From:	Wiechman, Lief
To:	Norman, Kate
Subject:	Re: Kate meet Lief, Lief, Kate
Date:	Friday, November 01, 2013 3:55:12 PM
Attachments:	GRSG measures discussion v.7(TABLE).docx Activity Types and Definitions.docx

---

Hi Kate,

Here's a draft version of the metrics table we've worked on... It'll change after next week's discussions and I can provide you with updated versions if that helps. This is still under review from other agencies and the states.
Also attached is the 'in-progress' draft of the definitions.

LW

Lief Wiechman
Sage-Grouse Energy Biologist
U.S. Fish & Wildlife Service
Mountain-Prairie Region
5353 Yellowstone Road
Cheyenne, WY 82009
307.772.2374
lief_wiechman@fws.gov

On Fri, Nov 1, 2013 at 1:48 PM, Norman, Kate <kate_norman@fws.gov> wrote:

> Hi Lief!
>
> K
>
> P.S. I don't normally look like a zombie.
>
> On Fri, Nov 1, 2013 at 3:46 PM, DeBerry, Drue <drue_deberry@fws.gov> wrote:
>
> > Drue DeBerry
> > Sage-Grouse Energy Coordinator
> > U.S. Fish & Wildlife Service
> > 134 Union Blvd.
> > Lakewood, CO 80228
> > (303) 236-4264
> >
> > drue_deberry@fws.gov
>
> --
> Kate Norman, Biologist

Branch of Recovery and State Grants
U.S. Fish and Wildlife Service, Headquarters
4401 N. Fairfax Dr., Rm 420
Arlington, VA 22203
703-358-1871
kate_norman@fws.gov

THREAT	ACTIVITY	SUBACTIVITY	METRIC	COMMENTS
ISOLATED POPULATIONS, SUBPOPULATIONS / SMALL POPULATION SIZE				
ISOLATED POPULATIONS, SUBPOPULATIONS / SMALL POPULATION SIZE	Research	Genetic Analysis		Genetic analysis to understand population structure
		Identify Seasonal Habitats		Identify limiting habitats (if any exist) for isolated or small populations, and for subpopulations
		Identify Connectivity Corridors		Between Management Zones, PACs
		Identify Movement Patterns		Identify migratory status (1-stage, 2-stage, non-migratory)
	Regulatory Mechanisms, Plans, Policy	Development Siting		Establish protocols for project proponents to aid in pre-construction planning and siting of development (infrastructure, etc.) to avoid PACs, Preliminary Priority Habitat (PPH), and key seasonal habitats; or site properly (when avoidance is not feasible) to minimize impact and reduce fragmentation in PACs, PPH, and seasonal habitats.
		State Conservation Plans		
		Rehabilitation Plans		
		Conservation Strategy		Strategy to maintain connectivity between subpopulations and between PACs and within Management Zones

		Harvest Regulations and Monitoring		Remove population loss through harvest by reduction or cessation of hunting seasons.
		Minimization/ BMPs		
		Compensatory Mitigation – Conservation Banking/ Crediting Systems		
		Avoidance		
	Sagebrush & Habitat Protection	Area / Seasonal Closure(s)		
		Conservation Easement		Include only those easements that improve connectivity for small populations
		Land Purchase		Include only those easements that improve connectivity for small populations

		Incentives		
		Vegetation Management		
	Livestock & Rangeland Management	Area / Seasonal Closure(s)		
		Vegetation Management		
		Avoidance		
		Site Descriptions / State and Transition Models		
		Meadow Irrigation		
	Habitat Restoration / Mitigation	Vegetation Management		Include only those restoration projects that improve connectivity for small populations
		Seedings		

	Infrastructure Construction, Removal, and Modification	Development Siting		
		Fence Modification		
		Fence Marking		
		Fence Removal		
		Avoidance		
		Minimization/ BMPs		
		Compensatory Mitigation – Conservation Banking/ Crediting		
		Structure Removal		
		Powerline Removal		

		Powerline Retrofitting		
	Population Augmentation	Translocations		Age and sex breakdown should be required
		Monitoring		... in order to monitor the contribution to the host [sub]population.
	Predator Control			Targeted predator control to protect small isolated populations that are vulnerable to near-term extinction.
				Targeted predator control to protect small isolated populations that are vulnerable to near-term extinction.

SAGEBRUSH ELIMINATION				
THREAT	**ACTIVITY**	**SUBACTIVITY**	**METRIC**	**COMMENTS**
SAGEBRUSH ELIMINATION	Research	Identify Seasonal and Limiting Habitats		Need to understand winter use areas
	Regulatory Mechanisms, Plans, Policy	Development Siting		
		State Conservation Plans		
		Rehabilitation Plans		Restore altered ecosystems such that non-native invasive plants are reduced to levels that do not put the area at risk of conversion if a catastrophic event were to occur. This is especially important within Wyoming big sagebrush communities as these cover types are the most at risk to displacement by cheatgrass (Wisdom et al. 2005). While complete elimination of non-native invasive plants would be ideal, we acknowledge that this is unlikely given our current understanding of underlying ecological processes, shifts in climate, and lack of resources.
		Conservation Strategy		Emphasis on protecting large expanses of contiguous sagebrush, and reducing or eliminating the use of fire as a habitat management tool in low precipitation zones with low resiliency to annual grass invasion.
		Urban Zoning		Work with states and counties to zone areas of priority habitat to limit development, habitat loss.
		Avoidance		Report surface disturbing activities that were deferred from PACs, PPH

