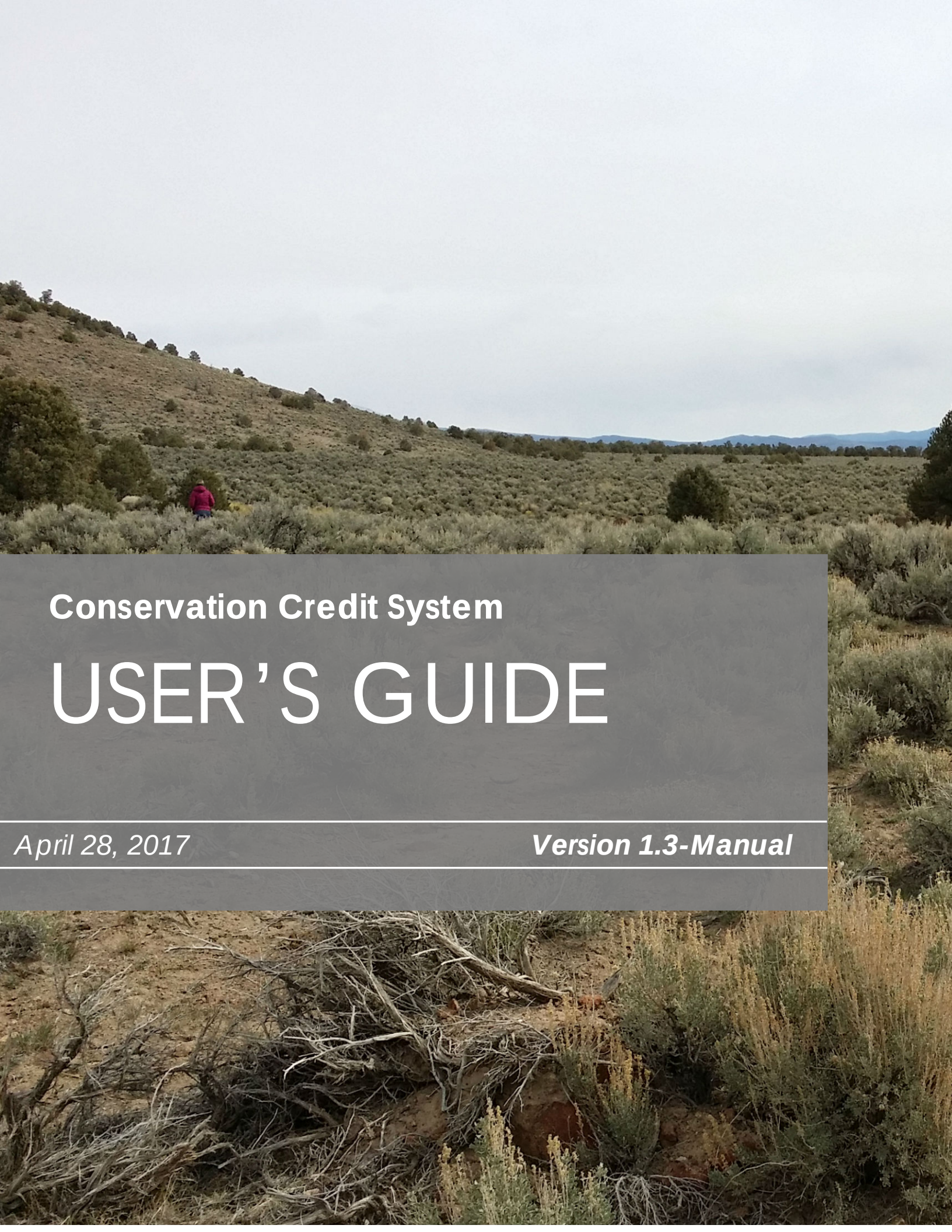


Conservation Credit System

USER'S GUIDE

April 28, 2017 ***Version 1.3-Manual***

INTRODUCTION

The User's Guide describes the detailed steps necessary to calculate credits and credit obligations for credit and debit sites, respectively, for the Nevada Conservation Credit System.

WHO USES THE USER'S GUIDE

The User's Guide is intended for use by the Credit System Administrator, Technical Support Providers and Verifiers to calculate credits and credit obligations, and is currently designed with these users in mind. This version of the User's Guide has been made available to the general public, along with data required to use the User's Guide (see *Required Data* in the *Desktop Analysis* section), to allow testing of the User's Guide steps. You are encouraged to send any feedback to the Credit System Administrator.

Using the User's Guide requires substantial knowledge of sage-grouse biology, moderate GIS capabilities, and extensive experience with field data collection methods including identification of Great Basin plant species. This expertise may be provided by a single individual or team. In addition, there are specific software requirements (as defined at the beginning of each section), including an ESRI ArcGIS license with the Spatial Analyst extension and Microsoft Excel 2000 or later.

HOW TO USE THE USER'S GUIDE

The User's Guide is organized into three major steps summarized in Figure 1. All steps should be executed in sequence listed below, unless the user has extensive experience and a deep understanding of the steps, in order to ensure accurate calculation of credits and credit obligations, and take advantage of efficiencies built into the design of the User's Guide.

1. **Desktop Analysis:** The Desktop Analysis should be completed first, because a) the Desktop Analysis informs the sampling protocol used in the field analysis, and b) the Desktop Analysis pre-screens credit project sites to ensure that they meet the credit site eligibility requirements (see the Credit System Manual for more on credit site eligibility) before investing significantly more resources to collect field data.
2. **Field Data Collections Methods:** The Field Data Collection Methods can be conducted after completing Step 1.3 of the Desktop Analysis since map units and sampling intensity guidelines will be available after this step. However, it is recommended to complete the entire Desktop Analysis before going into the field so that individuals in the field have more knowledge of the site and are able to vet all outputs from the Desktop Analysis while in the field, which will reduce the likelihood of having to conduct another site visit. Map units may be revised during the field visit, which would require portions of the Desktop Analysis to be rerun.
3. **Credit/Credit Obligation Calculation:** The complete Credit/Credit Obligation calculation can only be performed after completing both the Desktop Analysis and Field Data Collection Methods. It is possible to generate some partial estimates of the credit/credit obligation calculation that may be of interest in particular situations (e.g., projected local-scale function, site-scale habitat function) once required data for those elements are available.

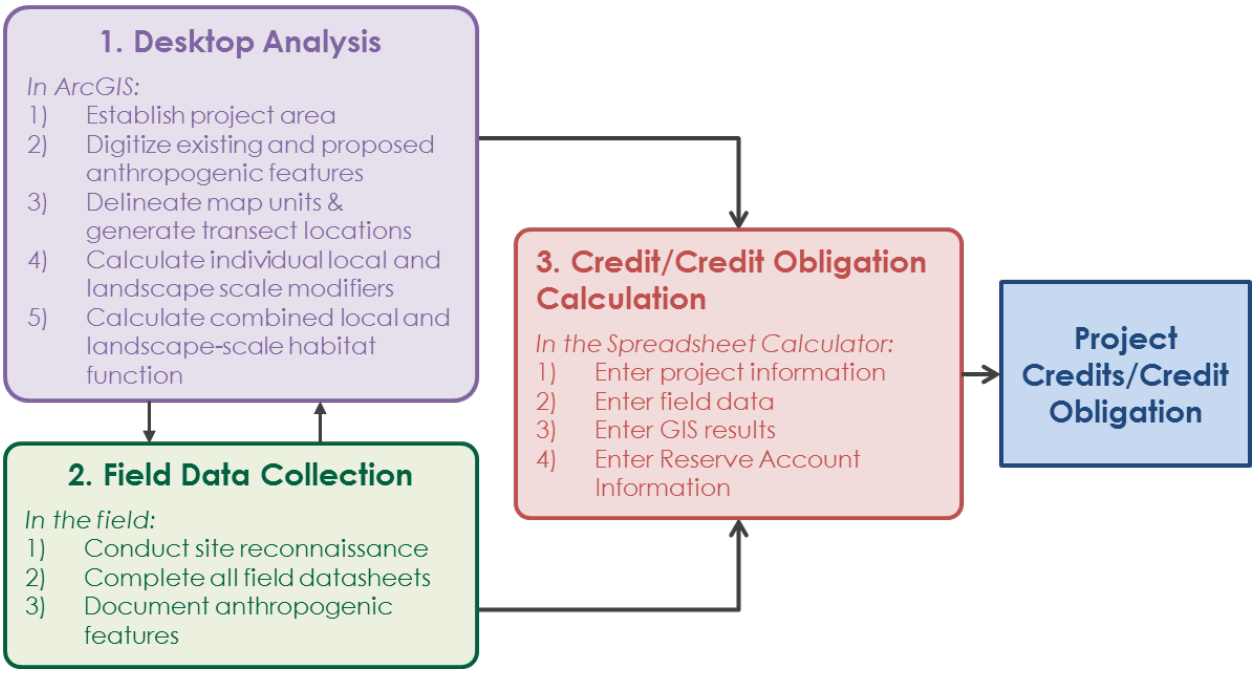


Figure 1. Workflow diagram for calculating credits/credit obligations for the Conservation Credit System

HOW THE USER'S GUIDE RELATES TO THE MANUAL AND HABITAT QUANTIFICATION TOOL

The User's Guide operationalizes steps, and applies the policy and technical methods defined in the Credit System Manual and Habitat Quantification Tool (HQT) Methods Document in order for Technical Support Providers, Verifiers and the Credit System Administrator to consistently and efficiently calculate credits and credit obligations.

OPERATIONALIZE STEPS DEFINED IN THE MANUAL

The User's Guide describes the detailed steps necessary to consistently and efficiently perform portions of the process to generate credits and purchase credits under the Credit System. *Section 3: Credit System Operations* of the Credit System Manual summarizes the process, and the portions of the process covered by the User's Guide are described below.

For Credit Projects

The User's Guide covers step D1 in *Section 3.1: Generating Credits* of the Nevada Conservation Credit System Manual (Figure 2). Before beginning the User's Guide, a Project Validation Checklist should be submitted and approved by the Administrator. Review *Section 3: Credit System Operations* of the Manual for more information.

Figure 2. Overview of the process steps to generate credits

For Debit Projects

The User's Guide covers step B2 in *Section 3.2: Acquiring Credits* of the Nevada Conservation Credit System Manual (Figure 3). Before beginning the User's Guide, the Credit Obligation Statement with

project design information should be submitted to the Administrator. Review *Section 3: Credit System Operations* of the Manual for more information.

Figure 3. Overview of the process to calculate credit obligation and acquire credits

APPLY POLICY AND TECHNICAL METHODS DEFINED IN THE MANUAL AND HQT METHODS DOCUMENT

The User's Guide describes the detailed steps necessary to consistently and efficiently apply the policy and technical methods defined throughout the Credit System Manual and HQT Methods Document when calculating credits and credit obligations. A summary of the Manual and HQT are described below.

