
Appendix J

Greater Sage-Grouse Draft Monitoring Framework

1 **APPENDIX J**
2 **GREATER SAGE-GROUSE DRAFT MONITORING**
3 **FRAMEWORK**

4 **INTRODUCTION**

5 Land use planning establishes intervals and standards for monitoring to report
6 progress on the implementation and effectiveness of the conservation actions
7 outlined in LUPs. This Greater Sage-Grouse Draft Monitoring Framework (draft
8 monitoring framework) outlines the process and methodology that the BLM and
9 USFS will use to monitor implementation and effectiveness of RMP and Forest
10 Plan, collectively referred to as LUP, decisions affecting GRSG. The BLM and
11 USFS are undertaking this planning effort to provide regulatory certainty that
12 land management actions reduce threats to habitats and populations that are
13 under agency control, thereby maintaining or restoring habitats necessary to
14 support viable GRSG populations. Implementation monitoring will evaluate
15 whether (and to what extent) decisions to ameliorate threats to GRSG have
16 been implemented. Effectiveness monitoring will consider the results of GRSG
17 population monitoring with results of GRSG habitat monitoring in the context
18 of existing conditions described in the baseline environmental report (Manier et
19 al. 2013). Habitat monitoring includes both vegetation monitoring and
20 disturbance monitoring.

21 This draft monitoring framework establishes the use of measurable quantitative
22 indicators for habitat availability and maintenance of habitat types (e.g., priority
23 and general habitats) to ensure each agency’s ability to make broad (yet
24 consistent) generalizations about habitat across the range of the species.
25 Monitoring methods and indicators are derived from the best available science.
26 Corporate data sets will be established so that data can easily be referenced for
27 reporting monitoring results across the range of GRSG as defined by Schroeder
28 et al. (2004), by populations and subpopulations as defined by Connelly et al.
29 (2004), by LUP area, by the seven WAFWA GRSG Management Zones (Stiver
30 et al. 2006), and by Priority Areas for Conservation as defined in the GRSG

1 Conservation Objectives: Final Report (USFWS 2013). Funding support and
2 dedicated personnel for broad- and mid-scale monitoring will be renewed
3 annually through the normal budget process.

4 GRSG are a landscape species, and conservation is a scale-dependent process
5 whereby priority landscapes are identified across the species range and
6 appropriate conservation actions are implemented within seasonal habitats to
7 benefit populations. Following guidelines established by multiple agencies in the
8 Greater Sage-Grouse Habitat Assessment Framework (Stiver et al. 2010), this
9 approach uses the four orders of GRSG habitat selection (Johnson 1980): first
10 order (broad scale), second order (mid-scale), third order (fine scale), and
11 fourth order (site scale). Because LUP decisions are made largely at the broad
12 and mid-scale, this draft monitoring framework focuses on these two larger
13 spatial scales. The need for fine- and site-scale habitat monitoring may vary by
14 area depending on existing conditions, habitat variability, threats, and land
15 health; however, indicators at these scales will be consistent with the Habitat
16 Assessment Framework (Stiver et al. 2010). Thus, this draft monitoring
17 framework includes methods, data standards, and intervals of monitoring at the
18 broad and mid scales, while outlining indicators that should be measured at all
19 scales.

20 **BROAD AND MID SCALES**

21 First order habitat selection at the broad scale describes the selection of
22 physical or geographical range of a species. There is one first order habitat, the
23 range of the species defined by populations of GRSG associated with sagebrush
24 landscapes (Schroeder et al. 2004; Connelly et al. 2004). Additionally, there is an
25 intermediate scale between the broad and mid scales that was delineated from
26 floristic provinces within which similar environmental factors influence
27 vegetation communities. This scale was developed by WAFWA and is referred
28 to as the WAFWA Management Zones (Stiver et al. 2006).

29 Second order habitat selection at the mid-scale includes GRSG populations,
30 subpopulations, and Priority Areas for Conservation. The second order includes
31 at least 40 discrete populations and subpopulations (Connelly et al. 2004).
32 Subpopulations range in area from 300 to 22,400 square miles, while
33 populations range in area from 150 to 54,600 square miles. Priority Areas for
34 Conservation range from 20 to 20,400 square miles.

