Gunnison Sage-grouse Habitat Prioritization Tool

Version 3

Documentation

2018 Update

June 2018

Table of Contents

page

1. Habitat Potential…… 3
    1.1 Habitat…… 3
    1.2 Impacts…… 8
2. Validation …… 10
3. Scoring Reference Matrix…… 11
4. Mapped Acreage …… 13
5. Summary of Updates…… 13
6. Future Update Plan…… 15
7. 2018 Project Update Team…… 16
8. 2011 Project Team…… 16
9. References…… 17
10. Acronyms ……18
Appendix I …… 19

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The below listed information was incorporated into a spatial model to evaluate habitat within the Gunnison Basin for Gunnison sage-grouse. The spatial model in itself can only be used on a broad scale for planning and rough habitat assessment. Projects and development will still need to be evaluated with an onsite assessment on a project-by-project basis.

This updated version of the model sought to update data and spatial layers to ensure the best, most-current science and knowledge was used in the prioritization of Gunnison sage-grouse habitat within the Gunnison Basin.

Address why this model only covers occupied critical habitat and not all critical habitat. The Habitat Prioritization Tool only addresses Gunnison Sage-grouse occupied habitat. Unoccupied habitat within USFWS designated critical habitat was not addressed because of discrepancies in soil types, necessity of significant habitat modifications to make it actually usable by GuSG, and other issues. The importance of prioritizing habitat where the species actually exists was determined to be of paramount importance.

This model has been developed through collaborative efforts of the Gunnison Basin Sage-grouse Strategic Committee with specific guidance from Gunnison County, US Fish and Wildlife Service (USFWS), Bureau of Land Management (BLM), US Forest Service (USFS), Colorado Parks and Wildlife (CPW), National Park Service (NPS), Natural Resources Conservation Service (NRCS), Gunnison Conservation District and interested stakeholders. This model incorporates the most recent information providing a representation of potential on the ground habitat conditions in the Gunnison Basin. Data included is the best information available at the time. Future updates will be essential when new and better data is available.

1. HABITAT POTENTIAL

Gunnison sage-grouse habitat potential was evaluated within the CPW Occupied Habitat boundary for the Gunnison Basin population. This mapped layer is updated frequently and this tool currently uses data from 2015 with slight modification to include areas around Blue Mesa reservoir down to the high water line. All land within the outer boundary is evaluated. This layer is slightly different than the habitat polygon delineated in the Federal Register. Potential and vacant/unknown habitats are not included in scoring because of lack of habitat and geospatial data. Vacant/Unknown habitat is apparently high quality habitat without birds. Potential habitat would require a significant amount of time, energy and resources to create to a habitat of sufficient quality that could be colonized by grouse.

This tool evaluates the habitat potential as a sum of the weighted scores assigned to each habitat layers in combination with perceived impacts (uncontrollable threats.) This score is the foundation for assigning habitat statuses (Tier 1 and Tier 2). The goal of this valuation is to decease future habitat fragmentation and to increase the ability for conservation planning. Tier 1 habitat is defined as those habitats scoring 15 or higher. Tier 2 habitats are all other habitats (<15).

1.1 HABITAT

Lek: The official lek status and high male count are defined and reported from lekking data collected and published by CPW in their annual Gunnison Basin Lek Count Summary and Population Estimate. The Official Status of a lek is given as a cumulative status and designated as Active, Historic, Inactive, or Unknown. To be Officially Active, a lek only needs to be designated as Active in the current year. A lek is not considered Officially Inactive unless it has been seasonally Inactive for five consecutive years. Thus, a lek might not have any birds for a given season, but its official status may be Unknown because the lek had not been Inactive all of the past five years. Historical lek status is not given until a lek has been Inactive for 10 consecutive years. (Jackson and Seward, 2011)

- **Geospatial Data:** This layer is the CPW lek polygon layer and includes a 0.6 mile buffer from the outside edge of the lek polygon with spatial boundaries from the 2014 unofficial update as well as the local status from 2016. Buffering the lek polygons by 0.6 miles matches up with the disturbance guidelines in the Rangewide Conservation Plan. This 0.6 mile buffer serves as a measure of protection to ensure that the entire lek polygon is captured within the buffer polygon and that potential direct or indirect impacts directly adjacent to a lek that could influence lekking behavior are evaluated.