Credit System Manual

The Credit System Manual describes the policy and technical requirements regarding the calculation, transaction, and tracking of credits and debits in the Credit System. *Section 2: Policy and Technical Elements* of the Credit System Manual contains the policy and technical requirements, and is organized by the following sections:

2.1 Program Governance: Describes the governance, enforcement, accounting and adaptive management procedures.
2.2 Habitat Quantification and Credit and Debit Calculation: Describes how to calculate credits, debits and credit obligations.
2.3 Credit Additionality Provisions: Describes requirements that ensure credit projects provide benefits beyond those that would be achieved if the project and associated management actions had not taken place.
2.4 Credit Durability Provisions: Describes requirements that ensure credit projects are producing expected outcomes for their entire duration.
2.5 Credit Obligation Provisions and Credit Investment Strategies: Describes requirements that ensure credit obligation projects offset the direct and indirect impacts of debit projects.

Habitat Quantification Tool Methods Document

The HQT Methods Document defines relevant habitat selection criteria corresponding to sage-grouse survival and reproduction at multiple spatial scales. The HQT measures and delineates habitat selection criteria using the following four orders, which are defined in substantial detail in *Section 3: Habitat Quantification Methods and Attributes* of the HQT Methods Document:[1]

Range-wide: the range for sage-grouse in Nevada;
Landscape Scale: management areas that have been identified as important for maintaining the species at statewide scales (e.g., Priority Habitat Management Areas, General Habitat Management Areas, and Other Habitat Management Areas) and the availability of seasonal habitats;
Local Scale: habitat conditions and anthropogenic factors that affect sage-grouse use of, and movement between, seasonal use areas within and surrounding the project site;
Site Scale: habitat conditions at the site of the proposed activities.

[1] Stiver, S.J., E.T Rinkes, and D.E. Naugle. 2010. Sage-grouse Habitat Assessment Framework. U.S. Bureau of Land Management. Unpublished Report. U.S. Bureau of Land Management, Idaho State Office, Boise, Idaho.

WHAT PRINCIPLES GUIDE THE CALCULATION OF CREDITS AND CREDIT OBLIGATIONS WHEN ADDITIONAL CLARITY IS NEEDED

The following principles guided the development of the process documented in this User's Guide to calculate credits and credit obligations. Users should reference these principles if they need clarity or additional guidance when calculating credits or credit obligations for any specific project.

1. Reflect the concepts and science of the Habitat Quantification Tool methods document accurately
2. Quantify both direct and indirect impacts of debit projects
3. Acknowledge the spatially explicit and cumulative nature of impacts to sage-grouse habitat
4. Evaluate all projects by comparing baseline and post-project condition
5. Strive for replicability and consistency
6. Increase ease of use and decrease cost whenever possible without reducing accuracy and replicability
7. Ensure all credit projects generate benefits to sage-grouse proportionate to the impact being offset

1. **Desktop** Analysis

1. DESKTOP ANALYSIS

TOOLS REQUIRED

In order to complete the Desktop Analysis, the following tools are required.

- ArcGIS version 10.0 or later—Basic (ArcView) license or better is required.
  - Spatial Analyst extension for ArcGIS.
  - For projects in Nevada, we suggest that the coordinate system used in this analysis is UTM Zone 11N, projected in NAD83.
- Microsoft Excel (2000 or higher).
- Current Version of the Credit or Debit Project Calculator.
- Management Plan and Validation Checklist (credit projects only).
- *Recommended:* Nevada Conservation Credit System Manual and HQT Scientific Methods Document for reference.

DATA REQUIRED

The following data should be acquired before beginning the Desktop Analysis.

1. Download and unzip the **NevadaCCSDataPackage_v1_3.zip** folder, available at https://dcnrftp.ndep.nv.gov.
   Username: SET_public
   Password: SET@1234

- In this folder, you will find (1) the Nevada CCS Map Package, (2) Anthro_Features.gdb, (3) Required_Data_Layers.gdb, and (4) the 'Layer Files' folder.
- **The Nevada CCS Map Template** (.mxd) can be used as a starting point for completing the Desktop Analysis on either Credit or Debit projects; use of the template is optional.
- **Anthro_Features.gdb** is a file geodatabase containing existing anthropogenic features to be used to assist in delineating anthropogenic features:
  - **Mines**: Federal mine locations derived from Mineral Resource Data System (MRDS) data.
  - **Oil_Gas**: Federal oil and gas well locations derived from Automated Fluid Mineral Support System (AFMSS) data dated 12/2012.
  - **Powerlines**: Empty feature class to allow users to more easily delineate powerlines.
  - **Renewable**: Geothermal leases dated 2013.
  - **Roads**: State, federal, and county roads compiled by Nevada Department of Transporation (NDOT).
  - **Towers**: Communications tower locations derived from FCC data.
  - **Urban**: Boundaries of census blocks in Nevada categorized based on a Wikipedia search of all cities/townships.
- **Required_Data_Layers.gdb** contains the following data:
  - Anthropogenic Disturbance Attribute Table (**Anthro_Attribute_Table**): This table provides the indirect-effect weights and distances of anthropogenic features. Data in this table is also provided in Table 1, further below.
  - Distance to Brood-Rearing Habitat (**Dist_Brood**): This raster layer represents habitat function associated with distance to brood-rearing habitats in Nevada. Use to calculate the Distance to Brood-Rearing Habitat modifier.
  - SEP Management Categories Map (**Mgmt_Cat**): This feature layer delineates the boundaries of Sagebrush Ecosystem Program (SEP) Management Categories in Nevada. Use for informing the Credit System's Mitigation Ratio.

- Biological Significant Units (**NV_BSU**): This feature class delineates the boundaries of the Biological Significant Units in Nevada.
- Nevada Disturbance Response Groups (**NV_DRG**) [2]: This feature class delineates the boundaries of ecological sites that have been grouped into identified disturbance response groups.
- Priority Conservation Areas (**NV_PCA**): This feature class delineates the boundaries of Priority Conservation Areas, which are defined as the intersection between Sagebrush Focal Areas and (SFA) and Priority Habitat Management Areas (PHMA) in Nevada.
- Population Management Units (**NV_PMU**): This feature class delineates the boundaries of the NDOW Population Management Units in Nevada.
- WAFWA Management Zones (**NV_WAFWA**): This feature class delineates the boundaries of the WAFWA Management Zones in Nevada.
- Precipitation Regime (**Precip**): This raster layer is reclassified such that areas with less than 25.4 cm of precipitation are categorized as arid (coded as '0'), and areas with greater than 25.4 cm are categorized as mesic (coded as '1'). It is derived from the 30-year normal PRISM dataset available at http://prism.oregonstate.edu/normals/. Use for identifying the precipitation regime of individual map units.
- Breeding Habitat Suitability Index (**Spring_HSI**): This raster dataset provides an index of local-scale habitat functionality for sage-grouse in Nevada during the spring season, which corresponds to the breeding life history period for sage-grouse.
- Late Brood-rearing Habitat Suitability Index (**Summer_HSI**): This raster dataset provides an index of local-scale habitat functionality for sage-grouse in Nevada during the summer season, which corresponds to the late brood-rearing life history period for sage-grouse.
- Over-Wintering Habitat Suitability Index (**Winter_HSI**): This raster dataset provides an index of local-scale habitat functionality for sage-grouse in Nevada during the winter season, which corresponds to the over-wintering life history period for sage-grouse.

- **Layer Files Folder**: Includes layer files that may be used to standardize the symbology of outputs of the Desktop Analysis. Instructions for applying symbology to layers using layer files are provided throughout the User's Guide at appropriate steps.

2. Download Supplemental Data Sources

   - **NAIP (National Agricultural Imagery Program) imagery:** Use as a supplemental data source for delineating map units, detecting additional disturbance and verifying disturbance from GIS layers. True Color images are available in seamless statewide coverage from the following ArcGIS Server site: https://gis.apfo.usda.gov/arcgis/rest/services.

     a) ***To install this ArcServer***: click the Add Data button> from the look in menu navigate to GIS Server (toward the bottom)> Add ArcGIS Server> Use GIS Services> Next> Enter https://gis.apfo.usda.gov/arcgis/rest/services into the internet server box> Finish.

     b) ***To use the images from the above server***: click the Add Data button> navigate to GIS Servers> arcgis on gis.apfo.usda.gov> NAIP> Nevada_2015_1m_NC.

     In addition, other aerial imagery sources may be used (e.g., base layers available through ArcMap (File>Add Data> Add Basemap).

[2] Disturbance Response Grouping of Ecological Sites Increases Utility of Ecological Sites and State-and-Transition Models for Landscape Scale Planning in the Great Basin. Tamzen K. Stringham, Patti Novak-Echenique, Devon K. Snyder, Sarah Peterson, and Keirith A. Snyder. *Rangelands* 2016 38 (6), 371-378

- **Synth Map 2008 (or most recent version)**: Use as a supplemental data source for delineating map units. Available at http://heritage.nv.gov/node/164. Download the 'Map High Resolution' and unzip the folder to the desired location. Add the layer file (.lyr) and set the data source as the shapefile (.shp).
- **SSURGO (Soil Survey Geographic Database)**: Use the web soil survey data to assist with delineating map units based on ecological site descriptions. Available at http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx. Download soils data either by navigating to appropriate county and select the most appropriate soils survey based on description or by defining area of interest (AOI) and downloading data for the AOI.
- **USGS Topographic Maps**: Use for assistance delineating map units. In ArcMap, go to File> 'Add data from ArcGIS Online'. Search for USA Topo. Click "Add" for most recent version. Also available at http://nationalmap.gov/ustopo/.

3. Acquire field data sheets and guidance for the scorecards, located in the Appendices.
4. Acquire the **Proposed Surface Disturbance** or **Credit Project Boundary** shapefile or feature layer. This is the area that is being proposed as the debit or credit project, and should be provided by the project proponent.

    a. If the proposed surface disturbance or credit project boundary shapefile is not provided, follow the steps below to create it. Ensure you have sufficient information to accurately digitize this layer.

    For credit projects:

    1. Create a new feature class, type— "Polygon Features". Name this file **Credit_Project_Boundary**.
    2. Start an editing session by right-clicking on the layer in the Table of Contents, clicking 'Edit Features', then 'Start Editing'.
    3. Digitize the area of land on which credits can be generated. For example, areas not designated within management categories are to be excluded as well as lands not eligible to be included in the project. Be sure to save edits and stop editing when done.

    For debit projects:

    1. Create a new feature class, type— "Polygon Features". Name this file **Proposed_Surface_Disturbance.**
    2. Digitize the outer extent of the proposed surface disturbance, creating separate features within the same feature class for each anthropogenic feature subtype described in Table 1. Be sure to save edits and stop editing when done.