	Sagebrush & Habitat Protection	Conservation Easement		If available, report the types of seasonal habitat(s) protected through agreement
		Land Purchase		
		Incentives		Incentives for maintaining or enhancing habitat in PACs.
		Surface Disturbance Avoidance		
		Area / Seasonal Closure(s)		
		Vegetation Management		
		Fuel Breaks / Fuel Management		
				Maintain a balance between nesting, brood-rearing, and winter habitat
	Livestock & Rangeland Management	Area / Seasonal Closure(s)		

		Site Descriptions / State and Transition Models		
		Grass Banks		
	Habitat Restoration / Mitigation	Vegetation Management		Ensure sage-grouse habitat needs are considered in restoration efforts including managing for the range of variation, as appropriate for the local area
		Seedings		Address shortage of locally-adapted seed and storage capabilities.
				Apply available seed where it is most likely to be effective and to areas of highest need.
	Habitat / Veg Treatment	Fuel Breaks / Fuel Management		
		Aerial seeding		
		Drill seeding		
		Plantings		

	Infrastructure Construction, Removal, and Modification	Development Siting		
		Structure Removal		
		Powerline Removal		
		Powerline Retrofitting		
	Recreation Management	Area Closure(s)		
		Enforcement		

AGRICULTURAL CONVERSION				
THREAT	**ACTIVITY**	**SUBACTIVITY**	**METRIC**	**COMMENTS**
AGRICULTURAL CONVERSION	Regulatory Mechanisms, Plans, Policy	Development Siting		
		State Conservation Plans		
		Zoning		Work with counties and states to restrict and/or reduce agriculture conversion in planning and zoning efforts.
		Conservation Strategy		Strategy to avoid agricultural conversion of sage-grouse habitat
		Avoidance		
				Develop and/or enforce state restrictions on agriculture conversion on state lands
	Sagebrush & Habitat Protection	Development Siting		
		Conservation Easement		

		Land Purchase		
		Incentives		Protect existing habitats on private lands through conservation agreements
				Revise Farm Bill policies and commodity programs that facilitate ongoing conversion of native habitats to marginal croplands (e.g., through the addition of a 'Sodsaver' provision), to support conservation of remaining sagebrush-steppe habitats.
				Develop criteria for set-aside programs which stop negative habitat impacts and promote the quality and quantity sage-grouse habitat.
				If lands that provide seasonal habitats for sage-grouse are taken out of a voluntary program, such as CRP or SAFE, precautions should be taken to ensure withdrawal of the lands minimizes the risk of direct take of sage-grouse (e.g., timing to avoid nesting season). Voluntary incentives should be implemented to increase the amount of sage-grouse habitats enrolled in these programs
		Surface Disturbance		
		Vegetation Management		

FIRE				
THREAT	**ACTIVITY**	**SUBACTIVITY**	**METRIC**	**COMMENTS**
FIRE	Research	Identify Seasonal Habitats		This will help in appropriate prepositioning of resources and prioritizing areas for suppression and restoration
		Weather Augmentation		Utilize weather augmentation (cloud seeding) in rehabilitation efforts post fire in strategic locations where a modest increase could improve germination success significantly.
		Strategic placement of pre-suppression treatments for SG habitat protection		
		Techniques to increase success of post-fire restoration		
		Site Descriptions / State and Transition Models		Areas that are in an invaded state that will likely transition to a cheatgrass monoculture if a disturbance occurs and are located within or near sage-grouse habitat should be prioritized for restoration efforts to increase resistance and resilience.
		Mapping [previous burns, restoration efforts, high risk areas]		Identify high risk fires areas
	Regulatory Mechanisms, Plans, Policy	State Conservation Plans		Develop prioritized pre-suppression plans that focus on priority sage-grouse habitat in and near PACs, similar to the Wildland Urban Interface planning analysis.
		Rehabilitation Plans		Develop plans and acquire the necessary resources (e.g. seed collection, seeding equipment pools, trained staff, etc.) for post fire rehabilitation activities and warehouse viable seed stockpiles.

				Design and implement restoration of burned sagebrush habitats to allow for natural succession to healthy native sagebrush plant communities. This will necessitate an intensive and well-funded monitoring system for this long-term endeavor. To be considered successful, restoration must also result in returning or increasing sage-grouse populations within burned areas.
		Conservation Strategy		Restrict or contain fire within the normal range of fire activity (assuming a healthy native perennial sagebrush community), including size and frequency, as defined by the best available science.
				Immediately suppress fire in all sagebrush habitats. Where resources are limited, these actions should first focus on PACs and any identified connectivity corridors between PACs.
	Sagebrush & Habitat Protection	Incentives		Provide incentives for suppressing fires in sagebrush habitats.
		Surface Disturbance		
		Area / Seasonal Closure(s)		
		Vegetation Management		
		Fuel Breaks / Fuel Management		Eliminate intentional fires in sagebrush habitats, including prescribed burning of breeding and winter habitats.

