponsible COT recommendation. The decision to set backfires as a control measure during a wildland fire is the responsibility of the Incident Commander, whose primary objectives are extinguishment and the protection of life and property, not sage-brush.

"f. Remove pinyon-juniper stands which are highly flammable (stands where trees are the dominant vegetation and the primary plant influencing ecological processes (Phase 3; Miller et al. 2008)) in low elevation sagebrush habitats." This is a worthwhile objective, although primarily from the perspective of increasing the availability of sage grouse habitat in areas that have been limited by pinyon-juniper encroachment (Miller et al. 2011).

"h. Provide incentives for suppressing fires in sagebrush habitats." The COT provides no examples of what such incentives would include.

"i. Federal land management agencies should consider placing additional firefighting resources and establish new Incident Attack Centers in or adjacent to PACs." This is another unreasonable and irresponsible COT recommendation that would result in the reallocation of wildland firefighting resources away from locations where they have been sited to protect human health, safety, and property.

7) The COT Report proposes "enforceable temporary measures."

7.1) The COT Report proposed that if adequate regulatory mechanisms cannot be implemented by specific deadlines, *"then enforceable temporary measures should be considered in order to ensure threats will be at least temporarily ameliorated until such time that an effective regulatory mechanism can be implemented."* However, the COT Report fails to mention what those "enforceable temporary measures" would include, which agency would be charged with enforcing them, if they would be enforced on private land, or the criteria that would be used to determine if they are an *"adequate regulatory mechanism."* The language of the COT Report is similar to that of activists and litigants, who in 2012, called upon the Western Governors for an "*enforceable interstate compact to effectuate their collective commitment to sage-grouse conservation" and "regulate private land uses that threaten Sage-grouse."* And that these

enforceable measures be imposed *"to ensure that private land owners meet their stewardship obligations for sage-grouse."*

7.2) An unintended consequence of the COT Report is that it provides an administrative record that litigants can then use in court to argue that additional regulation is needed for sage grouse. The fact that the COT fails to provide any detail on enforceable measures leaves open their interpretation to the Court. The COT, by failing to provide detail and guidance, has effectively abrogated its stated responsibility to *"serve as guidance for federal land management agencies, state sage-grouse teams, and others in focusing efforts to achieve effective conservation for this species."*

8) The ESA requires that decisions must be based upon best available scientific and commercial data, and not "best available science."

8.1) The COT states that, *"All proactive voluntary conservation efforts should use the best available science."* However, to be consistent with the ESA and the IQA, this language needs to be changed to *best available scientific and commercial* ***data***.

8.2) Although the COT makes the claim that it lists, *"sources of data used by states to develop Priority Areas for Conservation (PAC) maps for each state,"* no details on the data files were provided. Lacking are the location of where these data are archived, who is responsible for curation, the conditions under which those data were shared with the COT, and attributes of these data (i.e. methods of collection and associated metadata). In short, while the COT makes claims about how *"this report delineates reasonable objectives, based upon the best scientific and commercial data available at the time of its release,"* none of the cited sources of data are publicly accessible. It is a violation of the IQA that the underlying data used in such a highly influential document are not specified, or available for independent analysis by informed members of the public.

9) The COT uses new, subjective terms to evaluate risks to sage grouse.

9.1) The COT Report uses new, subjective terms from the *Significant Portion of the Range Polic*y to qualitatively describe the status of populations of a species being considered for ESA listing: *redundancy*, *resiliency*, and *representation*. To this list, the COT added a new, subjective term: *resistance*. None of these terms are quantifiable and all are open to arbitrary interpretation. Others have also recognized this deficiency and have pointed it out to the USFWS.

For example, the following is an excerpt from Alaska Oil and Gas Association and American Petroleum Institute's comments on *Draft Policy on Interpretation of the Phrase "Significant Portion of its Range" in the Endangered Species Act's Definitions of "Endangered Species" and "Threatened Species," Docket No. FWS-R9-ES-2011-0031:*

Develop and Incorporate Quantifiable and Objective Standards

The Draft Policy does not provide a uniform or quantifiable standard for interpretation of the SPR language, including the term "significance." Instead, the Services have chosen to rely on qualitative criteria:

We evaluate biological significance based on the principles of conservation biology using the concepts of redundancy, resiliency, and representation (Schaffer and Stein 2000). These concepts also can be expressed in terms of the four viability characteristics used more commonly by NMFS: Abundance, spatial distribution, productivity, and diversity of the species. Resiliency (abundance, spatial distribution, productivity) describes the characteristics of a species that allow it to recover from periodic disturbance.