5. Acquire the **Dist_Lek** layer from the Nevada Department of Wildlife by submitting a Data Request Form, available from the NDOW website at http://www.ndow.org/Nevada_Wildlife/Maps_and_Data/Data/. Provide the **Credit_Project_Area** or **Debit_Project_Area** layer after completing steps 1.1 and 1.2 of the Desktop Analysis as the 'Project Extent'. Clarify that you are requesting the **Dist_Lek** layer for the purpose of assessing a project site for the Conservation Credit System.

ANTHROPOGENIC FEATURES EVALUATED DURING THE DESKTOP ANALYSIS

Table 1 contains the definitions and indirect-effect weights and distances of anthropogenic features. This table is referenced throughout the Desktop Analysis to evaluate impacts from existing and proposed anthropogenic features. It is provided here for quick reference.

Table 1. Anthropogenic Features Considered in the Nevada Conservation Credit System

TYPE	SUBTYPE	WEIGHT (%)	DISTANCE (Meters)	DEFINITION	RECOMMENDED DATA SOURCE
Towers	Communications	75%	6,000 m	Tall structures designed to support antennas for telecommunications and broadcasting.	*Not Available*
	Meteorological	75%	6,000 m	Tall structures designed to support meteorological measuring instruments, including those installed to test the feasibility of wind farms.	*Not Available*
Powerlines*	Transmission - Distribution	75%	6,000 m	Major and minor electrical power transmission and distribution lines with cross members, supporting arms, etc. Do not include buried transmission lines.	Hanser, S. (2004). Powerlines in the Western United States; in SageMap. http://sagemap.wr.usgs.gov/HumanFootprint.aspx TIGER Line census data https://www.census.gov/geo/maps-data/data/tiger-line.html.
	Monopole	25%	6,000 m	Monopole distribution lines with no cross members, supporting arms, etc. or of a construction that would not support raven occupancy	
Mines	Active - Large	100%	6,000 m	Total area of 60 acres or more, active	Nevada Department of Environmental Protection (*included in Recommended_Anthro_Data.gdb*) BLM Permitted Mines (request from appropriate district or field office) USGS Mineral Resources Online Spatial Data http://mrdata.usgs.gov/mrds/
	Active - Med or Small	100%	3,000 m	Total area less than 60 acres, active	
	Inactive - Large	50%	1,000 m	Total area of 60 acres or more, inactive (no longer removing material from the ground and very little, if any, associated human activity. Some infrastructure, hard structures, or facilities are still present on the site. Do not include reclaimed mines or non-reclaimed mines with no remaining infrastructure).	
	Inactive - Med or Small	10%	1,000 m	Total area less than 60 acres, inactive (see above definition of inactive).	

Oil & Gas Wells	Producing	100%	3,000 m	Activity is occurring at the well pads.	*Not Available*
	Inactive	0%	0 m	Activity is not occurring at the location.	
Pipelines	Pipeline	n/a	n/a	Pipelines are not captured within the context of anthropogenic features on the landscape within the HQT. This is primarily due to lack of literature and the temporal nature of these features at this point in time. Do not digitize pipeline features.	*Not Applicable*
Urban, Suburban, Ex-Urban Development	Med - High	100%	6,000 m	Incorporated cities or unincorporated towns with a population of 10,000 residents or greater according to the latest population data from the State Demographer.	Sagebrush Ecosystem Program (SEP) Urban layer (*included in Recommended_Anthro_Data.gdb*) State Demographer's Office http://nvdemography.org/
	Low	75%	3,000 m	Incorporated cities or unincorporated towns with a population of less than 10,000 residents according to the latest population data from the State Demographer.	
Roads	Interstate	100%	6,000 m	Roads with an Interstate functional classification as defined by the Federal Highway Administration.	Nevada Department of Transportation (*included in Recommended_Anthro_Data.gdb*)
	High Use – Paved or Improved; Commercial	100%	3,000 m	Roads with an Arterial or Major Collector functional classification as defined by the Federal Highway Administration. Roads to commercial facilities (e.g., mines, geothermal plants), which may not necessarily be classified by the Federal Highway Administration.	
	Low Use – Improved; Local	25%	1,000 m	Roads with a Minor Collector or Local functional classification as defined by the Federal Highway Administration.	
Renewable	Solar	25%	1,000 m	Utility-scale solar, geothermal, or wind farm projects and any associated above-ground facilities, excluding transmission lines connecting to the main grid (categorize as 'Power Lines'). Do not include reclaimed projects or non-reclaimed projects with no remaining infrastructure.	*Not Available*
	Geothermal	100%	6,000 m		*Not Available*
	Wind	25%	6,000 m		*Not Available*

*The project proponent may request to review and adjust the weight and distance criteria based upon powerline height, construction, perch deterrents or other site-specific factors. Any requests must be submitted to the Administrator and approved by the Scientific Committee.

STEP-BY-STEP GIS INSTRUCTIONS

Before you begin, create a new folder for each project evaluated. Name this folder following the convention **YYMMDD_Project Name**. Within that folder, create a new File Geodatabase. In ArcMap, open the Catalog window (), navigate to the new geodatabase, right click on it and select 'Make Default Database'. You will submit this File Geodatabase to the Credit System Administrator along with the Credit or Debit Project Calculator. Optionally, open the **Nevada CCS Map Template** to begin.

TIP: When creating folder names and file names, use only letters, numbers, and underscores. Do not use other characters. Do not start file names with a number. Some tools will not run properly if there are periods, hyphens, or other symbols in the folder or file names.

NOTE: Make sure all layers are projected in a UTM projection coordinate system (Zone 11N) (EPSG code 26911) and the GIS extent is in the same working coordinate system. [ArcToolbox> Data Management Tools> Projections and Transformations> Project].

NOTE: This User's Guide was developed using ArcGIS version 10.4. Tool options may vary between versions.

1.1. Credit Project Boundary or Proposed Surface Disturbance

In this step, you will generate a layer that contains all anthropogenic features proposed for development or modification by the debit or credit project, differentiated and classified by type, subtype, and term of impact. For most debit projects, this step entails modifying the data provided by the project proponent to conform to the Credit System classifications included in Table 1.

NOTE: Ranch headquarters, equipment yards, home sites, etc. should be digitized and excluded as habitat, although they are not considered to be an anthropogenic disturbance. Treat similarly to roads within the project area (separate map unit, no field data collected, but no negative impact).

1.1.2 Using the Copy Features tool, copy the **Proposed_Surface_Disturbance** or **Credit_Project_Boundary** to the file geodatabase for this project. Name this file **Proposed_Surface_Disturbance** or **Credit_Project_Boundary.**

[ArcToolbox> Data Management Tools> Features> Copy Features]

1.1.3 Remove the original **Proposed_Surface_Disturbance** or **Credit_Project_Boundary** from the map project.

NOTE: If the **Credit_Project_Boundary** or **Proposed_Surface_Disturbance** provided by the project proponent is represented by multiple shapefiles, use the Merge tool to merge the shapefiles into a single feature class.

[ArcToolbox> Data Management> General> Merge]

- Input Datasets = All shapefiles representing the **Credit_Project_Boundary** or **Proposed_Surface_Disturbance,**
- Output Dataset = **Credit_Project_Boundary** or **Proposed_Surface_Disturbance,**
- Field Map = *leave as default*.

NOTE: Use the Intersect tool to determine if the **Credit_Project_Boundary** or **Proposed_Surface_Disturbance** provided by the project proponent contains overlapping polygons.
[ArcTools> Analysis> Overlay> Intersect]

- Input Features = **Credit_Project_Boundary** or **Proposed_Surface_Disturbance**
- Output Feature Class = *append* **'_Merged'** *to feature class name*
- Join Attributes = ALL,
- XY Tolerance = *blank*,
- Output Type = INPUT.

If overlapping polygons are present, remove any areas of overlap: In an editing session, select an overlapping polygon. Select the Clip tool in the Editor toolbar (Editor> Clip). A dialog box will pop up. Leave the Buffer Distance = 0.0 and select 'Discard the area that intersects', then click OK. Any polygon portions overlapping the selected polygons will be deleted. Repeat for all overlapping polygons. Consult the project proponent if unsure about how to categorize overlapping areas.

1.1.4 For credit projects: If the credit project does not involve modification of existing anthropogenic features, skip to step 1.2. Otherwise continue with this step.

For credit projects that propose to modify existing anthropogenic features: Digitize the anthropogenic features to be modified:

1.1.4(a) Create a new feature class, type— "Polygon Features". Name this layer **Proposed_Modified_Features**.
1.1.4(b) Add Fields (1) 'Type' and (2) 'Subtype', type – "text".
1.1.4(c) Start an editing session by right-clicking on the layer in the Table of Contents, clicking 'Edit Features', then 'Start Editing'.
1.1.4(d) Digitize the outer extent of the surface disturbance related to the anthropogenic feature to be modified, creating separate features for each of the anthropogenic feature subtypes described in Table 1. Anthropogenic features not described in Table 1 are considered 'de minimus' and should not be digitized.
1.1.4(e) Populate the 'Type' and 'Subtype' fields for each feature with the correct data from Table 1 (see Figure 4 for an example). Be sure to save edits and stop editing when done.
1.1.4(f) Using the 'Join Field' tool, join the **Anthro_Attribute_Table**'s 'Dist' and 'Weight' field.

[ArcToolbox> Data Management Tools> Joins> Join Field]

- Input Table = **Proposed_Modified_Features**
- Input Join Field = 'Subtype'
- Input Join Table = **Anthro_Attribute_Table**
- Output Join Field = 'Subtype'
- Join Fields = *check* 'Dist' *and* 'Weight'

For debit projects: Ensure that the Proposed_Surface_Disturbance layer only encompasses public lands (only disturbances that require mitigation through consultation are required).

1.1.4(g) Open the attribute table of the **Proposed_Surface_Disturbance**.
1.1.4(h) Add Fields (1) 'Type' and (2) 'Subtype', type – "text"; (3) 'Term', and (4) 'Rehab' type – "long integer" to the attribute table.

1.1.4(i) Start an editing session by right-clicking on the **Proposed_Surface_Disturbance** layer in the Table of Contents, clicking 'Edit Features', then 'Start Editing'.

1.1.4(j) Modify the **Proposed_Surface_Disturbance** layer so that separate features are created for each anthropogenic feature subtype described in Table 1 (if necessary). If an existing feature will be upgraded from one subtype to another (e.g., changing a low-use gravel road to a high-use road), ensure that it is also digitized as a feature within the feature layer.

1.1.4(k) Populate the 'Type' and 'Subtype' fields for each feature with the correct data from Table 1 (see Figure 4 for an example).

1.1.4(l) For anthropogenic features permitted for term impacts, populate the 'Term' field with the four-digit year that the activity at the anthropogenic feature will cease (estimate this year if unsure). Populate the 'Rehab' field with the four-digit year that the surface disturbance will be rehabilitated to pre-project condition. For anthropogenic features permitted for permanent impacts, input '9999' in the 'Term' and 'Rehab' fields. Be sure to save edits and stop editing when done.