- **Evaluation class breaks (weight) justification:** Leks are considered important habitat for the grouse. Habitat alteration on or near a lek has the potential to have a great impact to the population. There is a need to conserve all leks, regardless of the number of birds displaying on the lek. (Aldridge, 2011b; Phillips, 2011; Jackson and Seward, 2011.)
    - Active (15) *Active leks are those of greatest value to the grouse population. Birds are displaying regularly on an annual basis.*
    - Unknown (10) *These leks could have and Official Status of unknown for many reasons, including missing count data. Leks can fall into this category in a one year time frame.*
    - Inactive (8) *These leks should not be completely discounted. There is potential for the grouse to comeback and begin using these areas on a regular basis if numbers increase or surrounding habitat improves. It takes 5 years for a lek to move into this category.*
    - Historic (1) *The majority of these leks are close to high build-out densities and will probably never be able to recover to active status regularly. The lek would have been inactive for 10 years or greater.*

- **Data for support:**
    - 2015 Gunnison Basin Gunnison sage-grouse Lek Count Summary and Population Estimate Final Report (Jackson and Seward, 2015).
    - 2011 Gunnison Basin Gunnison Sage-grouse Lek Count Summary and Population Estimate Final Report (Jackson and Seward, 2011).
    - 2011. Seward, Nate. Lek Status Definitions.
    - 2011b. Aldridge, Cam. Public meeting information, December 1, 2011. Meeting to validate the priority tool model called by the Technical Subcommittee for the Gunnison Basin Strategic Committee for the Gunnison Sage-grouse.
    - 2011. Phillips, Mike. Public meeting information, December 1, 2011. Meeting to validate the priority tool model called by the Technical Subcommittee for the Gunnison Basin Strategic Committee for the Gunnison Sage-grouse.

- *Endangered and Threatened Wildlife and Plants: Critical Habitat for Gunnison Sage-Grouse; Final Rule*, 79 Fed. Reg. 69312 (November 20, 2014)

- **Area for improvement:**
  - The Local CPW Office GuSG Annual Report definitions do not align with the RCP or current Statewide definitions for Official Lek Status as defined by Colorado Parks and Wildlife. Local CPW staff has maintained consistency in local definitions and is working to align them with the RCP and Statewide definitions.

Brood Rearing Habitat: Brood rearing habitat is defined in the Rangewide Conservation Plan (RCP). It includes mesic areas (swales, meadows, sagebrush near irrigation ditches and irrigated meadows) with lush vegetation.

- **Geospatial Data:** This layer was updated extensively in the Version 2 model. A 10m DEM slope assessment was completed to find all drainages and draws. This layer was then combined with the NHD Stream Layer and ditch layers to capture more brood rearing habitat. Using a cost analysis which incorporated slope, the group was then able to create a varied width representing the actual floodplain and thus the brood habitat. The model also incorporated the wet meadow/sagebrush interface and all Aw (alluvial) soils. Areas within lakes and irrigated areas outside the 50m of ditches were removed from the Brood layer. Lastly areas outside of nesting/summer/fall/winter habitat but within the occupied habitat boundary were removed from this layer. The modifications to this layer tried to improve upon the general 50m buffer provided for in the Gunnison Basin Local Plan by incorporating varying relief and differences in width in these floodplain areas. Some areas may be wider than 50m while other are less.

- **Evaluation class breaks (weight) justification:**
  - Present (13)

- **Data for support:**
  - The Nature Conservancy: Gunnison Basin Mesic area project prioritization model, 2017
  - Gunnison Sage-grouse Rangewide Conservation Plan
  - Gunnison Basin- Colorado. 1997. Local species management plan.
  - USFWS Federal Register Critical Habitat
  - CPW streams layer

- **Area for improvement:**
  - Removal of any brood rearing habitat from heavily treed areas, and open water.
  - There is a need to add other features including springs and seeps that are not captured in the current data layers.

Nesting/Summer/Fall/Winter Habitat: These habitats are defined in the RCP and in the Federal Register for Critical Habitat and includes sagebrush dominated areas.

- **Geospatial Data:** This data layer was compiled from NRCS soils data and includes all sagebrush dominated range sites (mountain loam, subalpine loam, mountain outwash, dry mountain loam, dry

exposure and deep clay loam) and stony rock areas. *See Appendix X for soils included from each Soil Survey.* Brood and irrigated layers were removed from this layer.