76 Fed. Reg. at 76994. API and AOGA are concerned that proposed SPR Policy may purposefully avoid quantifiable standards and thresholds, using definitions that fail to provide objective, repeatable method(s) for evaluating listing decisions. In our view, this approach puts species conservation at a disadvantage, results in unnecessary litigation, and places a heavy burden on society. The Services have an opportunity here to define the criteria by which species are listed more precisely, place more limited and quantifiable definitions on disputable terms, and insure that ESA listing decisions are based on scientific evidence.

This concern is shared by scientists and agency staff, including those involved in listing decisions (D'Elia and McCarthy 2010). Those authors clearly articulated the problem:

The imprecision of terms leaves broad latitude for determining which species fit into a particular category. That latitude, although seen by some as providing flexibility to address a wide variety of individual circumstances, can result in subjective rather than repeatable or transparent decisions (USDOI 2007). Failure to clearly articulate how vulnerability assessment decisions are made undermines their credibility and erodes public confidence in the agencies responsible for developing the assessments (Shelden et al. 2001, USDOI 2007). Moreover, this lack of clarity can result in litigation (e.g., Western Watersheds Project v. Jeffrey Foss and Gale Norton, 2005), diverting resources from the implementation of species recovery actions, ultimately to the detriment of species conservation efforts.[1]

The scientific commentators also provided specific recommendations to address this issue. "To increase transparency and efficiency in imperiled species categorization systems, we recommend that the FWS and NMFS establish

[1] Jesse D'Elia and Scott McCarthy, *Time Horizons and Extinction Risk in Endangered Species Categorization Systems*, BioScience, 60(9):751-758 (2010), *available at* http://www.bioone.org/doi/full/10.1525/bio.2010.60.9.12.

quantitative criteria (including both time horizons and risk of extinction) for categorizing species as threatened or endangered (e.g., Gerber and DeMaster 1999, IUCN 2001, DeMaster et al. 2004) through policy or regulation." *Id.* Their specific recommendations for the development of these criteria are briefly listed below:

1. Establish time horizons based on explicit probabilities of endangerment.
2. Develop guidelines for using population viability analysis in categorization decisions.
3. Consider the desirable characteristics of species categorization systems.
4. Use a team approach and consult experts.

The authors conclude: "A case-by-case approach to explicitly defining analysis time horizons [as is done now] is likely to be plagued by inconsistencies in time horizons selected and the rationales for them. These inconsistencies increase the likelihood of capricious decision making and legal vulnerability (Office of the Solicitor 2009)." *Id.* And, "[e]stablishing an explicit framework for making categorization decisions gives a level of certainty and credibility to a process that is otherwise subject to political and socioeconomic influences." *Id.*

We urge the Services to act upon their recommendations before issuing a final SPR Policy.

9.2) We follow this analysis with a request to the USFWS: please provide quantitative definitions for "redundancy," "resiliency," and "representation" for use in the COT Report.

10) The COT Report promotes opened-ended research funding without acknowledgement of ongoing conflicts of interest.

10.1) The COT team calls for additional "key research" to resolve "uncertainties" in sage grouse management and for "effecting sage-grouse and sagebrush persistence." However, without a list of specific questions and how those answers would change management decisions, this is simply a *carte blanche* request for research funding. It subverts a conservation program into a long-term research program with no mention of how the research will be funded or who will decide how funding is to be allocated.

10.2) This issue is further exacerbated by the fact that much of the "science" being relied upon by the USFWS and BLM in decision making on sage grouse was produced by a small number of sage grouse researchers. These researchers write papers together and review each other's work (including their own) and subsequently serve on the highly influential NTT and COT teams (CESAR 2012). This is inconsistent with accepted scientific practice and the Department of Interior's information quality guidelines. Instead, the COT needs to foster greater independence by suggesting *"key research*

projects" and then allowing an independent scientific and policy team to prioritize and solicit competitive proposals. Such an approach would avoid any appearance of cronyism.

11) The COT Report does not evaluate any of its proposed conservation actions under the Policy for Evaluation of Conservation Efforts When Making Listing Decisions (PECE).

11.1) To date, the USFWS has avoided mention of which conservation measures would meet the PECE requirement or any quantitative criteria by which they could be objectively evaluated. This leaves open to question the effectiveness of numerous conservation actions that have been recommended by the COT (and the NTT).