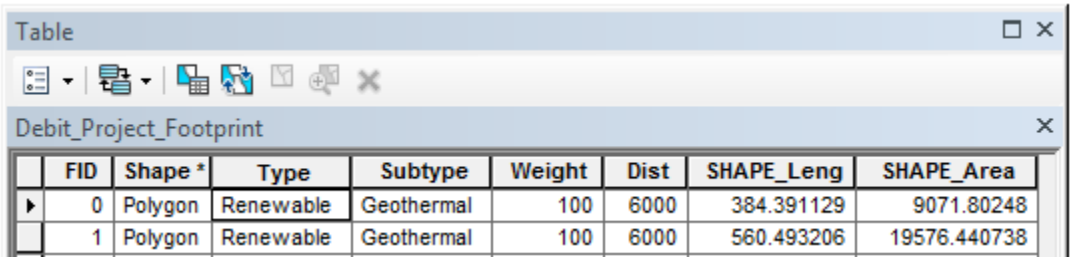
1.1.4(m) Using the 'Join Field' tool, join the **Anthro_Attribute_Table**'s 'Dist' and 'Weight' field.

[ArcToolbox> Data Management Tools> Joins> Join Field]

- Input Table = **Proposed_Modified_Features**
- Input Join Field = 'Subtype'
- Input Join Table = **Anthro_Attribute_Table**
- Output Join Field = 'Subtype'
- Join Fields = *check* 'Dist' *and* 'Weight'

NOTE: For mining (or renewable energy) facilities, proposed infrastructure such as roads and powerlines that are located within or immediately adjacent to anthropogenic features should be categorized as mining (or renewable energy) features. Proposed roads or powerlines that fall outside of the project footprint, such as those connecting the project to existing infrastructure, should be categorized as roads and powerlines.

TIP: The **Proposed_Surface_Disturbance** file provided by the project proponent will likely contain field codes analogous to the 'Type' and 'Subtype' fields populated with information from Table 1. Work with the project proponent to re-categorize the layer using those field codes.



Table

Debit_Project_Footprint

FID	Shape *	Type	Subtype	Weight	Dist	SHAPE_Leng	SHAPE_Area
0	Polygon	Renewable	Geothermal	100	6000	384.391129	9071.80248
1	Polygon	Renewable	Geothermal	100	6000	560.493206	19576.440738

Figure 4. Completed attribute table for the Proposed_Modified_Features layer for credit projects. The Proposed_Surface_Disturbance layer for debit projects will look similar, with the addition of 'Term' and 'Rehab' fields.

1.2. Project Area

1.2.1 To determine project area:

For credit projects: If the credit project does not involve modification of existing anthropogenic features, the project area is the same as the **Credit_Project_Boundary**. Skip to step 1.3.

For credit projects that propose to modify existing anthropogenic features:

1.2.1(a) Using the Buffer tool, buffer the **Proposed_Modified_Features** layer based on the disturbance subtype of the feature(s) to be modified using the 'Dist' attribute from the attribute table. Name this layer **Indirect_Benefits_Area**.

[ArcToolbox> Analysis Tools> Proximity> Buffer]

- Input Features = **Proposed_Modified_Features**,
- Output Feature Class = **Indirect_Benefits_Area**,
- Distance = the 'Dist' field from the attribute table (select the 'Field' radio button and choose 'Dist' from the dropdown menu),
- Side Type = FULL,
- Method = PLANAR,
- Dissolve Type = ALL,
- Dissolve Fields = *none checked*.

1.2.1(b) Using the Union tool, union the **Indirect_Benefits_Area** with the **Credit_Project_Boundary**. Name this layer **Credit_Project_Union**.

[ArcToolbox> Analysis> Overlay> Union]

- Input Datasets = **Indirect_Benefits_Area** and **Credit_Project_Boundary**,
- Output Dataset = **Credit_Project_Union**,
- Field Map = *leave as default*.

1.2.1(c) Using the Dissolve tool, spatially dissolve the **Credit_Project_Union** layer. Name this layer **Credit_Project_Area**.

[ArcToolbox> Data Management Tools> Generalization> Dissolve]

- Input Features = **Credit_Project_Union**,
- Output Feature Class = **Credit_Project_Area**,
- Dissolve Fields = *none checked*,
- Statistic Fields = *blank*,
- Create multipart features = *checked*,
- Unsplit lines = *unchecked*.

For debit projects:

1.2.1(d) Using the Buffer tool, buffer the **Proposed_Surface_Disturbance** based on the disturbance subtype of the feature(s) to be modified using the 'Dist' attribute from the attribute table. Name this layer **Debit_Project_Area** (Figure 5).

[ArcToolbox> Analysis Tools> Proximity> Buffer]

- Input Features = **Proposed_Surface_Disturbance**,
- Output Feature Class = **Debit_Project_Area**,
- Distance = the 'Dist' field from the attribute table (select the 'Field' radio button and choose 'Dist' from the dropdown menu),
- Side Type = FULL,
- Method = PLANAR,
- Dissolve Type = ALL,
- Dissolve Fields = *none checked*.

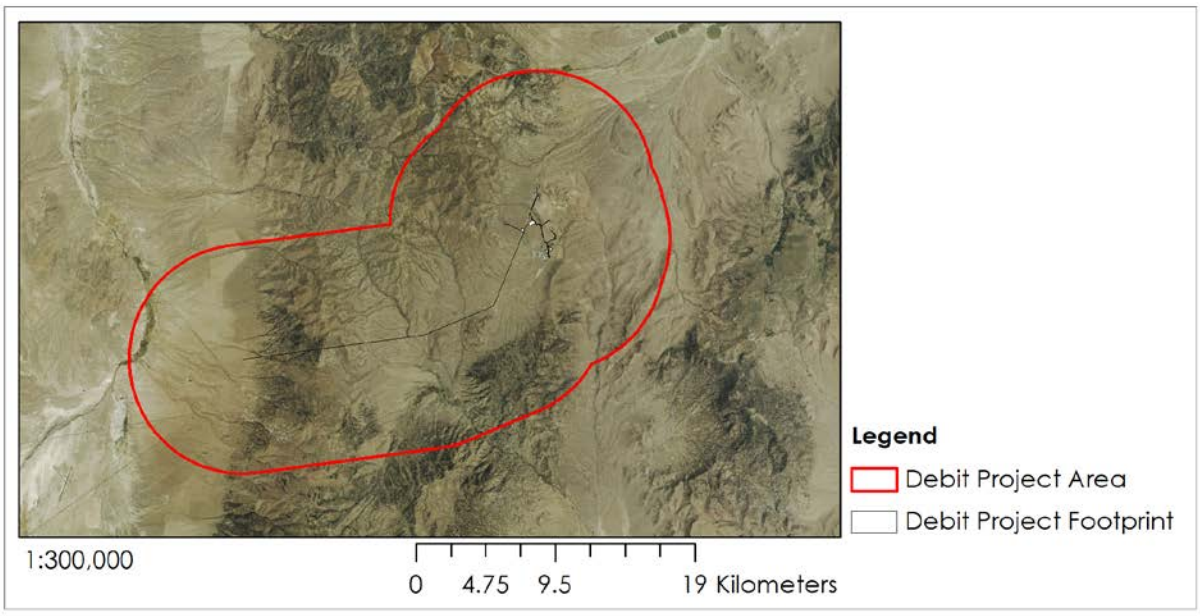


Figure 5. Proposed_Surface_Disturbance of a geothermal plant and transmission line buffered by the appropriate distance to generate the Debit_Project_Area layer

1.3. Existing & Proposed Surface Disturbance

In this step, you will digitize all existing surface disturbance associated with anthropogenic features described in Table 1 *using recommended data sources for help locating and identifying features. You will also combine the existing surface disturbance with the proposed surface disturbance (or proposed modified surface disturbance) to create a layer that reflects post-project conditions.*

1.3.1 Set the analysis area:

1.3.1(a) Using the Buffer tool, buffer **Credit_Project_Area** (i.e., **Credit_Project_Boundary** for most credit projects) or **Debit_Project_Area** by 6,000 meters (i.e., the maximum indirect effect distance of any anthropogenic feature considered by the Credit System). Name this layer **Analysis_Area_6000m**.

[ArcToolbox> Analysis Tools> Proximity> Buffer]

- Input Features = **Credit_Project_Boundary**, **Credit_Project_Area**, or **Debit_Project_Area**,
- Output Feature Class = Analysis_Area_6000m,
- Distance = 6,000 (in meters)
- Side Type = FULL,
- Method = PLANAR,
- Dissolve Type = ALL,
- Dissolve Fields = *none checked*.

1.3.2 Add data layers of existing anthropogenic features from **Anthro_Features.gdb** to the map project. Ensure that there is a data layer for each anthropogenic feature type listed in Table 2.The populated layers will be used to help identify anthropogenic features that exist on the landscape, although in some instances may reflect only a lease as occurs in the geothermal layer or similarly a right-of-way as opposed to an existing on-the-ground disturbance. A combination of these layers, the layers referred to in the Recommended Data Sources column in Table 1 on pages 13-14, and aerial imagery should be used to identify existing anthropogenic features and digitize associated surface disturbance prior to data collection in the field at which time all anthropogenic features will be verified or, if not yet found, located and documented

properly. Keep in mind the Powerlines layer is merely an empty feature class layer to utilize for digitizing all powerlines. To locate all of these structures, we recommend utilization of all appropriate data layers, conducting careful swaths along a close-up grid in GIS, contacting rural power companies and counties, as well as completing the necessary reconnaissance in the field to know the locations of and the classification of all powerlines in the analysis area. In general, use the existing data layers for anthropogenic disturbances. However, powerlines need to be identified and digitized in nearly every case. If an anthropogenic feature (other than powerlines) is digitized, consultation with the SETT is required and justification must be added to the final verification report.See Appendix 1 for additional steps to use layers within the **Anthro_Features** geodatabase.

1.3.3 Clip each anthropogenic disturbance type to the Analysis_Area_6000m

1.3.3(a) Using the Clip tool, clip each anthropogenic feature layer (e.g. **Mines**) to the **Analysis_Area_6000m** layer. Name this file **Current_Type_Features** (e.g. **Current_Mines_Features**)

[ArcTools> Analysis> Extract> Clip]

- Input Features = **Mines**,
- Clip Features = **Analysis_Area_6000m**,
- Output Feature Class = **Current_Mines_Features**,
- XY Tolerance = *blank*.

1.3.3(b) Repeat step 1.3.3(a) for each layer in the **Anthro_Features.gdb** that occur within the **Analysis_Area_6000m**

1.3.4 For each anthropogenic feature type:

1.3.4(a) Right click on the layer in the Table of Contents, click 'Edit Features', then click 'Start Editing'.