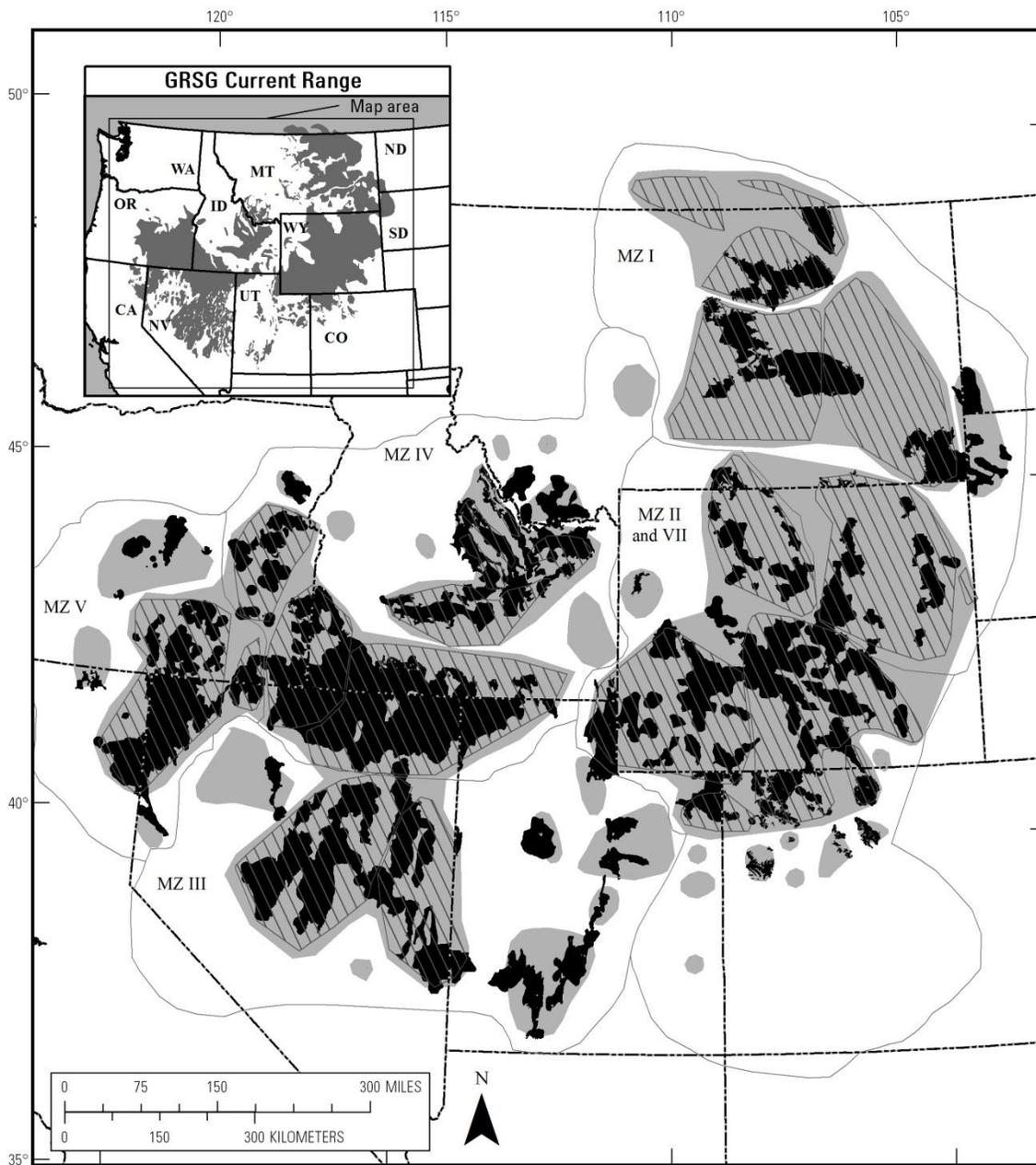
35 Broad- and mid-scale monitoring results will be reported at the appropriate and
36 applicable geographic scale (Table J-1, Monitoring for GRSG, and Diagram J-1,
37 GRSG Priority Areas for Conservation, Subpopulations, and Populations).