				Development and use of ACK-55
	Livestock & Rangeland Management	Vegetation Management		Address degraded sagebrush systems before fire occurs (e.g., improve grazing systems).
		Meadow Irrigation		Manage for the maintenance and, where necessary, restoration of healthy perennial grass (Blank and Morgan 2012) and sagebrush vegetative communities.
	Fire: Presuppression	Seasonal Closure		Seasonal closure to reduce fire risk, Close rangelands that are highly susceptible to fire to OHV use during the fire season
		Area Closures(s)		Manage land uses (e.g., improper livestock grazing, OHV and recreational use, roads) to minimize the spread of invasive species and or facilitate fire ignition. Close rangelands that are highly susceptible to fire to OHV use during the fire season
		Vegetation Management		Manage vegetation to reduce fuel loads in or near PACs or important habitat
				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.
				Manage for the maintenance and, where necessary, restoration of healthy perennial grass (Blank and Morgan 2012) and sagebrush vegetative communities.

		Preposition Resources		Pre-positioning available resources to suppress fire in key habitats with forecasted as high threat (this may be informed by the identification of seasonal and limiting habitats in each PACs). 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.
		Fuel Breaks / Fuel Management		Federal land management agencies should consider placing additional firefighting resources and establish new Incident Attack Centers in or adjacent to PACs.
				Carefully consider the use of backfires within PACs to minimize the potential for escape and further damage to sage-grouse and sagebrush habitats
				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.
				Investigate possible use of anthropogenic features, such as transmission lines, trails, previous fire perimeters, utility right -of -ways, etc. as fire breaks so as to not create new disturbances on the landscape. Strategic placement of new fire breaks, green strips, and fuels reduction treatments in and near PACs.
	Fire: Suppression	Seasonal Closure		Seasonal closure to reduce fire risk
		Vegetation Management		Manage vegetation to reduce fuel loads in or near PACs or important habitat
		Preposition Resources		Pre-positioning available resources to suppress fire in key habitats with forecasted as high threat (this may be informed by the identification of seasonal and limiting habitats in each PACs).

		Fuel Breaks / Fuel Management		
				Investigate possible use of anthropogenic features, such as transmission lines, trails, previous fire perimeters, utility right -of -ways, etc. as fire breaks so as to not create new disturbances on the landscape. Strategic placement of new fire breaks, green strips, and fuels reduction treatments in and near PACs.
		Cross-jurisdictional Agreements		Establish and implement a framework across all land jurisdictions for pre-suppression actions to minimize ignitions and alter fuel conditions in order to avoid, to the greatest extent possible, large damaging conflagrations. Complete landscape level habitat assessments in, and in proximity to, priority sage-grouse habitat areas to identify those habitat areas that are at the highest risk of wildland fire and subsequent conversion to invasive annual grasses.
	Fire: Post-fire Restoration	Seasonal Closure		Seasonal closure to reduce fire risk
		Vegetation Management		Manage vegetation to reduce fuel loads in or near PACs or important habitat
		Fuel Breaks / Fuel Management		
				Investigate possible use of anthropogenic features, such as transmission lines, trails, previous fire perimeters, utility right -of -ways, etc. as fire breaks so as to not create new disturbances on the landscape. Strategic placement of new fire breaks, green strips, and fuels reduction treatments in and near PACs.
		Restoration Monitoring		Implement monitoring programs for restoration activities. To ensure success, monitoring must continue until restoration is complete (establishment of mature, healthy native sagebrush plant communities), with sufficient commitments to make adequate corrections to management efforts if needed.

				Consider re-allocation of funding from other habitat work to restoration of sage-grouse habitats affected by fire
				In the case of limited resources, prioritize PACs over habitats outside of PACs for restoration efforts.
				Ensure sage-grouse habitat needs are considered in restoration efforts including managing for the range of variation, as appropriate for the local area
		Aerial seeding		Encourage use of local, native or locally-adapted seed mixes, whenever possible, so seeded species can compete. If local, native seeds are unavailable or impractical for site conditions, prioritize use of native and then locally-adapted seeds. Strategic placement of restoration efforts, likely success, may restore naturally, etc. Encourage use of appropriate local seed mixes, natives can compete.
		Drill seeding		
		Planting plugs		
		Burn Severity Assessments		Complete burn severity assessments and identify ecological site potential in, and in proximity to, PACs to identify the areas with the highest potential for restoration of habitat functions following fires. Focus rehabilitation efforts on areas of highest potential success based ecological site conditions (soils, precipitation zone, and geography).
	Habitat / Veg Treatment	Area / Seasonal Closure(s)		

		Vegetation Management		
		Preposition Resources		
		Fuel Breaks / Fuel Management		
		Rehabilitation Plans		
		Aerial seeding		
		Drill seeding		
		Planting plugs		
	Conifer Removal	Fuel Breaks / Fuel Management		