1.3.4(b) Using the most recent NAIP aerial imagery or similar imagery at approximately 1:5000 or finer scale, modify or delineate the outer extent of all surface disturbance associated with anthropogenic features of the same type within the analysis area, differentiating features by subtype.

- Refer to Table 1 for definitions of features that should be digitized. Note: Do not digitize pipeline right-of-ways as roads, unless the right-of-way contains a road that meets the definitions in Table 1. Pipeline right-of-ways are a series of connected straight lines. Roads are mostly not perfectly straight lines. Anthropogenic features not described in Table 1 are considered 'de minimus' and should not be digitized.
- All anthropogenic features should be digitized as polygon features. If you prefer, you may digitize linear features such as transmission lines as line features, then use the buffer tool to buffer each feature by the appropriate distance to create a polygon feature class. Add a 'Buff_Dist' field, type— "long integer", to the attribute table as you are digitizing and record half of the estimated road or transmission line width in this field (we recommend 5 m for powerlines and roads, and 3 m for distribution lines). The buffer is related to the width of the transmission or distribution line, not the weight. Use that field as the buffer distance in the buffer tool.

1.3.4(c) Confirm and populate the 'Type' and 'Subtype' for each feature with the correct data from Table 1.

Table 2. Anthropogenic features that should be included in the Project Area. Features in these layers are associated with indirect effects that may impact the habitat condition of the Project Area.

ANTHROPOGENIC FEATURES TO DIGITIZE	FILE NAME
Contained within the **Anthro_Features** geodatabase:	
Roads*	**Roads**
Urban, Suburban, and Ex-Urban Development	**Urban**
Towers	**Towers**
Powerlines	**Powerlines**
Mines†	**Mines**
Oil & Gas Wells	**Oil_Gas**
Renewable	**Renewable**

*Note: Any roads leading to commercial facilities should be classified as 'High_Use'.
†Note: Consult with the Credit System Administrator if a permitted but currently undeveloped mine is located within the Analysis_Area_6000m layer.

NOTE: Use the Data Driven Pages feature in ArcGIS to check your work before moving on:

1. Create a grid index to facilitate review of aerial imagery at approximately 1:5,000 scale.
   [ArcToolbox> Cartography Tools> Data Driven Pages> Grid Index Features]
   - Output Feature Class = a new layer named **GridIndexFeatures**
   - Input Features = **Analysis_Area_6000m**
   - Generate Polygon Grid that intersects input feature layers or datasets = *checked*
   - Use Page Unit and Scale = *unchecked*
   - Polygon Width = 1000 (in meters)
   - Polygon Height = 1000 (in meters)
   - *All other fields = blank*
2. Add the Data Driven Pages toolbar (Customize >Toolbars >Data Driven Pages), then set up data driven pages by clicking the Data Driven Page Setup icon ( ) and selecting **GridIndexFeatures** as the Layer. Leave all other options unchanged and click 'OK'.
3. Flip through every page using the next page icon ( ) for a thorough review.

1.3.5 Using the Merge tool, merge all anthropogenic feature layers created in steps 1.3.3 together into a single feature class. Name this file **Current_Anthro_Features.**

[ArcToolbox> Data Management Tools> General> Merge]

- Input Datasets = All anthropogenic feature layers created in step 1.3.3.
- Output Dataset = **Current_Anthro_Features**,
- Field Map = *leave as default (or see Tip Box, below).*

TIP: You may delete all fields except for 'Type', 'Subtype', 'Dist' and 'Weight' in the Field Map if they exist.

1.3.6 Using the 'Join Field' tool, join the **Anthro_Attribute_Table**'s 'Dist' and 'Weight' field.

[ArcToolbox> Data Management Tools> Joins> Join Field]

- Input Table = **Current_Anthro_Features**
- Input Join Field = 'Subtype'
- Input Join Table = **Anthro_Attribute_Table**
- Output Join Field = 'Subtype'
- Join Fields = *check* 'Dist' *and* 'Weight'

1.3.7 Label and print a map of all anthropogenic features and attach to the anthropogenic features datasheet (Appendix 7). The verifier is responsible for confirming the location of all existing anthropogenic features identified using GIS while in the field. Any changes must be properly reflected in the **Current_Anthro_Features** layer.

1.3.8 Modify the **Current_Anthro_Features** layer for post-project conditions:

For credit projects: If anthropogenic features will not be modified as part of the credit project, skip to step 1.4. Otherwise, continue with this step.

For credit projects that propose to modify anthropogenic features:

1.3.8(a) Create a copy of the **Current_Anthro_Features** layer within the file geodatabase for this project. Name this file **Projected_Anthro_Features**.

1.3.8(b) Right click on the layer in the Table of Contents, click 'Edit Features', then click 'Start Editing'.

1.3.8(c) Delete any anthropogenic features from the **Projected_Anthro_Features** layer that will be removed by the credit project. Refer to the **Proposed_Modified_Features** layer from step 1.1.4.

1.3.8(d) Modify the attribute table for any anthropogenic features in the **Projected_Anthro_Features** layer that will be downgraded from one subtype to another (e.g., changing a 2-lane paved road to a low-use gravel road). Be sure to save edits and stop editing when done.

For debit projects that will not upgrade an anthropogenic feature from one subtype to another:

1.3.8(e) Using the Merge tool, merge the **Current_Anthro_Features** layer with the **Proposed_Surface_Disturbance** layer. Name this file **Projected_Anthro_Features**.
[ArcToolbox> Data Management Tools> General> Merge]
- Input Datasets = **Current_Anthro_Features** and **Proposed_Surface_Disturbance**
- Output Dataset = **Projected_Anthro_Features**,
- Field Map = *leave as default*.

For debit projects that will upgrade an anthropogenic feature from one subtype to another or will be developed within an existing disturbance footprint:

1.3.8(f) Using the Copy Features tool, create a copy of the **Current_Anthro_Features** layer within the file geodatabase for this project. Name this file **Current_Anthro_Features_Copy**.
[Arc Toolbox> Data Management Tools> Features> Copy Features]
- Input Features = **Current_Anthro_Features,**
- Output Feature Class = **Current_Anthro_Features_Copy,**
- All other field = *blank.*

1.3.8(g) Right click on the **Current_Anthro_Features_Copy** layer in the Table of Contents, click 'Edit Features', then click 'Start Editing'.

1.3.8(h) Delete any anthropogenic features from the **Current_Anthro_Features_Copy** layer that will be upgraded from one subtype to another (e.g., changing a low-use gravel road to a 2-lane paved road) by the debit project. Also delete any existing anthropogenic features that will be replaced by the proposed surface disturbance (e.g., an existing meteorological tower that will be replaced by a wind turbine or a mine expansion footprint that overlaps with a current mine footprint). Refer to the **Proposed_Surface_Disturbance** layer from step 1.1.1.

TIP: Ensure that each feature deleted from the **Current_Anthro_Features_Copy** layer matches the surface extent of the equivalent feature in the **Proposed_Surface_Disturbance**. If necessary, using the Cut Polygon tool in the Editor Toolbar, modify the feature in the **Current_Anthro_Features_Copy** layer to match. For example, if only a segment of an existing road will be upgraded from one subtype to another, only delete the segment that will be upgraded.

1.3.8(i) Using the Merge tool, merge the **Current_Anthro_Features_Copy** layer with the **Proposed_Surface_Disturbance** layer. Name this file **Projected_Anthro_Features**.
[ArcToolbox> Data Management Tools> General> Merge]

- Input Datasets = **Current_Anthro_Features_Copy** and **Proposed_Surface_Disturbance**
- Output Dataset = **Projected_Anthro_Features**,
- Field Map = *leave as default*.

1.4. Map Unit Delineation

1.4.1 Eliminate areas categorized as 'Non-Habitat' from the **Project_Area** layer.

1.4.1(a) Using the Clip tool, clip the **Project_Area** layer (or **Credit_Project_Boundary** for most credit projects) to the **Mgmt_Cat** layer. Name this file **Project_Area_Habitat**.
[ArcTools> Analysis> Extract> Clip]

- Input Features = **Credit_Project_Area** or **Debit_Project_Area**,
- Clip Features = **Mgmt_Cat**,
- Output Feature Class = **Project_Area_Habitat**,
- XY Tolerance = *blank*.

1.4.2 Divide the **Project_Area_Habitat** layer into discrete map units:

TIP: Ensure snapping is enabled (add the Snapping Toolbar if necessary). Also ensure 'Snap to Sketch' is enabled once in your editing session, this will allow you to create map units that are fully contained within one other map unit.

1.4.2(a) Open the attribute table of the **Project_Area_Habitat** layer.
1.4.2(b) Add Field (1) 'Map_Unit_ID', type— "short integer," (2) 'Map_Unit_Name', type— "text" and (3) 'Meadow', type— "text" to the attribute table.
1.4.2(c) Start an editing session by right-clicking on the layer in the Table of Contents, clicking 'Edit Features', then 'Start Editing'.
1.4.2(d) Using the Cut Polygon tool in the Editor Toolbar, delineate map units in the **Project_Area_Habitat** layer.

TIP: Useful information about stratification has been developed by the US Department of Agriculture (Herrick, et al., 2009, Monitoring Manual for Grassland, Shrubland and Savanna Ecosystems, Chapter 2 – "Stratify Land into Monitoring Units", page 13[1]).

- Before beginning to delineate map units, we recommend referencing the DRG layer and grouping the ecological sites into the identified DRGs that are listed in the attribute table. (Note: DRGs will not display in the **NV CCS Map Template** if zoomed out beyond a 1:250,000 scale). Use supplemental data sources identified in the *Data Required* section for assistance in meadow delineation and other unique features.

- Meadows should be digitized as distinct map units. Meadows are important resources for sage-grouse so take care in identifying and delineating all meadows within the project area.

TIP: Map units should always be confirmed in the field.

- Ignore existing anthropogenic surface disturbance for now. The existing anthropogenic surface disturbance you have already digitized will be incorporated in the step 1.4.3.
- See Box 1 on page 28 for more information on map unit delineation.

1.4.2(e) Name map units numerically and record the name in the 'Map_Unit_ID' field. Map units that appear to be very similar, but not adjacent to each other, can receive the same numerical name and be considered a single map unit. In the field, a visual walk-through should confirm that this is the case.

1.4.2(f) Name each map unit by providing a short description, typically associated with the major vegetation type, in the 'Map_Unit_Name' field.

1.4.2(g) For any map units that are meadows, populate the 'Meadow' attribute with 'Altered' or 'Unaltered'. For all other map units, populate the 'Meadow' attribute with 'No Meadow'. Definitions are provided in the HQT Scientific Methods Document. Be sure to save edits and stop editing when done.