**Table J-1
Monitoring for GRSG**

Geographic Scales	Implementation	Habitat		Population (States)
	Decisions	Disturbance	Vegetation	Demographics
Broad Scale: From the range of GRSG to WAFWA Management Zones	LUP objectives, thresholds, and management actions	Priority and general habitat delineation (occupied habitat)	Existing national level vegetation monitoring and mapping efforts (remote sensing)	WAFWA Management Zone population level and population trends
Mid-Scale: From WAFWA Management Zone scale to subpopulation/ Priority Area for Conservation scale	LUP decisions, vegetation/ mid-scale decisions	Percent of sagebrush per unit area, anthropogenic footprint, density of energy development	National data augmented with locally collected data using core indicators and statistical study design	Subpopulation scale, dispersal, and lek complex trends

I

I **Diagram J-I. GRSG Priority Areas for Conservation, Subpopulations, and Populations**



GRSG PACs, Subpopulations and Populations

LEGEND

-  Subpopulations
-  COT PACs
-  Populations

Sources:
 Current Range: Schroeder et al., 2004
 Populations: Connelly et al., 2004
 Subpopulations: Connelly et al., 2004
 PACs: USFWS COT Report, 2013

2
3

1 **Implementation (Decision) Monitoring**

2 The regulations for the BLM (43 CFR 1610.4-9) and USFS (36 CFR 219.12)
3 require that LUPs establish intervals and standards for monitoring and
4 evaluations, based on the sensitivity of the resource decisions involved.
5 Implementation monitoring is the process of tracking and documenting the
6 implementation (or the progress toward implementation) of LUP decisions.
7 Because GRSG conservation actions will occur on a fairly regular basis, the BLM
8 and USFS will be documenting progress annually toward full implementation of
9 the LUP.

10 **Habitat (Vegetation) Monitoring**

11 The current geographic extent of sagebrush vegetation within the rangewide
12 distribution of GRSG populations will be ascertained using the most recent
13 version of Existing Vegetation Type layer in LANDFIRE. The resulting
14 geospatially explicit map will be compared against the geographic extent of land
15 that has the capability to support sagebrush vegetation as determined using
16 LANDFIRE Biophysical Setting to ascertain the areas within the rangewide
17 distribution of GRSG populations that have the potential to support sagebrush
18 vegetation. The resulting sagebrush map will become the base layer against
19 which disturbance changes are measured, incorporated, and reported.

20 LANDFIRE lacks specificity for types of sagebrush vegetation and has relatively
21 low accuracy; however, it is currently the best available rangewide mapping
22 product. The BLM is extending the Grass/Shrub mapping product (Homer et al.
23 2009) that spatially depicts the percent cover of sagebrush vegetation, as well as
24 three other components (percent bare ground, percent herbaceous vegetation,
25 and percent shrubs) rangewide. As the Grass/Shrub mapping base product is
26 developed over the next 5 years, it will refine the Existing Vegetation Type layer
27 in LANDFIRE and better depict the current geographic extent of sagebrush
28 vegetation.

29 The geographic extent of sagebrush vegetation will be reported at a maximum
30 of 5-year intervals. The BLM will use sagebrush cover estimates from the
31 Landscape Monitoring Framework points within the rangewide distribution of
32 GRSG populations to ground-truth, refine, and improve the accuracy of
33 sagebrush vegetation within the Grass/Shrub and LANDFIRE mapping products.

34 The Grass/Shrub mapping product will allow for estimation of patch size and
35 number, patch connectivity, linkage areas, and landscape matrix and edge effects
36 (mid-scale indicators; see Stiver et al. 2010). Until the Grass/Shrub mapping
37 product is available, these landscape metrics will be calculated annually using the
38 LANDFIRE Existing Vegetation Type layer as the sagebrush base layer and
39 integrating the spatial extent of new disturbances into the database. Once the
40 disturbance updates have been included into the base layer, the landscape
41 metrics will be recalculated to examine changes in pattern and abundance of
42 sagebrush at the various geographic boundaries.