		Mechanical Conifer Removal (Stage 1&2)		
		Mechanical Conifer Removal (Stage 3)		
		Prescribed Fire (Stage 3)		
		Natural Fire (Stage 3)		
	Recreation Management	Area / Seasonal Closure(s)		
		Enforcement		

CONIFER ENCROACHMENT				
THREAT	**ACTIVITY**	**SUBACTIVITY**	**METRIC**	**COMMENTS**
CONIFER ENCROACHMENT	Regulatory Mechanisms, Plans, Policy	State Conservation Plans		
		Conservation Strategy		Priority areas for conifer removal identified?
	Conifer Removal	Mechanical Conifer Removal (Stage 1&2)		
		Mechanical Conifer Removal (Stage 3)		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.
		Prescribed Fire (Stage 3)		
		Natural Fire (Stage 3)		

NOXIOUS WEEDS / ANNUAL GRASSES / INVASIVE SPECIES				
THREAT	**ACTIVITY**	**SUBACTIVITY**	**METRIC**	**COMMENTS**
NOXIOUS WEEDS / ANNUAL GRASSES / INVASIVE SPECIES	Research	Development and use of ACK-55		
		Identify Seasonal and Limiting Habitats		
		Develop protocols for rehabilitation efforts that are more effective, more often		Stat and Transition Models
	Regulatory Mechanisms, Plans, Policy	State Conservation Plans		Retain all remaining large intact sagebrush patches, particularly at low elevations.
		Rehabilitation Plans		Monitor and control invasive vegetation post-wildfire for at least three years.
		Conservation Strategy		Require best management practices for construction projects in and adjacent to sagebrush habitats to prevent invasion.
		Mapping [known infestations]		Create sole source mapping, treatment, revegetation, etc. on both public and private lands.
				Evaluate allotments that are predominately Wyoming big to determine how grazing management practices are promoting native perennial grass and forb community health as well as maintaining or enhancing soil biotic crusts Identify allotments with cheatgrass and/or other invasives to minimize transfer of livestock to 'uninvaded' parcels.

	Sagebrush & Habitat Protection	Conservation Easement		
		Land Purchase		
		Incentives		
		Surface Disturbance		Reduce or eliminate disturbances that promote the spread of these invasive species, such as reducing fires to a “normal range” of fire activity for the local ecosystem, employing grazing management that maintains the perennial native grass and shrub community appropriate to the local site, reducing impacts from any source that allows for the invasion by these species into undisturbed sagebrush habitats, and precluding the use of treatments intended to remove sagebrush.
		Area / Seasonal Closure(s)		Manage land uses (e.g., improper livestock grazing, OHV and recreational use, roads) to minimize the spread of invasive species and or facilitate fire ignition.
		Vegetation Management		Where cheatgrass is predominantly present within the understory of sagebrush, utilize targeted grazing and potential seeding to reduce the threat of catastrophic fire and increase the potential resiliency of the understory.
		Fuel Breaks / Fuel Management		

	Livestock & Rangeland Management	Area / Seasonal Closure(s)		
		Vegetation Management		
		Avoidance		
		Site Descriptions / State and Transition Models		
	Fire: Presuppression	Area / Seasonal Closure(s)		
		Vegetation Management		
		Preposition Resources		
		Fuel Breaks / Fuel Management		
	Fire: Post-fire Restoration	Area / Seasonal Closure(s)		

		Vegetation Management		
		Preposition Resources		
		Fuel Breaks / Fuel Management		
		Rehabilitation Plans		Restore altered ecosystems such that non-native invasive plants are reduced to levels that do not put the area at risk of conversion if a catastrophic event were to occur. This is especially important within Wyoming big sagebrush communities as these cover types are the most at risk to displacement by cheatgrass (Wisdom et al. 2005). While complete elimination of non-native invasive plants would be ideal, we acknowledge that this is unlikely given our current understanding of underlying ecological processes, shifts in climate, and lack of resources.
		Aerial seeding		
		Drill seeding		
		Planting plugs		
		Burn Severity Assessments		

	Habitat Restoration / Mitigation	Area / Seasonal Closure(s)		
		Vegetation Management		Ensure sage-grouse habitat needs are considered in restoration efforts including managing for the range of variation, as appropriate for the local area
		Seedings		Address shortage of locally-adapted seed and storage capabilities.
				Apply available seed where it is most likely to be effective and to areas of highest need.
	Habitat / Veg Treatment	Area / Seasonal Closure(s)		
		Vegetation Management		
	Recreation Management	Area / Seasonal Closure(s)		
		Enforcement		