- **Evaluation class breaks (weight) justification:** As we looked at the map the group decided to differentiate nesting habitats based on proximity to brood rearing habitat-- nesting habitat closer to the brood rearing habitat would receive a higher score. Sage grouse hens have to be able to move their broods from the nests to brood rearing habitat by walking. All nesting habitat is of value, but nesting habitat closer to brood rearing habitat has potential to be of higher value. All nesting habitat within 4 miles of a lek is accounted for in the model (Connelly et al 2000, Aldridge 2011b).
    - Present <750 ft from brood rearing and winter habitat (15)
    - Present >750 ft from brood rearing and winter habitat (10)

- **Data for support:**
    - Gunnison Sage-grouse Rangewide Conservation Plan; Gunnison Basin- Colorado. 1997. Local species management plan.
    - NRCS Soil Surveys—See Appendix X
    - 2011b. Aldridge, Cam. Public meeting information, December 1, 2011. Meeting to validate the priority tool model called by the Technical Subcommittee for the Gunnison Basin Strategic Committee for the Gunnison Sage-grouse.
    - Connelly et. al 2000
    - 2011. Phillips, Mike. Public meeting information, December 1, 2011. Meeting to validate the priority tool model called by the Technical Subcommittee for the Gunnison Basin Strategic Committee for the Gunnison Sage-grouse.

- **Area for improvement:**
    - Updated NRCS soils mapping and ecological site mapping.

    - **Critical Winter Habitat:** Gunnison Sage-grouse Rangewide Conservation Plan; Gunnison Basin- Colorado. 1997. Local species management plan. This layer was not included in the HPT because defining data was not available.

- **Area for improvement::**
    - There is a need to define these areas spatially, but the group does not have the tools/data necessary at this point.
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Land Near Active Leks: Land near active leks is considered a higher priority for preservation. Leks are often in close proximity to quality nesting habitat. (Connelly et al. 2000; Aldridge et al. 2011) The Local Gunnison Sage-grouse Conservation Plan notes that these areas are priority areas used by nesting hens (1997).

- **Geospatial Data:** A two mile buffer was placed around the outer edge of the 2017 CPW lek polygon layer. Both the area within the 2 mile buffer and the lek itself were included in this layer. Irrigated areas were removed from this layer. The two mile buffer is from the Gunnison Sage-grouse Rangewide Conservation Plan (1997).

- **Evaluation class breaks (weight) justification:**

- Areas within active leks and < 2 miles from the edge of the active leks (5)

- **Data for support:**
  - Connelly, J.W., M.A. Schroeder, A.R. Sands and C.E. Braun. 2000. Guidelines to manage sage grouse populations and their habitat. Wildlife Society Bulletin 28:967-985.
  - Aldridge et al. 2011
  - Gunnison Sage-grouse Rangewide Conservation Plan; Gunnison Basin- Colorado. 1997. Local species management plan.

Irrigated Lands: Irrigated areas greater than 50m from the sagebrush interface and outside CPW lek polygons are not considered as suitable grouse habitat.

- **Geospatial Data:** This is a spatial layer of irrigated meadows where the inside of the polygon greater than 50m from the sagebrush was scored to reduce the value of the habitat as indicated in the RCP and Federal Register. If this area happened to coincide with a lek polygon, the value was not removed (the higher score was kept). Irrigated areas within brood habitat were removed from this layer.

- **Evaluation class break (weight) justification**:
  - Present (1)

- **Data for support:**
  - Gunnison Sage-grouse Rangewide Conservation Plan; Gunnison Basin- Colorado. 1997. Local species management plan.
  - *Endangered and Threatened Wildlife and Plants: Threatened Status for Gunnison Sage-Grouse; Final Rule*, 79 Fed. Reg. 69192 (November 20, 2014)
  - 2011. Phillips, Mike. Public meeting information, December 1, 2011. Meeting to validate the priority tool model called by the Technical Subcommittee for the Gunnison Basin Strategic Committee for the Gunnison Sage-grouse.

Tree Canopies: Trees are not typically present in grouse habitat, not only do they reduce desired vegetation by the grouse, they also increase the risk of predation. This is not a specific layer in the HPT. It is somewhat defined by the forested soils layer.

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1.2 Impacts

Subdivisions: Areas divided by subdivision and development have greater impacts on grouse habitat.