The COT report is notable (in comparison to the NTT Report) in recommending that conservation plans should *"use local data on threats and ecological conditions, including status of local sage-grouse populations and their associated habitats."* However, the COT Report fails to acknowledge the practical limitations of obtaining population trend data and how such data limitations could ultimately have the unintended consequences of justifying *"enforceable temporary measures,"* or preventing the allocation of credit for mitigation effort, simply because the data do not provide sufficient resolution (or statistical confidence) to detect increasing trends. It is scientifically unreasonable for the COT to require population monitoring as the basis of regulation, when it knows full well that the data and methods for estimating population trends are inadequate for the task.

11.2) The COT Report's proposed objective to "*Develop and implement proactive, voluntary conservation actions,"* is consistent with numerous papers by ESA scholars. The COT also proposes that *"Sage-grouse conservation strategies should consider using the criteria identified in the FWS/NOAA Fisheries Policy for Evaluation of Conservation Efforts (PECE) when Making Listing Decisions (Federal Register/Vol. 68, No. 60/Friday, March 28, 2003; Appendix B) to help evaluate its likely implementation and effectiveness."* However, the COT Report does not provide a single example of a sage grouse conservation plan that is consistent with the PECE Policy. Nor does it appear than any sage grouse conservation plans have been approved by the USFWS. To date, the USFWS has not provided specific comment on conservation plans (that this reviewer was able to find), such that local agencies may at least be assured of approval under PECE if the plans are modified in specific ways to suit the USFWS. Thus, there is no reasonable assurance that the substantial investments that state and local governments, or private landowners, have undertaken can be expected to secure a PECE approval.

Similarly, there is no assurance from the USFWS that specific conservation measures recommended in the COT or NTT reports (both of which include USFWS staff as authors), if adopted, would meet the PECE policy.

12) The COT Report erroneously evaluates threats using a single category for all

energy production, despite substantial differences in the type and permanence of impacts.

12.1) The COT Report does not acknowledge the fact that renewable energy projects (wind, solar, and geothermal) have a uniformly permanent impact on the landscape (solar arrays and wind turbines), while oil and gas development has a mix of temporary and permanent impacts. Blending these two vastly different types of energy production into one threat category is contrary to the best available scientific and commercial data, and counter-productive to sage grouse conservation (because specific threats and their underlying cause and effect mechanisms are not adequately addressed).

12.2) Furthermore, while projected oil and gas development were based on *actual* well data, known oil and gas deposits, and lease sales that overlap sage grouse habitat, wind development is primarily based on undeveloped and unleased commercial wind *potential* (i.e. as in Doherty et al. 2011). Thus, it is erroneous for the COT Report to base its threats ranking, and for the USFWS to base its policy decisions, on a combined analysis of two vastly different types of energy development, one of which is primarily based on speculation.

12.3) In order to be unbiased, the COT Report should have analyzed the two types of energy development separately, then overlaid their projected impacts to sage grouse in a common unit that reflects each development's impact(s) to sage grouse.

13) Two examples are provided below of erroneous information used in the COT Report's Appendix A - Management Zone And Population Risk Assessments. This appendix detailed the threats to each PAC and population listed in Table 2 of the COT Report. The issues raised in the following examples apply to other populations as well.

13.1) How the COT Report's review of quasi-extinction risks and population trends uses erroneous information: An example from the Powder River Basin review**.**

As an initial matter, both of the cited papers, Garton et al. (2011) and Taylor et al. (2012) were modeling exercises based upon lek count data (discussed previously in this review), and as a result, estimates derived from those data have extremely large errors and low statistical confidence. Garton et al. (2011) made predictions for sage grouse populations across the West, 30 and 100 years into the future, starting from 2007. However, the models used to develop these predictions had extremely low resolution. For example, the 26 models used by Garton et al. (2011) had adjusted r^2 values ranging from 0 to 0.682, and the next closest value was 0.498, and the average r^2 was only 0.257. This indicates that the models, on average, did not explain 75% of the variation in the data sets. (In the case of the Powder River Basin the r^2 was only 0.315). Adding to this error, neither Garton et al. (2011) nor Taylor et al. (2012) accounted for the effect of documented population fluctuations that are the result of climatic fluctuations (i.e. Wyoming Game and Fish 2012b; Blomberg 2012) on their trend estimates.

Taylor et al. (2012) used data from 2003 to 2009, a period of population fluctuation that peaked in 2006 and then declined (a fact not mentioned by Taylor et al. (2012) nor acknowledged by the COT Report). This omission is relevant because the study period began in 2003 during the low point of a population fluctuation, continued through a population peak in 2006, and ended with a downward trend in 2009, potentially biasing results.