ENERGY DEVELOPMENT				
THREAT	**ACTIVITY**	**SUBACTIVITY**	**METRIC**	**COMMENTS**
ENERGY DEVELOPMENT	Regulatory Mechanisms, Plans, Policy	Development Siting		Avoid energy development in PACs (Doherty et al. 2010). Identify areas where leasing is not acceptable, or not acceptable without stipulations for surface occupancy that maintains sage-grouse habitats.
				Site planning outside of PACs, PPH, and important seasonal habitat to avoid disturbance. Avoid conflict by siting associated facilities (and activities) in non-habitat wherever possible.
				If avoidance is not possible within PACs due to pre-existing valid rights, adjacent development, or split estate issues, development should only occur in non-habitat areas, including all appurtenant structures, with an adequate buffer that is sufficient to preclude impacts to sage-grouse habitat from noise, and other human activities.
				If development must occur in sage-grouse habitats due to existing rights and lack of reasonable alternative avoidance measures, the development should occur in the least suitable habitat for sage-grouse and be designed to ensure at a minimum that there are no detectable declines in sage-grouse population trends (and seek increases if possible) by implementing the following:
				Reduce and maintain the density of energy structures below which there are not impacts to the function of the sage-grouse habitats (as measured by no declines in sage-grouse use), or do not result in declines in sage-grouse populations within PACs).
				Design development outside PACs to maintain populations within adjacent PACs and allow for connectivity among PACs.
				Design development to minimize tall structures (turbines, powerlines), or other features associated with the development (e.g., noise from drilling or ongoing operations; Blickley et al. 2012).
		State Conservation Plans		

		Rehabilitation / Mitigation Plans		Reclamation of disturbance resulting from a proposed project should only be considered as mitigation for those impacts, not portrayed as minimization.
		Minimization/ BMPs		
		Compensatory Mitigation – Conservation		
		Conservation Strategy / Avoidance		
			On-site planning to avoid disturbing PACs, leks.	
	Sagebrush & Habitat Protection	Conservation Easement		

		Land Purchase		
		Incentives		
		Surface Disturbance		
		Area / Seasonal Closure(s)		
		Vegetation Management		
	Habitat Restoration / Mitigation	Area / Seasonal Closure(s)		
		Vegetation Management		
		Seedings		

	Habitat / Veg Treatment	Area / Seasonal Closure(s)		
		Vegetation Management		
		Preposition Resources		
		Rehabilitation Plans		
	Infrastructure Construction, Removal, and Modification	Development Siting		
		Structure Removal		
		Powerline Removal		

		Powerline Retrofitting		
	Recreation Management	Area / Seasonal Closure(s)		
		Enforcement		

MINING				
THREAT	**ACTIVITY**	**SUBACTIVITY**	**METRIC**	**COMMENTS**
MINING	Regulatory Mechanisms, Plans, Policy	Development Siting		Avoid new mining activities and/or any associated facilities within occupied habitats, including seasonal habitats;
				Avoid leasing in sage-grouse habitats until other suitable habitats can be restored to habitats used by sage-grouse;
		State Conservation Plans		
		Mine Reclamation		Reclamation plans should focus on restoring areas disturbed by mining and associated facilities to healthy sagebrush ecosystems, including evidence of use by sage-grouse.
				Reclamation of abandoned mine lands should focus on restoring areas to healthy sagebrush ecosystems where possible.
		Minimzation/ BMPs		
		Compensatory Mitigation – Conservation Banking/ Credit Systems		
		Conservation Strategy / Avoidance		Site disturbance, development, and associated mining infrastructure (railroad lines, yards, spurs, outside of GRSG habitat).

				Strategic planning of lease sales outside of PACs
				On-site planning to avoid disturbing PACs, leks.
	Sagebrush & Habitat Protection	Conservation Easement		
		Land Purchase		
		Incentives		
		Surface Disturbance		
		Vegetation Management		

	Habitat Restoration / Mitigation	Area / Seasonal Closure(s)		
	Habitat / Veg Treatment	Area / Seasonal Closure(s)		
		Vegetation Management		
		Rehabilitation Plans		
		Aerial seeding		
		Drill seeding		
		Planting plugs		

	Infrastructure Construction, Removal, and Modification	Development Siting		
		Structure Removal		

INFRASTRUCTURE				
THREAT	**ACTIVITY**	**SUBACTIVITY**	**METRIC**	**COMMENTS**
INFRASTRUCTURE	Research	Transmission Line Impacts		Indirect Impacts
	Regulatory Mechanisms, Plans, Policy	Development Siting		Avoid energy development in PACs (Doherty et al. 2010). Identify areas where leasing is not acceptable, or not acceptable without stipulations for surface occupancy that maintains sage-grouse habitats.
				Site planning outside of PACs, PPH, and important seasonal habitat to avoid disturbance. Avoid conflict by siting associated facilities (and activities) in non-habitat wherever possible.
				If avoidance is not possible within PACs due to pre-existing valid rights, adjacent development, or split estate issues, development should only occur in non-habitat areas, including all appurtenant structures, with an adequate buffer that is sufficient to preclude impacts to sage-grouse habitat from noise, and other human activities.
				If development must occur in sage-grouse habitats due to existing rights and lack of reasonable alternative avoidance measures, the development should occur in the least suitable habitat for sage-grouse and be designed to ensure at a minimum that there are no detectable declines in sage-grouse population trends (and seek increases if possible) by implementing the following:
				Reduce and maintain the density of energy structures below which there are not impacts to the function of the sage-grouse habitats (as measured by no declines in sage-grouse use), or do not result in declines in sage-grouse populations within PACs).
				Design development outside PACs to maintain populations within adjacent PACs and allow for connectivity among PACs.
				Design development to minimize tall structures (turbines, powerlines), or other features associated with the development (e.g., noise from drilling or ongoing operations; Blickley et al. 2012).