- **Geospatial Data:** Gunnison and Saguache County's parcel layers, as well as their 9-1-1 house point layers, have been combined to determine development potential/impact. Development was defined as home, barn, or any improvement valued at more than $30,000 on a parcel. At each house point, there was a 300 foot radius buffer added to the known structure. House points that were within 1000 ft of another two house points were then buffered by 1000 ft due to the increased impact on the grouse. (Cochran, 2011) The 300 ft buffered housing points buffer was clipped and removed from the 1000 ft buffer so that points did not receive a negative score for both the buffers. Parcel and house point data is from 2017 updates for both counties.

- **Evaluation class break (weight) justification:**
  - Areas within 300ft of a house point (-5) *Areas adjacent to houses are not suited for grouse habitation.*
  - Areas where a 3 house points are within 1000 ft (-20) *Areas where more house points are located closer together (subdivisions) will have an even greater negative impact on the grouse habitat.*

- **Data for support:**
  - Cochran, Jim. 2011. Personal communication.
  - Phillips, Mike. 2011. Personal communication.

Roads and Trails: All roads and improved trails were evaluated for their impact to the habitat from fragmentation and predator corridors. ***Use and recreation impacts from disturbance are not considered in this layer. This is a habitat impact evaluation of the roads themselves.*** Improved roads are considered all roads bigger than all season, 2-wheel drive roads. Improved roads are defined as passenger car roads, highways, and improved county roads. Double track roads are considered unimproved roads and include: admin routes, jeep trails, primitive roads, high clearance roads, private roads, and ATV routes. Single track routes are considered trails (mechanized and motorized are included). Closed routes are routes that are permanently closed (not seasonally) that have not been reclaimed.

- **Geospatial Data:** Road data from the county, CPW, BLM, NPS and USFS were used to create this layer. Data included is from 2017 and the 2010 USFS/ BLM Travel Management Plan

- **Evaluation class break (weight) justification:**
  - <150 ft from the centerline of an improved road (-4) *These roads are defined as passenger car roads, highways, and county roads.*
  - <50 ft from centerline of a double track(-3) *These roads are defined as roads with vegetation growing between the tracks and include admin routes, jeep trails, primitive roads, private roads (driveways), unmaintained roads, and ATV routes.*
  - <25 ft from that center line of a single track *(-2) These are defined as smaller disturbances that include trails, including both mechanized and motorized uses.*
  - <25 ft from that center line of a closed route *(0) These are defined as routes that are permanently closed (not seasonally) that have not been reclaimed.*

- **Data for support:**
    - Aldridge et al. 2010- Aldridge does not agree with the 150ft buffer. He feels that improved roads can impact nesting habitat up to 8km away. Double track roads can have an impact to over 6 km away. He feels that there is not a non-linear response as you move away from the road and that a regression model needs to be used to depict this.
    - *2010 Gunnison Basin USFS and BLM Federal Travel Management Plan*

- **Area for improvement:**
    - Winter use trails and roads should be incorporated when information is available
    - Reclaimed roads and trails should be incorporated

Power Lines: Power lines pose a potential risk for habitat degradation due to predation and fragmentation. There is a significant distinction between WAPA lines and the GCEA lines. WAPA lines do have large structures, high lines, and improved roads associated with them. GCEA lines are smaller primary and secondary lines that usually do not have roads associated with them.

- **Geospatial Data:** There is a data layer available with large, above ground, WAPA transmission lines mapped.

- **Evaluation class break (weight) justification:**
    - 0 to 820 ft. (0.25km) from an above-ground, transmission power line (WAPA) (-3) *These lines typically have a maintained road and taller structures associated with them.*
    - 820 ft. to 1,640 ft. (0.25 to 0.5 km) from an above-ground, transmission power line (WAPA) (-2) *These lines typically have a maintained road and taller structures associated with them.*
    - 1,640 ft. to 4,920 ft. (0.5 to 1.5 km) from an above-ground, transmission power line (WAPA) (-1) *These lines typically have a maintained road and taller structures associated with them.*
    - 4,920 ft. to 6,560 ft. (1.5 to 2km) from an above-ground, transmission power line (WAPA) (0) *These lines typically have a maintained road and taller structures associated with them.*
    - 150 ft. to 450 ft. from a GCEA above-ground, distribution power line (-1) *Are typically smaller in structure and have no maintained to that accompanies them.*
    - <150 ft. from a GCEA above-ground, distribution power line (-2) *Are typically smaller in structure and have no maintained to that accompanies them.*