1.4.3 Using the Clip tool, clip the **Projected_Anthro_Features** layer (if created, see step 1.3.8) or the **Current_Anthro_Features** layer (for most credit projects) to the **Project_Area_Habitat** layer. Name this file **Anthro_Features_Clip**.

[ArcTools> Analysis> Extract> Clip]

- Input Features = **Projected_Anthro_Features** or **Current_Anthro_Features,**
- Clip Features = **Project_Area_Habitat,**
- Output Feature Class = **Anthro_Features_Clip,**
- XY Tolerance = *blank*.

1.4.4 Using the Union tool, union the **Project_Area_Habitat** layer with the **Anthro_Features_Clip** layer. Name this file **Map_Units**.

[ArcTools> Analysis> Overlay> Union]

- Input Features = **Project_Area_Habitat** and **Anthro_Features_Clip**,
- Output Feature Class = **Map_Units,**
- Join Attributes = ALL,
- XY Tolerance = *blank*,
- Gaps Allowed = *checked*.

1.4.5 Assign a Map Unit ID for map units of existing surface disturbance in the **Map_Units** layer:

1.4.5(a) Start an editing session by right clicking on the layer in the Table of Contents, clicking 'Edit Features', then 'Start Editing'.

1.4.5(b) Open the attribute table.

1.4.5(c) Using the Select by Attributes tool ( , select all features with a <Null> value for the Rehab attribute, using the expression 'Rehab IS NULL'. This will select all features corresponding to surface disturbance from existing anthropogenic disturbance.

1.4.5(d) Replace the Map Unit ID for all selected attribute values with a single Map Unit ID. We recommend assigning the value of the next sequential Map Unit ID. Also change the 'Meadow' field to 'No Meadow' if necessary.

1.4.6 For credit projects: Save edits, stop editing, and skip to step 1.4.7.

For debit projects: Assign a Map Unit ID for map units of proposed surface disturbance in the **Map_Units** layer.

1.4.6(a) Using the Select by Attributes tool (, select all features with an equivalent 'Rehab' attribute (e.g., all features with 'Rehab' of 2025). This will select all features corresponding to proposed surface disturbance of the same expected rehabilitation date.

NOTE: Ignore any values in the 'Rehab' field that were auto-generated during the Union processing step (e.g., a '0' in the 'Rehab' field, which is not a four-digit year.)

1.4.6(b) Replace all selected attribute values with a single Map Unit ID. We recommend assigning the value of the 'Rehab' field, if not already assigned (e.g., Map Unit ID = 2025).

1.4.6(c) Repeat steps 1.4.5(c) to 1.4.5(d) for each unique year in the 'Rehab' field, including '9999' for permanent impacts. In this way, all surface disturbances corresponding to the same expected rehabilitation date are categorized as the same map unit. This will ensure the appropriate number of term debits can be calculated for each phase of the project. Be sure to save edits and stop editing when done.

1.4.7 Using the Dissolve tool, create multipart features in the **Map_Units** layer before continuing. Name this file **Map_Units_Dissolve**.

[ArcToolbox> Data Management Tools> Generalization> Dissolve]

- Input Features = **Map_Units,**
- Output Feature Class = **Map_Units_Dissolve,**
- Dissolve fields = *check* 'Map_Unit_ID', 'Map_Unit_Name', 'Meadow', *and (for debit projects only)*, 'Term', *and* 'Rehab',
- Statistics fields = *blank,*
- Create multipart features = *checked*,
- Unsplit lines = *blank.*

1.4.8 Calculate area in acres for each map unit:

1.4.8(a) Open attribute table of the **Map_Units_Dissolve** layer.

1.4.8(b) Add Field 'Acres', type— "double", to the attribute table.

1.4.8(c) Calculate the area (in acres) of each map unit. Right click on the 'Acres' column in the attribute table and use the Calculate Geometry tool to calculate acres per map unit (the coordinate system should be UTM Zone 11N and units in acres) (Figure 6).

NOTE: Check to ensure that the sum of the acres in the **Map_Units_Dissolve** layer is equal to the sum of the acres in the **Map_Units** layer.

1.5. Precipitation Regime

NOTE: Precipitation regime should only be identified for map units that will be sampled in the field.

1.5.1 Ensure the **Precip** layer from the **NevadaCCSDataPackage** is added to the map. This layer has been classified such that areas with less than 25.4 cm of precipitation are categorized as arid (coded as '0'), and areas with greater than 25.4 cm are categorized as mesic (coded as '1').

1.5.2 Determine the precipitation regime for each map unit using PRISM Precipitation Data:

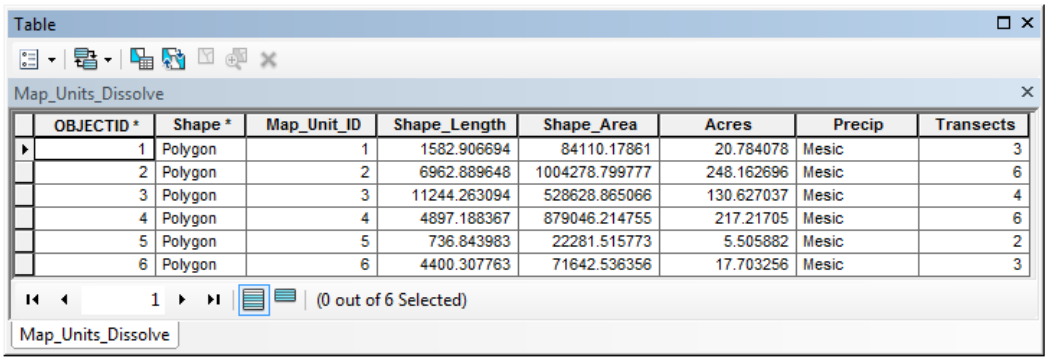
1.5.2(a) Open attribute table of the **Map_Units_Dissolve** layer.
1.5.2(b) Add Field 'Precip', type— "text", to the attribute table.
1.5.2(c) Start an editing session by right clicking on the layer in the Table of Contents, clicking 'Edit Features', then 'Start Editing'.
1.5.2(d) Populate the 'Precip' field for each map unit with the correct precipitation regime from the **Precip** layer. Record if the map unit falls in the 'arid' or 'mesic' precipitation regime. If a map unit spans both precipitation regimes, record the dominant regime or split the map unit into two map units. Be sure to save edits and stop editing when done.

1.6. Transect Locations

NOTE: Sampling intensity should only be determined for map units that will be sampled in the field. For map units where field data will not be collected, input '0' in the 'Transects' field.

1.6.1 Select the appropriate number of transects for each map unit based on pilot data or expected variance within the map unit. Map units of the same name can be considered as a single map unit. See Box 2 on page 30 for help determining number of transects required. We recommend generating a few redundant random transect bearings in case the field crews need to take additional samples in the field. The map unit containing existing surface disturbance should not be sampled, input '0' for the number of transects for that map unit.

1.6.1(a) Open the attribute table of the **Map_Units_Dissolve** layer.
1.6.1(b) Add Field 'Transects', type— "short integer", to the attribute table.
1.6.1(c) Start an editing session by right-clicking on the layer in the Table of Contents, clicking 'Edit Features', then 'Start Editing'.
1.6.1(d) Populate the 'Transects' field for each map unit with the number of transects to be sampled within each map unit according to the necessary sampling intensity. Be sure to save edits and stop editing when done (Figure 6). For the map unit associated with existing surface disturbance, and any other map units where field data will not be collected, input '0'.



Table

Map_Units_Dissolve

OBJECTID *	Shape *	Map_Unit_ID	Shape_Length	Shape_Area	Acres	Precip	Transects
1	Polygon	1	1582.906694	84110.17861	20.784078	Mesic	3
2	Polygon	2	6962.889648	1004278.799777	248.162696	Mesic	6
3	Polygon	3	11244.263094	528628.865066	130.627037	Mesic	4
4	Polygon	4	4897.188367	879046.214755	217.21705	Mesic	6
5	Polygon	5	736.843983	22281.515773	5.505882	Mesic	2
6	Polygon	6	4400.307763	71642.536356	17.703256	Mesic	3

1 (0 out of 6 Selected)

Map_Units_Dissolve

Figure 6. Completed attribute table for the Map Units layer

1.6.2 Generate random, spatially distributed locations within each map unit. Name this file **Transects**. Consult with the SETT for large projects to develop a site-specific sampling design to generate transects.

TIP: If you have access to the GeoStats extension for ArcGIS, use the Create Spatially Balanced Points tool to generate random, spatially balanced transect locations. You may also use the Generalized Random Tessalation Stratified (GRTS) function within the Spatial Survey Design & Analysis package (spsurvey) in R. See the appropriate documentation for help with those tools. Alternatively, use the approach described below.

1.6.2(a) Using the Create Random Points tool, create random transect locations within each map unit. Name this file **Transects**.

[ArcToolbox> Data Management Tools> Feature Class> Create Random Points]

- Output Location = the File Geodatabase created for this project,
- Output Point Feature Class = **Transects**,
- Constraining Feature Class = **Map_Units_Dissolve** layer,
- Number of Points = 'Transects' attribute field of the **Map_Units_Dissolve** layer,
- Minimum Allowed Distance = 25 meters,
- Create Multipoint Output = *unchecked*.

TIP: Ensure that the Spatial Analyst extension is turned on to use the Create Random Points tool. From the top menu, under 'Customize', click 'Extensions' and ensure Spatial Analyst is checked.

TIP: If too few random points are created, reduce the Minimum Allowed Distance and try again.

1.6.3 Generate random bearings for each transect.

1.6.3(a) Open attribute table of the **Transects** layer (created in step 1.6.2).

1.6.3(b) Add Field 'Bearing', type— "short integer", to attribute table.

1.6.3(c) Use the Field Calculator (right click on the column header to access the Field Calculator) and type the following expression (ensure 'Python' is selected under 'Parser' and check the 'Show Codeblock' option):

1.6.3(d) Under *Pre-Logic Script Code*, type (or copy and paste):

```
def randombearing (min, max):
  import random
  return random.randint (min, max)
```

1.6.3(e) Under *Bearing =*, type (or copy and paste):

```
randombearing (0, 360)
```

1.6.3(f) Click OK to run Field Calculator.

NOTE: If the random bearing generated for a transect results in a transect that cannot be sampled by field crews, then the next randomly generated point should be used. We recommend generating extra random transects and bearings in the event the field crews need to take reject transects in the field. All rejections need to be documented and justified.

1.6.4 Calculate the UTM Easting and Northing of each transect:

1.6.4(a) Open the attribute table of the **Transects** layer.

1.6.4(b) Add Fields (1) 'UTM_E' and (2) 'UTM_N', type— "double", to attribute table.

1.6.4(c)Right click on the 'UTM_E' column in the attribute table and use the Calculate Geometry tool to calculate the X Coordinate of Point in meters (the coordinate system should be UTM Zone 11N and units in meters).