Habitat (Disturbance) Monitoring

Most of the decisions in these LUPs are in response to “Factor A: The Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range” in the USFWS’s 2010 listing decision for GRSG (75 Federal Register 13910 2010; USFWS 2010). The USFWS identified several threats affecting Factor A; therefore, the BLM and USFS will monitor the relative extent of these threats on sagebrush, both spatially and temporally to report on conditions at the appropriate and applicable geographic scales and boundaries.

Disturbance monitoring will focus on three general measures:

1. Percent of sagebrush per unit area
2. Percent of non-habitat (human footprint) per unit area
3. Number of energy facilities and mining locations per unit area (density)

To accomplish disturbance monitoring, the BLM and the USFS will begin with a base layer of sagebrush described above in the *Habitat (Vegetation) Monitoring* section. Restored areas will also be considered when evaluating the percentage of sagebrush on the landscape.

Next, the BLM and USFS will use corporate, rangewide, best available data (Manier et al. 2013) to evaluate anthropogenic and natural disturbances (direct physical footprint) of GRSG habitat based on threats (Attachment A, Geospatial Data Layers Used to Determine Three Factors for GRSG Habitat Disturbance Monitoring at the Broad and Mid Scales) listed in Factor A of the USFWS listing decision (USFWS 2010). Most of these data are from external data sources and are considered the best available data at the rangewide scale. A subset of these data (e.g., mine and energy sites), provided by BLM field and state offices and USFS forests and regional offices, will be updated and reported to agency headquarters annually.

Disturbance data will include:

- | | |
|-------------------------|----------------------------------------------------------|
| 1. Agriculture | 7. Energy (coal mines) |
| 2. Urbanization | 8. Energy (oil and gas wells and development facilities) |
| 3. Habitat treatments | 9. Energy (wind towers) |
| 4. Wildfire | 10. Energy (solar fields) |
| 5. Invasive plants | 11. Energy (geothermal) |
| 6. Conifer encroachment | |

- | | | |
|---|----------------------------------|------------------------------------|
| 1 | 12. Mining (active | 16. Infrastructure (communication |
| 2 | developments; locatable, | towers) |
| 3 | leasable, salable) | |
| 4 | 13. Infrastructure (roads) | 17. Infrastructure (other vertical |
| 5 | 14. Infrastructure (railroads) | structures) |
| 6 | 15. Infrastructure (power lines) | 18. Other developed ROWs |

Population (Demographics) Monitoring

State wildlife management agencies are responsible for monitoring GRSG populations within their respective states. The BLM and USFS have initiated a process to establish that WAFWA coordinate collection of annual population data by state agencies, and facilitate analysis of these data at least once every 5 years. Data collection will be coordinated at the population/subpopulation level to help address effectiveness of conservation measures outlined in the conservation objectives report and implementation of LUP decisions related to GRSG. These population data will also be available for analysis at the WAFWA Management Zones and rangewide scale to demonstrate overall effectiveness of management actions across the range of the species. State wildlife agencies will provide annual lek data and 5-year population summaries to BLM state offices and USFS regional offices to convey that information to the BLM National Operations Center for long-term reference, use, and storage. The existing Memorandum of Understanding signed by WAFWA, BLM, USFS, Natural Resources Conservation Service, and USFWS will be revised to outline collaboration, process, and responsibilities for data analysis and transfer related to management of GRSG.

Effectiveness Monitoring

Effectiveness monitoring for the Northwest Colorado sub-region will involve evaluating the change in habitat conditions from the baseline conditions, in relation to the goals and objectives of the LUP and other rangewide conservation strategies (BLM 2004; Stiver et al. 2006; USFWS 2013). The BLM and USFS will evaluate those data to characterize the relationship among the disturbance, habitat condition, and population trends at the appropriate and applicable geographic scale or boundary, identify emerging issues and research needs, and suggest implications for management. This process will involve the compilation of broad- and mid-scale data and population trends needed for the evaluation of effectiveness with a 5-year reporting schedule, or more often as needed. Effectiveness monitoring will be consistent with and will inform the BLM’s adaptive management strategy (see **Chapter 2, Section 2.10.1, Monitoring for the Greater Sage-grouse Planning Strategy**).