- **Data for support:**
    - 2011. Phillips, Mike. Public meeting information, December 1, 2011. Meeting to validate the priority tool model called by the Technical Subcommittee for the Gunnison Basin Strategic Committee for the Gunnison Sage-grouse. Mike feels that an impact from power lines is for direct mortality (2 birds within the scope of his study).
    - 2011b. Aldridge, Cam. Public meeting information, December 1, 2011. Meeting to validate the priority tool model called by the Technical Subcommittee for the Gunnison Basin Strategic Committee for the Gunnison Sage-grouse.
    - Messmer, T. et al. 2017 Greater sage-grouse lek persistence and breeding distributions relative to electric power transmission and distribution lines

- **Area for improvement:**

- Exponential decay out to about 2.5km is more probably the direct influence of the power lines. This would reflect the impact of predation on the grouse from perching predators. (Aldridge 2011b.)

Unsuitable Habitat: There are areas within the Gunnison Basin that may have been included within CPW's occupied habitat layer that need to be removed. This layer servers to call out specific, finite areas that should not be counted as grouse habitat.

- **Geospatial Data:** The spatial information comes from aerial imagery and county parcel data.

- **Evaluation class break (weight) justification:**
  - Landfill boundary (-30) *The Gunnison County landfill does not count as grouse habitat due to the level of disturbance, lack of appropriate vegetation and/ or subsidized predation.*
  - <500 ft of the landfill boundary (-30) *This area still provides large subsidies for predators and reduces the quality of habitat to the grouse due to increased levels of predation.*
  - UMTRA site (-30) *This site is the mitigated tailing location for uranium mining that has historically occurred in the valley. Currently, the area is capped with a very thick layer of course black rock that precludes growth of vegetation. The boundary of the rock can be seen using aerial imagery and it is not grouse habitat.*
  - Gunnison County Airport(-30)
  - Large areas of open water(-30)
  - Large, historic gravel pits (-30)

- **Data for support:**

- **Area for improvement:**

2. Validation

The 2012 HPT was validated using known grouse locations by CPW. The 2018 HPT has not been validated against known grouse locations.

Model Accuracy*		
	Version 1	*Version 2*
Tier 1	87.75	
Tier 2	12.25	
Total	100.00	

**Number presented are the % of known bird locations accounted for within the tool.*

4. Scoring Reference Matrix

Habitat Potential	
	Evaluation Class
Lek (0.6 mile buffer from edge of lek polygon)	active
	unknown
	inactive
	historic
Brood Rearing Habitat within 50m of water (riparian, irrigation ditches, mt meadows, swales) and sagebrush	present
Nesting/Summer/ Fall/ Winter Habitat (sagebrush dominated ecological sites and stony rock lands)	< 750ft from brood rearing habitat
	> 750ft from brood rearing habitat
Land Near Active Leks (areas within 2 miles of an active lek and the lek itself)	lek and land <2 miles from active lek boundary
Land Near Active Leks (areas within 2 miles of an active lek and the lek itself)	lek and land <2 miles from active lek boundary
Irrigated Lands (irrigated land greater than 50m from sagebrush not discounting any leks in these areas)	present

Impacts *(This accounts for impacts on the habitat that will not likely be changed.)*	
Subdivisions (areas with development at certain densities)	
Subdivisions (areas with development at certain densities)	areas with 3 housing points within 1000'
Subdivisions (areas with development at certain densities)	
Roads and Trails (this accounts for the fragmentation impacts of the road/trail structure and NOT the impacts associated with the recreational use)	<150ft from the centerline of improved roads
Roads and Trails (this accounts for the fragmentation impacts of the road/trail structure and NOT the impacts associated with the recreational use)	<50ft from the centerline of a double track roads
	<25ft from the centerline of a single track roads
	<25ft from the centerline of a closed routes

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Powerlines	0 – 820 ft from above ground transmission line (-3)
	820ft – 1,640ft from above ground transmission line (-2) 1,640 – 4920 ft from above ground transmission line (-1_ 4,920 – 6,560 ft from above ground transmission line (0) 150- 450ft from above ground distribution line (-1) <150ft from above ground distribution line (-2)
	Landfill boundary (-30)
	< 500ft of the landfill boundary (-30)
	UMTRA site (-30)
	Gunnison County Airport (-30)
	Open water (-30)
Unsuitable Habitat	arge, historic gravel pits (-30)