1.6.4(d)Right click on the 'UTM_N' column in the attribute table and use the Calculate Geometry tool to calculate the Y Coordinate of Point in meters (the coordinate system should be UTM Zone 11N and units in meters) (Figure 7).

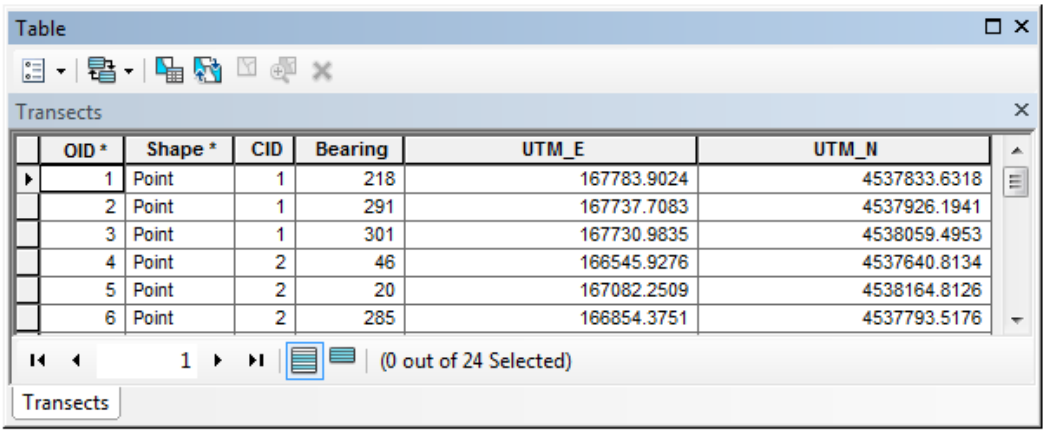


Figure 7. Completed attribute table for the Transects layer

1.6.5 Using the Spatial Join tool, join the **Transects** layer to the **Map_Units_Dissolve** layer. Name this file **Transects_SpatialJoin**.

[ArcToolbox> Analysis Tools> Overlay> Spatial Join]

- Target Features = **Transects** layer,
- Join Features = **Map_Units_Dissolve** layer,
- Output Feature Class = a new feature class named **Transects_SpatialJoin**,
- Join Operations = JOIN_ONE_TO_MANY,
- Keep All Target features = *checked*,
- Match Options = WITHIN,
- Search Radius = *blank*.

1.6.6 Export the attribute table of the **Transects_SpatialJoin** layer to a text file named **'Transects_Data'**.

1.6.6(a)Open the attribute table of the **Transects_SpatialJoin** layer.

1.6.6(b)Under 'Table Options' ( ), select Export and save as a .txt file. Name this file **Transects_Data**.

1.6.6(c)When prompted to add the table to the current map, select 'No'.

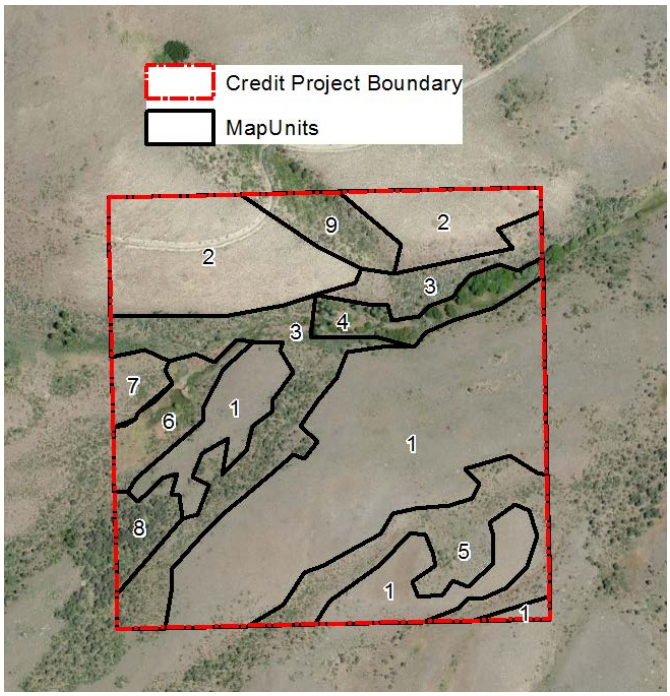
1.6.7 Upload transect locations to a GPS unit and print a map with map unit delineations and transect start point locations and bearings that should be attached to the map unit datasheets to take into the field. See your GPS manufacturer's instructions for instructions on how to upload data to your GPS unit.

NOTE: After completing step 1.6, you are now ready to place Pre-Field Work Submittals in a folder on the ftp site for SETT Review. This folder should include the completed site validation checklist, a brief description of plans for field data collection featuring the lead verifier on the project, preliminary dates for field work, and other relevant information, as well as the GIS data showing the applicable project area, analysis area boundaries, habitat categories, map unit delineation, and transect locations and bearings. A Conflict of Interest Disclosure form will also be necessary with this submission. Please download the Pre-Field Submission Guidance folder from the ftp site for further details and the necessary forms. After receiving permission by the SETT to move forward with data collection in the field, complete Section 2. *Field Data Collection Method*. The field crew will confirm the boundaries of map units, add or remove transect locations, and confirm the location of known anthropogenic features as well as ensure all powerlines are documented. When field work is complete, make any necessary revisions to the **Map_Units_Dissolve** layer, **Transects** layer, and **Current_Anthro_Features** layer before continuing with step 1.7.

Box 1 | Project Area & Map Units

Project Area: The project area is the area that is being evaluated, and includes all habitats within the boundaries of what is delineated as the project area. For credit projects, the project area is the extent of the obligation by the credit developers. For debit projects, the project area is the extent of the proposed surface disturbance plus the indirect effects area.

Map Units: The map units are sub-divisions of the project area based on unique vegetation communities, structure, and site potential. Map units need to be defined in order to capture differences in the site-scale habitat attributes assessed to more accurately inform the functional acre scores. See the *Field Data Collection Methods* for a list of attributes assessed. When delineating map units, it is important to keep these attributes in mind as they are the drivers of the habitat function scores. For example, map units should be delineated based on expected variation in sagebrush canopy cover and distance to sagebrush cover. Elevation, slope, aspect, soil type and other factors should also be considered, as they may impact vegetation distribution.



Although map units can be somewhat subjective, a map unit should encompass a relatively homogenous area of vegetation. Map units should be delineated based on ecological sites, recent aerial photography, and ground verification. Major breaks such as changes in vegetation community, relative abundance of species, water vs. terrestrial, shrub land vs. meadow, and roads vs. undeveloped area, are relatively straight-forward to delineate via aerial photography. In addition, supplemental data layers within GIS can help identify other distinctions such as changes in topography (elevation, slope, and aspect) or soils which may affect vegetation composition. Defining map units requires a good working knowledge of the habitats important to sage-grouse and local site conditions. If possible, a site visit is encouraged to help inform the map unit delineation process prior to initiating the Desktop Analysis. Map unit boundaries may also be modified based on site conditions identified during field data collection. If this is the case, map unit boundaries should be adjusted (step 1.4) and subsequent steps in the Desktop Analysis will need to be repeated.

Additional rules for map unit delineation:

- Minimum map unit size should generally be 0.5 acres, unless there are features such as stringer meadows that are appropriate to delineate at a smaller scale.
- If a map unit consisting of meadow habitats are smaller than 0.5 acres or does not calculate a local scale habitat function due to the map unit's shape, then additional steps are needed to calculate habitat function within these map units. If this situation occurs, follow step 1.17.
- Clusters of dense woody riparian vegetation (e.g. willow thickets) within meadows or clusters of dense upland shrub cover (e.g. serviceberry, snowberry, and other mountain shrub steppe communities) should not be delineated as separate map units. However, transects should not be run through vegetation too dense to walk through. If this situation is encountered while vetting transects in GIS, discard them. If this situation is encountered in the field, reflect the transect 90

degrees (first right, then left) or pick the next randomly generated transect point with in the map unit.

- For debit projects, map units should first be delineated by indirect disturbance area, proposed surface disturbance, and already existing disturbance areas. Indirect and proposed should then be further subdivided according to the standards guidelines. No sampling will occur in existing disturbance areas, so no further subdivision is needed. This map unit will be assigned a site scale score of zero and no transects will be generated in this map unit.
- For debit projects, term features should be separate map units from permanent features.
- For credit projects, treatment areas where a change in the site scale score is anticipated should be delineated as separate map units. (Even if currently they are similar in vegetation to other areas, but a change is not expected in those areas.)

Box 2 | Sampling Intensity

This section provides guidance for the number of transects per map unit based on area and variability of the habitat within the map unit. When delineating map units, the technician should seek to maximize map unit area while minimizing variability within each map unit. Once map units are defined, the sampling intensity (number of transects per map unit) should be determined based on the acreage of the map units and the relative homogeneity of vegetation within the map unit. Table 3 contains the minimum number of transects required for each map unit, based on map unit size; however more transects can be sampled if determined appropriate due to site specific conditions. When delineating map units using aerial imagery, the technician should note which map units have a mosaic of vegetation or patchiness that may require a greater level of sampling intensity. Similarly, map units which are more obviously homogeneous should be noted as they may require a lower level of sampling intensity.

Table 3. Minimum number of transects required based on map unit acreage

Map Unit Size:	0.5 TO <40 ACRES	40 TO <640 ACRES	≥640 ACRES
Transects per Map Unit:	2 - 3*	4 - 8*	8 - 16*

*Choose the higher end of the range for map units with higher variability.

In the field, the variability within each map unit will be evaluated before moving on to sample the next map unit. If the variability and number of samples does not provide sufficient confidence in the parameter estimate for each attribute measured, additional samples will be taken from the map unit. The process for generating new transects and calculating the number of additional transects to be sampled is described in the *Field Data Collections Method* section.

Additional guidance for generating random transect locations and bearings:

- Transects that are impeded by clusters of willow, riparian woody vegetation or other patches of shrubs that are too dense to run a transect through should be discarded and alternative, random sample points should be generated. To avoid creating an incentive to modify riparian habitat that supports sage-grouse habitats but is not used directly by sage-grouse, and thus does not receive credits, clusters of willows or other riparian woody vegetation will receive the habitat function score of the map unit that it is contained within.
- If a transect will cross a map unit boundary into another map unit or outside of the project area, the transect will need to be reflected back into the map unit by the field crew and continued. Do not discard transects near map unit boundaries, as this would bias results.
- Do not sample transects that originate in or cross existing surface disturbance. Discard and select an alternative, random sample point.

- For debit projects with large acreage associated with in Debit or Credit Project Area, contact the SETT to develop a site-specific transect sampling area to eliminate inaccessible or difficult to access areas.