FINE AND SITE SCALES

Third-order habitat selection at the fine scale describes the physical and geographic area within home ranges. At this level, maps of seasonal habitats

1 (breeding, summer, winter) and the connectivity between these seasonal use
2 areas can be examined to determine limiting factors for populations,
3 subpopulations, and Priority Areas for Conservation.

4 Fourth-order habitat selection at the site scale is based on physical conditions
5 and the geographic area within seasonal ranges to meet life requisite needs (e.g.,
6 nesting and brood rearing). Specific habitat measures are used at this scale as
7 microsite conditions within the seasonal range to determine distribution and
8 use. These measures are typically sampled across a defined area to inform third-
9 order habitat selection.

10 Details and application of these two scales will be determined during
11 implementation of the Northwest Colorado sub-region. The need for fine- and
12 site-scale specific habitat monitoring will vary by area depending on existing
13 conditions, habitat variability, threats, and land health. For example,
14 implementation monitoring will track decisions in priority habitat; habitat
15 vegetation monitoring will be conducted to evaluate projects targeting GRS
16 habitat enhancement and restoration; habitat disturbance monitoring will be
17 conducted where mid-scale monitoring indicates the need for fine-scaled
18 anthropogenic disturbance footprints; and population monitoring (in
19 cooperation with state wildlife agencies) will be analyzed below the
20 subpopulation/Priority Area for Conservation level, where needed, for more
21 specific effectiveness monitoring for LUP objectives, activity plans, development
22 plans, and leasing plans.

23 At a minimum, the habitat indicators at the fine and site scales will be consistent
24 with the Habitat Assessment Framework and the core indicators in assessment,
25 inventory, and monitoring strategy (Toevs et al. 2011); however, the metrics
26 and interpretation for the indicators can be adjusted for regional conditions.
27 When evaluating the land health habitat standard in designated GRS habitats,
28 the BLM will analyze core indicators and other supplemental site-scale indicators
29 as appropriate for the seasonal habitat. The activity-level plans will describe a
30 sampling scheme for collecting indicators with a nonbiased sampling design for
31 vegetation treatments or management actions implemented at the site scale. In
32 addition, the consistent collection of these data will be used to inform the
33 classification and interpretation of imagery used at the mid-scale as described
34 above.

35 For examples of current applications of disturbance and reclamation monitoring
36 at the fine scale, see the BLM Wyoming Density and Disturbance Calculation
37 Tool (<http://ddct.wygisc.org/>) and the BLM White River Data Management
38 System in development with the US Geological Survey.

39 **FINAL MONITORING PLAN**

40 This draft monitoring framework was developed for draft EISs to describe the
41 proposed monitoring activities for this LUPA. The BLM and USFS will consider

1 public comments and collaborate with other agencies to finalize the Northwest
2 Colorado sub-region GRSG Monitoring Plan.

3 **REFERENCES**

4 BLM (US Department of the Interior, Bureau of Land Management). 2004.
5 National Sage-Grouse Habitat Conservation Strategy. US Department
6 of the Interior, Bureau of Land Management, Washington, DC.

7 Connelly, J. W., S. T. Knick, M. A. Schroeder, and S. J. Stiver. 2004.
8 Conservation Assessment of Greater Sage-grouse and Sagebrush
9 Habitats. Western Association of Fish and Wildlife Agencies.
10 Unpublished Report. Cheyenne, WY. Homer, C. G., C. L. Aldridge, D. K.
11 Meyer, M. J. Coan, and Z. H. Bowen. 2009. Multiscale sagebrush
12 rangeland habitat modeling in southwest Wyoming: US Geological
13 Survey Open-File Report 2008–1027. 14 pp.

14 Johnson, D. H. 1980. The comparison of usage and availability measurements for
15 evaluating resource preference. *Ecology* 61:65-71.