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4. Mapped Acreage

Mapped Acreage			
		Version 1 (2012)	*Version 2 (2018)*
Lek	Active		
	Unknown		
	Inactive		
	Historic		
	Brood Rearing Habitat		
	Nesting/Summer/ Fall Habitat		
	Winter Habitat		Included with Nesting/Fall
	Critical Winter Habitat	Not Evaluated	
	Land Near Active Leks		
	Irrigated Lands		
Subdivisions	< 300' of a development		
	3 housing points within 1000'		
	<70 acres and developed		
Roads and Trails	<150' from improved road		
	<50' from double-track		
	<25' from single-track		
	<25' from closed route		
Power Lines	<450' from GCEA line		
	<450' from WAPA line		

6. Summary of Updates

In order to maintain the usefulness and improve the accuracy of this tool, occasional updates will be needed. It is proposed that this tool be reviewed and adjusted according to new science and spatial information. Reviews should coincide with CPW's species review for the Gunnison sage-grouse or at the request of the Gunnison sage-grouse Strategic Committee.

The major changes to the HPT are:

- Reduced the **buffer to proximity of Brood Rearing** (BR) habitat to the Nesting/ Summer/ Fall (NSF) habitat and added proximity to Winter habitat. This was to capture the idea that NSF and Winter habitat in closer proximity to brood rearing/ mesic areas has higher value.
- Drastically updated the **brood rearing habitat** to capture the floodplain versus a buffered line (increased brood rearing substantially)—based on the TNC mesic area project prioritization model created by The Nature Conservancy in their Climate Resiliency Project. This update also

captured small depression areas in ephemeral drainages that might not have been captured in the first tool.
- Added missing **soil layers** (like Taylor Park Soil Survey)
- Removed the **development threat to areas greater than 70 acres**. This tended to reduce the core of high quality habitat for political reasons that is not appropriate for a habitat assessment.

Updates that were not incorporated, but may provide useful in future updates:

- **Tree stands** are not consistently removed from the habitat model. Is there a better way to capture sites that have the potential to produce trees? If so, those areas should be removed.
- **Noxious weeds** and invasive species information would be very valuable to add to the tool, but due to inconsistencies in mapping across private and public lands, it is hard to incorporate into this model. Adding this layer would also tend to indicate a permanent loss or degradation of habitat that may not actually reflect new treatment and restoration technologies.
- Consider using a view shed analysis to review implications of **powerlines** on habitat. Currently there is a gradient, but topography is not weighing in to the mapping. To complete this analysis, we would need more information like tower and wire heights.

Major Questions/ Concerns:

- Have we adequately captured grouse habitat (at nearly 60% of the basin)? Can we ground truth this again like we did in the previous model with the CPW data. (Version 1 captured >80% of the bird locations.)
- Winter habitat was combined with the nesting/summer/fall habitat. Differentiation between the two habitat types was difficult and inaccurate. A new Critical Winter Habitat layer is needed in future year updates.
- Official lek status was updated to 2016 data provided by CPW. The lek boundary layer remains the 2012 layer.
- The occupied habitat layer collected by CPW will be updated from the 2005 data to the 2015 data.
- All address points (indicating development and housing) will be updated to the current available data (2017).
- Road data is current as of 2010 for BLM, USFS, County, Municipal, State and US.
- Unofficial Taylor Park Soil Survey data was incorporated into the model.
- Updated power line data to include GCEA local distribution lines.
- To simplify the geospatial layers included in the model, the 2018 model will only include scored habitat and impact layers. All other layer data will be kept for future years project analysis.
- Small sliver polygons less than 1 acre will be blended into an adjacent polygon in which it shares the largest border. Due to the model's spatial inaccuracies, the removal of these small polygons will more closely reflect the data's accuracy.
- More information is needed to substantiate the ranking values assigned.
- Comparative analysis of model to known grouse locations as provided by CPW and NPS needs to be done to fully understand the model's ability to capture grouse habitat suitability. Initial reviews of the original tool with on the ground assessment and preliminary data from CPW have shown good ability to capture habitat values.
- A future update strategy needs to be created.
- Area around Blue Mesa that was initial outside of CPW's occupied habitat layer but above the Bureau of Reclamation's high water line for the reservoir was added back in.
- When compared to several other models that have been created specifically for the Gunnison sage-grouse, the HPT is the only one that focuses on habitat potential based upon soils and not bird

tracking locations. Both Mindy Rice's (CPW) and Cam Aldridge's models (USGS) focus on resource selection which may not truly depict habitat potential, quality and distribution.