				Avoid construction of these features in sage-grouse habitat, both within and outside of PACs.
		State Conservation Plans		
		Rehabilitation Plans		
		Minimization/ BMPs		
		Compensatory Mitigation – Banking/ Crediting Systems		
		Conservation Strategy / Avoidance		Site planning outside of PACs, PPH, and important seasonal habitat to avoid disturbance. Avoid conflict by siting associated facilities (and activities) in non-habitat wherever possible.
				On-site planning to avoid disturbing PACs, leks.

	Sagebrush & Habitat Protection	Conservation Easement		
		Land Purchase		
		Incentives		
		Surface Disturbance		
		Area / Seasonal Closure(s)		Closure of ROWs and Maintenance roads during biologically relevant periods
		Vegetation Management		Infrastructure corridors should be designed and maintained to preclude introduction of invasive plant species.
	Fire: Presuppression	Area / Seasonal Closure(s)		Closure of maintenance roads in area areas of high fire risk
		Fuel Breaks / Fuel Management		Maintenance roads used as firebreaks

	Habitat Restoration / Mitigation	Area / Seasonal Closure(s)		
		Vegetation Management		
				Habitat function lost from placement of infrastructure should be replaced.
	Habitat / Veg Treatment	Area / Seasonal Closure(s)		
		Vegetation Management		
		Preposition Resources		
		Fuel Breaks / Fuel Management		
	Conifer Removal	Fuel Breaks / Fuel Management		
		Mechanical Conifer Removal (Stage 1&2)		

		Mechanical Conifer Removal (Stage 3)		
	Infrastructure Construction, Removal, and Modification	Development Siting		Design development to minimize tall structures (turbines, powerlines), or other features associated with the development (e.g., noise from drilling or ongoing operations; Blickley et al. 2012).
				Avoid installation of compressor stations in PACs or other sage-grouse habitats where sage-grouse would be affected by noise and operation activities.
				Placement of new fences and livestock management facilities (including corrals, loading facilities, water tanks and windmills) should consider their impact on sage-grouse and, to the extent practicable, be placed at least 1 km from occupied leks (Stevens et al. 2012)
		Fence Modification		Lay-down fence construction
		Fence Marking		Mark fences that are in high risk areas for collision (Stevens et al. 2012) with permanent flagging or other suitable device to reduce sage-grouse collisions on flat to gently rolling terrain in areas of moderate to high fence densities (i.e., more than 1 km of fence per km2) located within 2 kms of occupied leks.
		Fence Removal		Identify and remove unnecessary fences.
		Structure Removal		

		Powerline Removal		Power transmission corridors which cannot avoid PACs should be buried (if technically feasible) and disturbed habitat should be restored.
				Remove transmission lines and roads that are duplicative or are not functional. Transmission line towers should be constructed to severely reduce or eliminate nesting and perching by avian predators, most notably ravens, thereby reducing anthropogenic subsidies to those species.
		Powerline Retrofitting		
	Recreation Management	Area / Seasonal Closure(s)		Restrictions limiting use of roads should be enforced.
		Enforcement		

GRAZING / RANGE MANAGEMENT				
THREAT	**ACTIVITY**	**SUBACTIVITY**	**METRIC**	**COMMENTS**
GRAZING / RANGE MANAGEMENT	Research	Site Descriptions / State and Transition Models		
		Identify Seasonal and Limiting Habitats		
	Regulatory Mechanisms, Plans, Policy	Development Siting		
		State Conservation Plans		
		Conservation Strategy		Range management structures should be designed and placed to be neutral or beneficial to sage-grouse
	Sagebrush & Habitat Protection	Conservation Agreements		Provide land-owners with opportunities to enroll in large-scale CCAAs.
		Conservation Easement		
		Land Purchase		

		Incentives		
		Vegetation Management		
	Livestock & Rangeland Management	Area / Seasonal Closure(s)		Establish and enforce timing restrictions / seasonal restrictions in PACS, PPH.
				Implement seasonal road closures associated with range management activities.
		Vegetation Management		
		Avoidance		
		Site Descriptions / State and Transition Models		
		Meadow Irrigation		

	Infrastructure Construction, Removal, and Modification	Fence Removal		
		Fence Modification		
		Fence Marking		
		Structure Removal		Structures that are currently contributing to negative impacts to either sage-grouse or their habitats should be removed or modified to remove the threat.