16 Manier, D. J., D. J. A. Wood, Z. H. Bowen, R. Donovan, M. J. Holloran, L. M.
17 Juliusson, K. S. Mayne, S. J. Oyler-McCance, F. R. Quamen, D. J. Saher,
18 and A. J. Titolo. 2013. Summary of Science, Activities, Programs and
19 Policies that Influence the Rangeland Conservation of Greater Sage-
20 Grouse (*Centrocercus urophasianus*). US Geological Survey Open-File
21 Report 2013-1098. Ft. Collins, CO.

22 Schroeder, M. A., C. L. Aldridge, A. D. Apa, J. R. Bohne, C. E. Braun, S. D.
23 Bunnell, J. W. Connelly, P. A. Deibert, S. C. Gardner, M. A. Hilliard, G.
24 D. Kobriger, S. M. McAdam, C. W. McCarthy, J. J. McCarthy, D. L.
25 Mitchell, E. V. Rickerson, and S. J. Stiver. 2004. Distribution of sage-
26 grouse in North America. *Condor* 106: 363-376.

27 Stiver, S. J., A. D. Apa, J. R. Bohne, S. D. Bunnell, P. A. Deibert, S. C. Gardner,
28 M. A. Hilliard, C. W. McCarthy, and M. A. Schroeder. 2006. Greater
29 Sage-Grouse Comprehensive Conservation Strategy. Western
30 Association of Fish and Wildlife Agencies. Unpublished report.
31 Cheyenne, WY.

32 Stiver, S. J., E. T. Rinkes, and D. E. Naugle. 2010. Sage-grouse habitat assessment
33 framework. Bureau of Land Management Unpublished Report. US
34 Department of the Interior, BLM, Idaho State Office, Boise, ID. Internet
35 Web site:
36 http://wgfd.wyo.gov/web2011/Departments/Wildlife/pdfs/SG_HABITAT
37 [ASESSMENT0000669.pdf](http://wgfd.wyo.gov/web2011/Departments/Wildlife/pdfs/SG_HABITAT). Accessed in June 2013.

1 Toevs, G. R., J. J. Taylor, C. S. Spurrier, W. C. MacKinnon, and M. R. Bobo.
2 2011. Assessment, inventory, and monitoring strategy: For integrated
3 renewable resource management. US Department of the Interior,
4 Bureau of Land Management, National Operations Center, Denver, CO.

5 USFWS (United States Fish and Wildlife Service). 2010. 12-Month Findings for
6 Petitions to List the Greater Sage-Grouse (*Centrocercus urophasianus*) as
7 Threatened or Endangered: Notice of 12-month petition findings.
8 Federal Register 75 pp 13910. March 23, 2010.

9 _____ . 2013. Greater Sage-grouse (*Centrocercus urophasianus*) Conservation
10 Objectives: Final Report. USFWS, Denver, CO. February 2013.

11

1
2
3

ATTACHMENT A, GEOSPATIAL DATA LAYERS USED TO DETERMINE THREE FACTORS FOR GRSG HABITAT DISTURBANCE MONITORING AT THE BROAD AND MID SCALES

Geospatial Data Layer	Percent of Sagebrush	Percent of Non-habitat (Human Footprint)	Number of Energy and Mining Facilities
Sagebrush	X		
Areas with biotic potential for sagebrush	X		
Agriculture	X		
Urbanization	X		
Habitat treatments	X		
Wildfire	X		
Invasive plants	X		
Conifer encroachment	X		
Energy (oil and gas wells and development facilities)		X	X
Energy (coal mines)		X	X
Energy (geothermal)		X	X
Energy (wind towers)		X	X
Energy (solar fields)		X	X
Infrastructure (communication towers)		X	
Infrastructure (other vertical structures)		X	
Infrastructure (power lines)		X	
Infrastructure (railroads)		X	
Infrastructure (roads)		X	
Mining (active locatable, leasable, and salable developments)		X	
Transmission corridors and other developed ROWs		X	

4
5

I

This page intentionally left blank.