6. HPT Future Update Plan

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7. 2018 Project Update Team

- **Matt Vasquez-** US Forest Service**,** *chair*
- **Russ Japuntich-** Bureau of Land Management
- **Kathy Brodhead-** Bureau of Land Management
- **Theresa Childers-** National Park Service
- **Jim Cochran-** Gunnison County
- **Mike Pelletier-** Gunnison County
- **Nathan Seward-** Colorado Parks and Wildlife
- **Brooke Vasquez-** Gunnison Conservation District
- **Gay Austin-** Bureau of Land Management
- **Tara DeValois-** Bureau of Land Management
- **Liz With-** Natural Resources Conservation Service
- **John Scott-** Scott Resources Management
- **Brooke Vasquez-** Gunnison Conservation District
- **Mark Brennan-** USFWS
- **Pat Magee-** Western State Colorado University
- **Suzie Parker-** USFS
- **Aleshia Fremgen-** Interested community member

8. 2011 Project Team

- **Matt Vasquez-** US Forest Service
- **Russ Japuntich-** Bureau of Land Management
- **Tony Apa-** Colorado Parks and Wildlife
- **Mike Phillips-** Colorado Parks and Wildlife
- **Theresa Childers-** National Park Service
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- **John Toolen-** Bureau of Land Management
- **Charlie Sharp-** US Fish and Wildlife Service
- **Susan Linear-** US Fish and Wildlife Service

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8. References

Colorado Division of Wildlife. *2011 Gunnison Basin Gunnison Sage-Grouse Lek Count Summary and Population Estimate Final Report*. Colorado Division of Wildlife, Gunnison basin, Colorado, USA.

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Aldridge, Cameron L., D. Joanne Saher, Theresa M. Childers, Kenneth E. Stahlnecker, and Zachary H. Bowen. "Crucial Nesting Habitat for Gunnison Sage-Grouse: A Spatially Explicit Hierarchical Approach." *Journal of Wildlife Management*.

Rice M. etal. The importance of seasonal resource selection when managing a threatened species: targeting conservation actions within critical habitat designations for the Gunnison sage-grouse. 2017. CSIRO Publishing

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9. Acronyms

BLM- Bureau of Land Management
CPW- Colorado Parks and Wildlife
CDOW- Colorado Division of Wildlife
GCEA- Gunnison County Electric Association
NPS- National Park Service
NRCS- Natural Resources Conservation Service
RCP- Gunnison Sage-grouse Rangewide Conservation Plan
USFS- US Forest Service
USFWS- US Fish and Wildlife Service
WAPA- Western Area Power Association

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Appendix I: NRCS Soil Survey data

Nesting/Summer/Fall

Soil survey CO660: [MUSYM] in ("127", "138", "142")] and in NE aspects (331 to 149 degrees) in ("107", "131", "139", "153", "165", "172", "191")

Soil survey CO661: [MUSYM] in ("PeA") and in NE aspects (331 to 149 degrees) in ("BaE", "BaF", "EyF", "GoE", "JuF", "LiF", "LmF", "LuE", "LuF", "MhF", "Rl", "SmF", "SoF", "St", "SuF")

Soil survey CO662: [MUSYM] in ("BsB", "CuB", "DeB", "EvB", "EvD", "GeB", "IrB") and in NE aspects (331 to 149 degrees) in ("Ad", "BoE", "CeE", "CoE", "CrE", "DeC", "DoE", "DrE", "DsE", "EvD", "GeE", "JeE", "KcE", "KuE", "KvE", "LeE", "LhF", "MoE", "MrE", "PhF", "PmF", "PwE", "RcE", "Ro", "Rs", "RuE", "SuE", "St", "YgE", "YlE", "YpE")

Soil Survey: CO663 [MUSYM] in ("108") and in NE aspects (331 to 149 degrees) in ("105", "109", "110", "111", "119", "121", "122", "130", "131", "132", "133", "141", "142")

Winter Habitat (just the SW aspects of 150 to 330 degrees for all following soils)

Soil survey CO660: [MUSYM] in ("107", "131", "139", "153", "165", "172", "191")