It is also significant that Taylor et al. (2012) contains a number of overstatements and omissions. For example, *"Findings reflect the status of a small remaining sage-grouse population that has already experienced an 82% decline within the expansive energy fields (Walker et al. 2007a), a level of impact that has severely reduced options for delineating core areas that are large enough and in high enough quality habitats to sustain populations."* However, while this statement is dramatic, the reality of the situation is quite different. Walker et al.'s (2007) estimates had confidence intervals so large that they render the estimates meaningless (i.e., a rate of increase in coal bed methane fields of 0.65 with a 95% confidence interval between 0.34 and 1.25, as 34 to 125% annual increase). Furthermore, although male lek counts declined from 2001 through 2004, they rebounded in 2005. This was an observation not acknowledged in Taylor et al. (2012) but consistent with sage grouse population fluctuations statewide (Wyoming Game and Fish 2012b).

COT Report stated that, *"Garton et al. (2011) reported a minimum male count for this population at 3,042."* However, Garton et al. (2011) included two different numbers for male sage grouse counted in the Powder River Basin in 2007, a discrepancy: *"The Gompertz model with declining time trend implies the Powder River population of sage-grouse will fluctuate around carrying capacity which will decline from **3,042** males attending leks in 2007 to only 312 males attending leks in 2037 to going extinct with only two males attending leks in 2107 if this trend continues at the same rate in the future. The 2007 count of **5,397** males is estimated to be about 2,000 males higher than the carrying capacity of the region."*

Both Garton et al. (2011) and Taylor et al. (2012) used model selection procedures. As described by Taylor et al. (2012) in simple terms, their results were derived *"using a statistical technique (AIC) that is akin to using a dial to tune a radio to pick up the strongest signal."* However, in equally simple terms it can be argued that model selection procedures, like the strongest signal on a radio dial, is not necessarily where the most accurate information comes from.

13.2) How the COT Report relies on erroneous information for priority habitat mapping and evaluation of threats: An example from the Colorado Plateau Management Zone and associated PACs.

Regarding the Colorado Plateau Management Zone and Parachute-Piceance-Roan PAC, the COT Report states, ***"Priority habitats are well mapped and include all high use habitat (which includes breeding, summer, and winter habitat within 4 miles of all***

known leks) and linkage zones to Management Zone 2 to the north. There is no known connectivity with Utah *(Management Zone 3 to the west) due to natural habitat fragmentation and large areas of nonhabitat."* This is in error. There are genetic data that provide evidence of connectivity to Utah contained in Apa (2010). And, as discussed below, the priority habitats are not "well-mapped" but mapped at low resolution and contain large areas of non-habitat and marginal habitat.

The COT Report states, ***"****The Parachute-Piceance-Roan Basin population appears to be captured within priority areas for conservation, and representation appears to be captured adequately. Priority areas for conservation capture 60 percent of the occupied range in this population and also include 100 percent of all known active leks and all habitats that were modeled "high probability of use" within four miles of a lek that has been active in the last 10 years."* This statement is a misrepresentation of the best available scientific and commercial data. First, the COT does not mention the fact that the PAC contains large areas of marginal habitat and non-habitat in a naturally fragmented landscape produced by dense conifer and aspen stands, shrubs, meadows, and rugged topography. High-resolution vegetation mapping (hyperspectral data) and modeling of the PPR sage grouse habitat (using habitat parameters specific to the PPR population) by Garfield County (2012), and previously by Heather Sauls in Garfield and Rio Blanco Counties (2008), both concur with this conclusion. These two habitat-mapping efforts were based on best available data in the public domain. When compared to the low resolution PAC map for the PPR population, these analyses show that approximately 80% of the mapped PAC is non-habitat. Second, the location data upon which the low-resolution Preliminary Priority Habitat Map is based (produced by the Colorado Parks and Wildlife), are not in the public domain, and there is no written assurance that they ever will be accessible for independent review and reanalysis. Furthermore, requests for these data under legally binding data-share and non-disclosure agreements have been met with refusal by CPW. Thus, the CPW maps of the PPR and northwestern Colorado used by the COT, and by the BLM in its RMP revisions (including maps based upon Rice et al. 2012 where the data are scaled down to 1-km grid cells resulting in a massive 4,000% loss of information, are not reproducible). Use of these maps by federal agencies as a basis for decision-making is a clear violation of the Information Quality Act requirements.