FREE ROAMING EQUIDS				
THREAT	**ACTIVITY**	**SUBACTIVITY**	**METRIC**	**COMMENTS**
FREE-ROAMING EQUIDS	Research	Population Control		
		Surveys		
		Evaluate AMLs		Determine if the current appropriate management levels (AMLs) maintain suitable sage-grouse habitat parameters. Support additional research to quantitatively determine impacts of wild horses and burros on sage-grouse habitat parameters.
	Regulatory Mechanisms, Plans, Policy	Monitoring		Until research on AMLs is completed, manage for AMLs within horse management areas on federal lands. Current AMLs should be adjusted for drought conditions.
		State Conservation Plans		
		Conservation Strategy		Develop, implement, and enforce adequate regulatory mechanisms to protect sage-grouse habitat from negative influences of grazing by free-roaming equids.
				Manage free-roaming equids at levels that allow native sagebrush vegetative communities to minimally achieve PFC (for riparian areas) or RHS (for uplands). Similar measures should be implemented on non-federal land surfaces
				Develop scientific procedures that can be replicated to count horses so that proper management actions can be implemented when numbers exceed AMLs.

				Develop a sound monitoring program with prescriptive management “triggers” to make adjustments in horse and burro numbers or their distribution, as necessary.
	Livestock & Rangeland Management	Area / Seasonal Closure(s)		
		Vegetation Management		
		Avoidance		
	Wild Equid Management	Horse Gathers		

RECREATION				
THREAT	**ACTIVITY**	**SUBACTIVITY**	**METRIC**	**COMMENTS**
RECREATION	Regulatory Mechanisms, Plans, Policy	State Conservation Plans		
		Conservation Strategy		
		Avoidance		Avoid development of recreational facilities (e.g., new roads and trails, campgrounds) in sage-grouse habitats.
	Sagebrush & Habitat Protection	Conservation Easement		
		Land Purchase		
		Incentives		
		Surface Disturbance		Remove (or decommission) non-designated roads within sagebrush habitats.
		Area Closure(s)		Establish 4.0-mile disturbance buffer in nesting habitat in PACs and PPH.

				Close important sage-grouse use areas to off-road vehicle use.
	Fire: Presuppression	Area Closure(s)		Close rangelands that are highly susceptible to fire to OHV use during the fire season
	Fire: Post-fire Restoration	Area Closure(s)		
	Recreation Management	Area / Seasonal Closure(s)		Seasonal closures as necessary; set and enforce seasonal and timing restrictions on all recreational trails in sage-grouse habitat during breeding, nesting, and brood-rearing seasons.
				Seasonal closures as necessary; set and enforce seasonal and timing restrictions on all recreational trails in sage-grouse habitat during breeding, nesting, and brood-rearing seasons.
		Mapping [existing roads and trails]		Mapping of existing roads and trails in and out of PPH
		Enforcement		

URBANIZATION				
THREAT	ACTIVITY	SUBACTIVITY	METRIC	COMMENTS
URBANIZATION	Regulatory Mechanisms, Plans, Policy	Development Siting		Do not allow landfills in sage-grouse habitats, or within 5 km of sage-grouse habitats
		State Conservation Plans		
		Conservation Strategy		Do not relinquish public lands for the purpose of urban development in sage-grouse habitat
		Urban Zoning		
		Avoidance		
	Sagebrush & Habitat Protection	Conservation Easement		Attempt to create easements in lieu of development with land owners to decrease the amount of housing and anthropogenic infrastructure development on the landscape
		Land Purchase / Swaps		Acquire and manage sage-grouse habitat to maintain intact ecosystems.
		Incentives		Provide incentives to maintaining large tracts of private lands that provide habitat for sage-grouse.

		Area / Seasonal Closure(s)		
	Infrastructure Construction, Removal, and Modification	Development Siting		Consolidate infrastructure that supports urban and exurban development.
		Structure Removal		

	ACTIVITY TYPES:	SUBACTIVITY TYPES:
1	Research	Genetic Analysis Identify Seasonal Habitats Identify Limiting Habitats Identify Connectivity Corridors Movement Patterns Site Descriptions / State and Transition Models Weather Augmentation
2	Regulatory Mechanisms	Development Siting State Conservation Plans Rehabilitation Plans Mine Reclamation Conservation Strategy Harvest Regulations and Monitoring Avoidance Minimization/ BMPs Compensatory Mitigation – Conservation Banking/ Credit Systems
3	Sagebrush & Habitat Protection	Development Siting State Conservation Plans Conservation Strategy Conservation Easement Land Purchase Incentives Urban Zoning Surface Disturbance Area / Seasonal Closure(s) Vegetation Management Fuel Breaks / Fuel Management Development and use of ACK-55
4	Livestock & Rangeland Management	Area / Seasonal Closure(s) Vegetation Management Avoidance Site Descriptions / State and Transition Models Meadow Irrigation
5	Fire: Presuppression	Area / Seasonal Closure(s) Vegetation Management