Soil survey CO661: [MUSYM] in ("BaE", "BaF", "EyF", "GoE", "JuF", "LiF", "LmF", "LuE", "LuF", "MhF", "Rl", "SmF", "SoF", "St", "SuF")

Soil survey CO662: [MUSYM] in ("Ad", "BoE", "CeE", "CoE", "CrE", "DeC", "DoE", "DrE", "DsE", "EvD", "GeE", "JeE", "KcE", "KuE", "KvE", "LeE", "LhF", "MoE", "MrE", "PhF", "PmF", "PwE", "RcE", "Ro", "Rs", "RuE", "SuE", "St", "YgE", "YlE", "YpE")

Soil survey CO663: [MUSYM] in ("105", "109", "110", "111", "119", "121", "122", "130", "131", "132", "133", "141", "142")

~~Nesting/ Summer/ Fall Habitat~~

~~Soil Survey~~	~~Soil~~	~~-~~
	~~107~~	
	~~127~~	
	~~138~~	
	~~139~~	
	~~142~~	
	~~165~~	
	~~172~~	
~~CO660~~	~~191~~	
~~Grand Mesa- West Elk~~	~~153~~	~~*only NE aspects~~
	~~BaE~~	
	~~BaF~~	
	~~EyF~~	
~~CO661~~	~~GoE~~	

	~~JuF~~	~~*only S aspects~~
	~~LiF~~	
	~~LuE~~	
	~~LuF~~	
	~~MhF~~	
~~Taylor Park~~	~~SmF~~	~~*only elevations below 9,500 ft~~
	~~BeD~~	
	~~CeC~~	
	~~CoE~~	
	~~CuE~~	
	~~DeB~~	
	~~EvD~~	
	~~GeE~~	
	~~JeE~~	
	~~KvE~~	
	~~LeE~~	
	~~MoE~~	
	~~MrE~~	
	~~PwE~~	
	~~RcE~~	
	~~SuE~~	
	~~YgE~~	
	~~YlE~~	
	~~YpE~~	
	~~CrE~~	~~*only NE aspects~~
	~~DrE~~	~~*only NE aspects~~
	~~DsE~~	~~*only NE aspects~~
	~~KcE~~	~~*only NE aspects~~
	~~LhF~~	~~*only NE aspects~~
	~~PhF~~	~~*only NE aspects~~
~~CO662~~	~~PmF~~	~~*only NE aspects~~
~~Gunnison~~	~~MrE~~	~~*only NE aspects~~
	~~105~~	
	~~108~~	
	~~110~~	
	~~111~~	
	~~119~~	
	~~121~~	
	~~122~~	
	~~131~~	
	~~132~~	
	~~133~~	
~~CO663~~	~~141~~	

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	~~142~~	
~~Cochetopa~~	~~110~~	~~*only NE aspects~~

~~Brood Rearing Habitat~~

~~Soil Survey~~	~~Soil~~	~~-~~
~~CO660~~	~~127~~	
~~Grand Mesa- West Elk~~	~~162~~	~~*50m in if adjacent to sagebrush~~
	~~Ad~~	
	~~DnF~~	
	~~PcA~~	~~* only if irrigated~~
	~~PnA~~	
~~CO661~~	~~PnE~~	
~~Taylor Park~~	~~TnA~~	~~-~~
	~~Ad~~	
~~CO662~~	~~Ao~~	
~~Gunnison~~	~~Aw~~	~~-~~
	~~106~~	
~~CO663~~	~~108~~	
~~Cochetopa~~	~~109~~	~~*only NE aspects~~

~~Wintering Habitat~~

~~Soil Survey~~	~~Soil~~	~~-~~
~~CO660~~	~~153~~	
~~Grand Mesa- West Elk~~	~~-~~	~~-~~
~~CO661~~	~~none~~	
~~Taylor Park~~	~~-~~	~~-~~
	~~CrE~~	~~*only SE to NW aspects~~
	~~DrE~~	~~*only SE to NW aspects~~
	~~DsE~~	~~*only SE to NW aspects~~
	~~KcE~~	~~*only SE to NW aspects~~
	~~LhF~~	~~*only SE to NW aspects~~
	~~PhF~~	~~*only SE to NW aspects~~
~~CO662~~	~~PmF~~	~~*only SE to NW aspects~~

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~~Gunnison~~	~~MrE~~	~~*only SE to NW aspects~~
~~CO663~~	~~110~~	
~~Cochetopa~~	~~130~~	~~-~~

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