The COT Report fails to mention the inconsistency in definition of an "active lek" between that used in the scientific literature and that used to map the PPR PAC. The scientific literature defines an active sage grouse lek as locations where two or more males have been observed and documented actively courting females in the last two years (Doherty et al. 2011). The "active lek" criteria applied to the PPR for habitat maps used by the COT is: a site where at least one male was observed lekking within the *past 10 years* (whether the lek was surveyed or not before or following that observation). Moreover, the COT Report does not acknowledge that the CPW lek-count and lek location data set for the PPR contain numerous missing cells, and that even locations where a single male was observed 7 years ago, with three years of missing data before that, is still considered an "active" lek. It is arbitrary, capricious, and scientifically unreasonable for federal agencies to use inconsistent definitions as a basis for regulatory

decisions, and for it to rely on such an arbitrarily low threshold. To further emphasize this point, if no males were in attendance at a lek for potentially nine years, then just how were the un-bred female sage grouse going to produce eggs and nest within 4 miles of that "active" lek? Clearly, immaculate conception has not been documented to occur in sage grouse.

The COT Report states, *"Redundancy is not captured within this population because it is relatively small (three year running average number of males is 93) and somewhat isolated."* The COT Report provides no genetic or dispersal data with which to conclude that this population is isolated from other nearby populations. The COT does not provide any quantifiable definition of "redundancy," nor any data with which to conclude that the population lacks "redundancy." However, genetic data and analyses do exist for northwestern Colorado and Utah that are contrary to this assertion. Those data have an especially large sample size for the PPR population (n=65). Those data and results (Apa 2010), not mentioned by the COT Report, reveal that levels of genetic diversity in mitochondrial DNA and microsatellite markers are comparable to other populations in Colorado, and there is extensive shared variation among populations. That study reported,

> *"This analysis of the PPR population compared with 5 other Greater Sage-grouse populations in Colorado revealed that the genetic make-up of PPR is generally consistent with the other 5 populations. Using mtDNA sequence data, 5 of the 8 haplotypes found in PPR (66% of the PPR birds) were also found in the other populations in Colorado."*
>
> *"The mtDNA neighbor-joining network (Fig. 2), which was constructed using F_{ST} genetic distances among populations, suggests that PPR is more closely related to North Park, Cold Springs, and Blue Mountain, than to Middle Park and Eagle. The fact that PPR is not shown to have branch lengths longer than the other Colorado populations suggests that it is not genetically distinct from all other Colorado Greater Sage-grouse populations."*

Additionally, the levels of genetic variation are comparable to those in other populations in Colorado, and indistinguishable when the most appropriate measure; expected heterozygosity is used (as DNA obtained from feathers are more likely to contain closely related individuals and bias results towards heterozygote deficiency, making expected heterozygosity based on allele frequencies and more representative parameter).

The COT Report states, *"There is some potential for connectivity to the north to the Wyoming Basin population in Management Zone 2. Linkage habitats have been included in mapping efforts."* The data, however, are contrary to assertions made in the COT Report in justification of its arbitrary linkage habitat maps. Instead, the data reveal a broader genetic linkage, including nearby populations and in Utah. This conclusion is more consistent with recent genetic and GPS tracking studies that show sage grouse can disperse over much greater distances and over/around land uses that were previously thought to contribute to fragmentation (i.e. Bush 2009; Bush et al 2011; Tack et al. 2011; Thompson 2012). As noted previously in this review, linkage habitat maps used by the COT Report are purely speculative and cannot be relied upon as a basis for decision-making.

Data on lek locations and attending male numbers from Colorado Parks and Wildlife (CPW) show that currently active (2012) sage grouse leks occur on, or immediately adjacent to, roads, pipeline corridors, and well pads in the area. This is a direct contradiction to, and refutation of, assertions in the COT Report that, *"Representation and redundancy are at risk within this population due to its small size, energy development and the associated infrastructure, especially road development."* And, *"Advances in drilling technology and rapid natural gas demand and subsequent rising prices have led to a significant increase in natural gas drilling activity. Road and infrastructure are also ranked high as they are closely related to energy production."* While oil and gas development can contribute to sage grouse avoidance and mortality in specific ways (see review by Ramey, Brown, and Blackgoat 2011), it is counter-productive to conservation efforts for the COT Report to make wholesale negative assertions.

The COT states, *"A large majority of PACs are privately owned, mostly by energy companies. Energy and mineral development is the highest ranked threat to sage-grouse in this area."* However, the fact that much of the land in the PPR is privately owned by energy companies means that adequate funding is available for implementation of mitigation and habitat restoration efforts to benefit sage grouse populations. This has been the case for the Pinedale Planning Area of Wyoming, where oil and gas development, mitigation, *and* sage grouse numbers have all increased (lek count data from Wyoming Game and Fish). These are facts not acknowledged by the COT.

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