		Preposition Resources Fuel Breaks / Fuel Management
6	Fire: Suppression	Area / Seasonal Closure(s) Vegetation Management Preposition Resources Fuel Breaks / Fuel Management Cross-jurisdictional Agreements
7	Fire: Post-fire Restoration	Area / Seasonal Closure(s) Vegetation Management Fuel Breaks / Fuel Management Restoration Monitoring Aerial seeding Drill seeding Plantings Burn Severity Assessments
8	Habitat Restoration / Mitigation	Area / Seasonal Closure(s) Vegetation Management Seedings/ Plantings
9	Habitat / Veg Treatment	Area / Seasonal Closure(s) Vegetation Management Preposition Resources Fuel Breaks / Fuel Management Rehabilitation Plans Aerial seeding Drill seeding Plantings
10	Conifer Removal	Fuel Breaks / Fuel Management Mechanical Conifer Removal (Stage 1&2) Mechanical Conifer Removal (Stage 3) Prescribed Fire (Stage 3) Natural Fire (Stage 3)
11	Wild Equid Management	Population control Grazing management Horse Gather
12	Infrastructure Construction, Removal, and Modification	Development Siting

		Fence Modification Fence Marking Fence Removal Structure Removal Power line Removal Power line Retrofitting Avoidance Minimization/ BMPs Compensatory Mitigation – Conservation Banking/ Credit Systems
13	Recreation Management	Area / Seasonal Closure(s) Mapping Enforcement
14	Population Augmentation	Translocations
15	Predator Control	Predator control programs Eliminate/ Reduce nesting/ perching sites Eliminate external food sources (e.g cover landfills, road kill)

ACTIVITY DEFINITIONS	
Conifer Removal	Removal of conifers that are encroaching into GRSG habitat
Fire: Presuppression	Aid in presupression actions, preparation.
Fire: Suppression	Wildlife suppression with GRSG conservation in mind.
Fire: Post-fire Restoration	Related to restoration and rehabilitation of habitat lost due to wildfire.
Habitat Restoration / Mitigation	Habitat restoration efforts and action outside of post-fire restoration and conifer removal. Typically the actions that take place on the way to recovery.
Habitat / Veg Treatment	Treatment efforts to remove non-habitat, improve or create new habitat, and restore previously occupied habitat to a functional state
Infrastructure Construction, Removal, etc.	Actions related to the modification, removal, or siting of any man-made infrastructure on the landscape. Typically associated with energy development, and vertical structure that remove and fragment habitat, as well as increase likelihood of predators.
Livestock & Rangeland Management	Related to livestock management and grazing operations. On-the-ground actions include activities that benefit GRSG and their associated habitats.
Population Augmentation	Activities involving translocation or similar activities to bolster GRSG populations. Specific to the threat of 'Small and isolated populations.'
Predator Control	Activities that address impacts predators may have on GRSG survival and reproductive efforts. Specific to the threat of 'Small and isolated populations.'
Recreation Management	Related to management recreation activities (including but not limited to hunting, OHV use, hiking, camping) in GRSG habitat.
Regulatory Mechanisms, etc.	Activities that relates to state- and federal-level planning efforts. These regulatory mechanisms can influence any threat are the 'how-to' and dedicated plans to conserve GRSG, NOT on-the-ground actions
Research	Related to research in which identified gaps in information or population level information are achieved through research-related actions.
Sagebrush & Habitat Protection	Assist in protecting sagebrush and other sage-grouse habitat through many on-the-ground conservation actions.
Wild Equid Management	Management of free-roaming equids that benefit GRSG habitat. Specific to the threat of 'Free-Roaming Equids' on the landscape.

SUBACTIVITY DEFINITIONS / EXAMPLES (not all-inclusive)	
Aerial seeding	Activities where aerial seeding is employed. May be conducted in vegetation treatments, restoration efforts, etc.
Area Closure(s)	Closing of access, areas, roads to general public for a period of time to preserve GRSG and associated habitats seasonally, annually, or in case of high fire risk, spread of invasives, etc.
Seasonal Closure(s)	Closing of access, areas, roads to general public for a period of time to preserve GRSG and associated habitats seasonally, annually, or in case of high fire risk, spread of invasives, etc.
Avoidance	A measure of how development-related actions (often energy development) are prohibited or moved out of GRSG habitat because of conservation plans in place.
Burn Severity Assessments	
Conservation Easement	
Conservation Strategy	
Cross-jurisdictional Agreements	
Development and use of ACK-55	
Development Siting	
Drill seeding	
Enforcement	
Fence Marking	
Fence Modification	
Fence Removal	
Fuel Breaks / Fuel Management	
Genetic Analysis	
Grazing management	
Harvest Regulations and Monitoring	Activities that address harvest and the impact on GRSG. Specific to the threat of 'Small and isolated populations.'
Horse Gathers	
Identify Connectivity Corridors	
Identify Seasonal Habitats	
Incentives	
Land Purchase	
Mapping	
Meadow Irrigation	
Mechanical Conifer Removal (Stage 1&2)	
Mechanical Conifer Removal (Stage 3)	
Mine Reclamation	

[Identify] Movement Patterns	
Natural Fire (Stage 3)	
Planting plugs	
Population control	
Power line Removal	
Power line Retrofitting	
Preposition Resources	
Prescribed Fire (Stage 3)	
Rehabilitation Plans	
Restoration Monitoring	
Site Descriptions / State and Transition Models	
State Conservation Plans	
Structure Removal	
Surface Disturbance	
Translocations	
Urban Zoning	Actions that may reduce the development of GRSG habitat for urban development.
Vegetation Management	
Weather Augmentation	