NOTE: Before continuing, you may choose to allow the field crew to field-verify map unit delineations and anthropogenic features. If the field crews recommend changes, steps 1.7 through 1.16 of the Desktop Analysis will need to be repeated. You can complete the Desktop Analysis now to estimate the credits or credit obligation of the project, understanding that the Desktop Analysis may need to be repeated. Depending on project size and complexity, the effort to complete steps 1.7 through 1.16 of the Desktop Analysis is approximately 2 – 4 hours.

1.7. Management Importance Factor

1.7.1 Using the Intersect tool, intersect the **Map_Units_Dissolve** layer with the **Mgmt_Cat** layer. Name this file **Current_Mgmt_Cat**.

[ArcTools> Analysis> Overlay> Intersect]

- Input Features = **Map_Units_Dissolve** and **Mgmt_Cat**
- Output Feature Class = **Current_Mgmt_Cat**
- Join Attributes = ALL,
- XY Tolerance = *blank*,
- Output Type = INPUT.

1.7.2 Calculate proportion of each map unit in each management category:

1.7.2(a) Open the attribute table of the **Current_Mgmt_Cat** layer.

1.7.2(b) Add Field 'Mgmt_Cat_Acres', type— "double", to the attribute table.

1.7.2(c) Use the Calculate Geometry tool (right click the column header to access the Calculate Geometry tool) to calculate the number of acres for each feature in the 'Mgmt_Cat_Acres' field.

1.7.2(d) Add Field 'Mgmt_Proportion', type— "double", to the attribute table.

1.7.2(e) Build the following expression using the Field Calculator (right click the column header to access the Field Calculator) to calculate the proportion of each map unit in each management category; check that Mgmt_Proportion values add up to 1 for each map unit:

(Mgmt_Cat_Acres/Acres (of the map unit))

1.7.3 Export the attribute table to a text file named '**Mgmt_Cats_Data**':

1.7.3(a) Under 'Table Options' () select Export and save as a .txt file. Name this file **Mgmt_Cats_Data**.

1.7.3(b) When prompted to add the table to the current map, select 'No'.

1.8. Indirect Impacts from Existing Anthropogenic Features

1.8.1 For each existing anthropogenic feature subtype present within the **Current_Anthro_Features** layer (created in step 1.3):

1.8.1(a) Using the Euclidean Distance tool, calculate the distance from the nearest feature of each subtype of each anthropogenic disturbance in the Analysis Area (make sure to select a single Subtype by attribute in the Attribute Table):

[ArcToolbox> Spatial Analyst Tools> Distance> Euclean Distance]

- Input raster or feature source data: selected features (based on subtype) of **Current_Anthro_Features**
- Output distance raster: **Current_Type_Subtype_Distance**
- Maximum distance (optional): *input D, Distance effect associated with subtype*
- Output cell size (optional): **15**
- Output direction raster (optional): *leave blank*

- Click on 'Environments' at the bottom of the tool window.
  1. Set the 'Processing Extent' to be the same as **Analysis_Area_6000m.**
  2. Set the 'Snap Raster' to the **Winter_HSI** layer (**Spring_HSI** or **Summer_HSI** can also be used).
  3. Click OK at the bottom of the Environment Settings window and run the tool.

1.8.1(b) For each **Anthro_Subtype_Distance** layer created in step 1.8.1(a), using the Map Algebra tool, translate distance to habitat function using the anthropogenic disturbance curve:

[ArcToolbox> Spatial Analyst Tools> Map Algebra> Raster Calculator]

```
1 - (W * Power((1 - "Current_Type_Subtype_Distance" / D),2))
```

Where W: Weight (0 – 1); D: Distance (meters)

- Output raster = **Current_Type_Subtype_Disturbance**
- Click on 'Environments' at the bottom of the tool window.
  1. Set the 'Processing Extent' to be the same as **Analysis_Area_6000m.**
  2. Set the 'Snap Raster' to a seasonal HSI layer (either **Winter_HSI**, **Spring_HSI** or **Summer_HSI** can be used).
  3. Click OK at the bottom of the Environment Settings window and run the tool.

1.8.1(c) For each Anthro_Subtype_Disturbance layer created in step 1.8.1(b), using the Map Algebra tool, convert Null Values to 1:

[ArcToolbox> Spatial Analyst Tools> Map Algebra> Raster Calculator]

```
Con(IsNull("Current_Type_Subtype_Disturbance"),1,
"Current_Type_Subtype_Disturbance")
```

- Output raster = **Current_Type_Subtype_noNull**
- Click on 'Environments' at the bottom of the tool window.
  1. Set the 'Processing Extent' to be the same as **Analysis_Area_6000m.**
  2. Set the 'Snap Raster' to a seasonal HSI layer (**Winter_HSI**, **Summer_HSI** , or **Spring_HSI**).
  3. Click OK at the bottom of the Environment Settings window and run the tool.

1.8.2 Use the Raster Calculator tool to multiply all layers created in step 1.8.1(c) together to calculate the current anthropogenic disturbance, using the equation below. Name this file **Current_Anthro_Disturbance**.

[ArcToolbox> Spatial Analyst Tools> Map Algebra> Raster Calculator]

'**Current_Type_Subtype_noNull_1**' * '**Current_Type_Subtype_noNull_2**' * … * '**Current_Type_Subtype_noNull_*i***'

- Output raster = **Current_Anthro_Disturbance**
- Click on 'Environments' at the bottom of the tool window.
  1. Set the 'Processing extent' to be the same as **Analysis_Area_6000m.**
  2. Set the 'Snap raster' to be a seasonal HSI layer (**Winter_HSI**, **Summer_HSI**, or **Spring_HSI**).
  3. Click OK at the bottom of the Environmental Settings window and run the tool.

TIP: The **Current_Anthro_Disturbance** raster should be scaled from ≥0 to ≤1 and have the same extent as the **Analysis_Area_6000m** layer. Ensure that this is the case.

1.9. Indirect Impacts from Projected Anthropogenic Features

1.9.1 Repeat steps 1.8.1 to 1.8.2, replacing the **Current_Anthro_Features** layer with the **Projected_Anthro_Features** layer. Name the output of step 1.8.1 '**Projected_Type_Subtype_Disturbance'**. Name the output of step 1.8.2 **Projected_Anthro_Disturbance**.

For debit projects with both term and permanent indirect impacts: Debit projects that consist of both temporary activity or infrastructure and permanent activity or infrastructure must complete the following steps to calculate debits associated with the permanent, indirect impacts. For debit projects with only term or permanent indirect impacts (but not both), skip to step 1.10.

1.9.2 Using the Select tool, select all features from the **Projected_Anthro_Features** layer except those associated with a term impact using the expression 'Term = 9999 OR Term IS NULL'. Name this file **Permanent_Anthro_Features**.

[ArcToolbox> Analysis> Extract> Select]

- Input Features = **Projected_Anthro_Features,**
- Output Feature Class = **Permanent_Anthro_Features**,
- Expression = *use the SQL Query Builder () to select all features except those associated with a term impact (i.e., all existing anthropogenic features and all proposed anthropogenic features with permanent impacts),*

1.9.3 Repeat steps 1.8.1 to 1.8.2, replacing the **Current_Anthro_Features** layer with the **Permanent_Anthro_Features** layer. Name the output of step 1.8.1 '**Permanent_Type_Subtype_Disturbance'**. Name the output of step 1.8.2 **Permanent_Anthro_Disturbance**.

NOTE: For complex debit projects with multiple debit terms, consult with the Credit System Administrator to estimate the credit obligation at each phase of the project.

TIP: The **Projected_Anthro_Disturbance** raster should be scaled from ≥0 to ≤1 and have the same extent as the **Analysis_Area_6000m** layer. Ensure that this is the case. The **Current_Anthro_Disturbance** and **Projected_Anthro_Disturbance** (if applicable) layer(s) will be used to calculate local-scale modifier values in step 1.13.

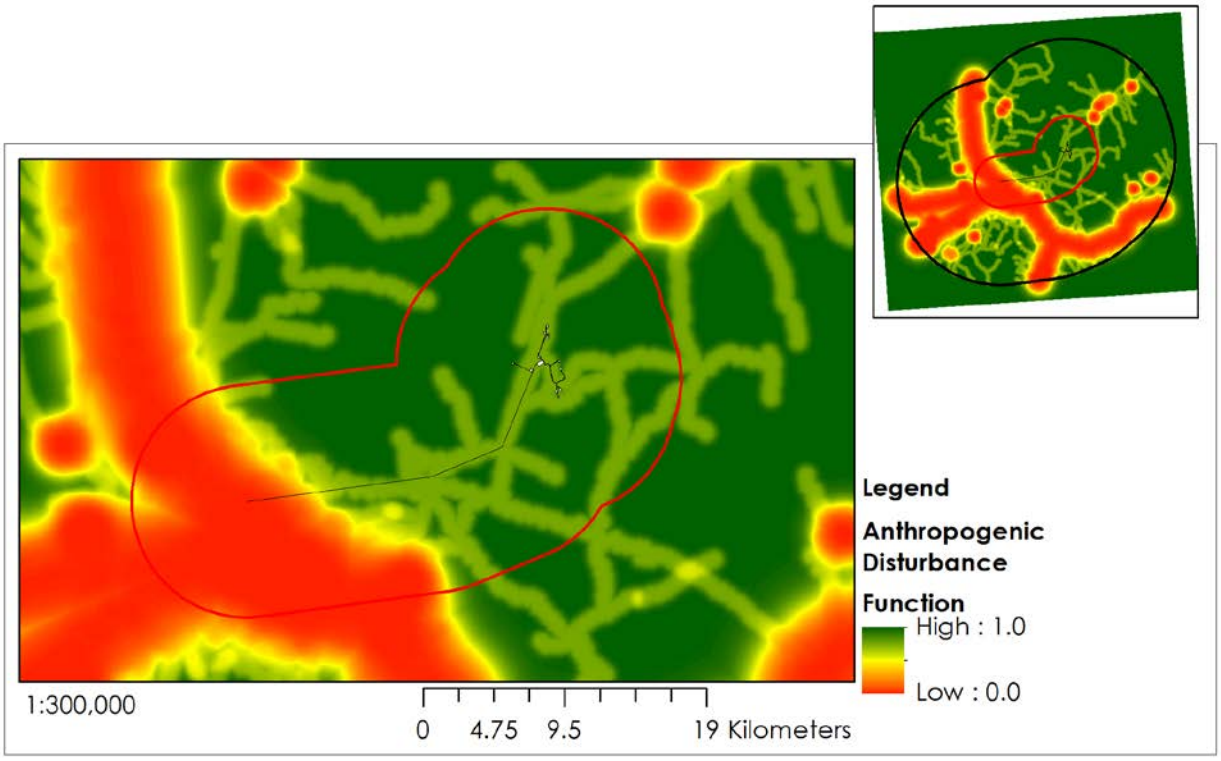


Figure 8. **Current_Anthro_Disturbance** layer

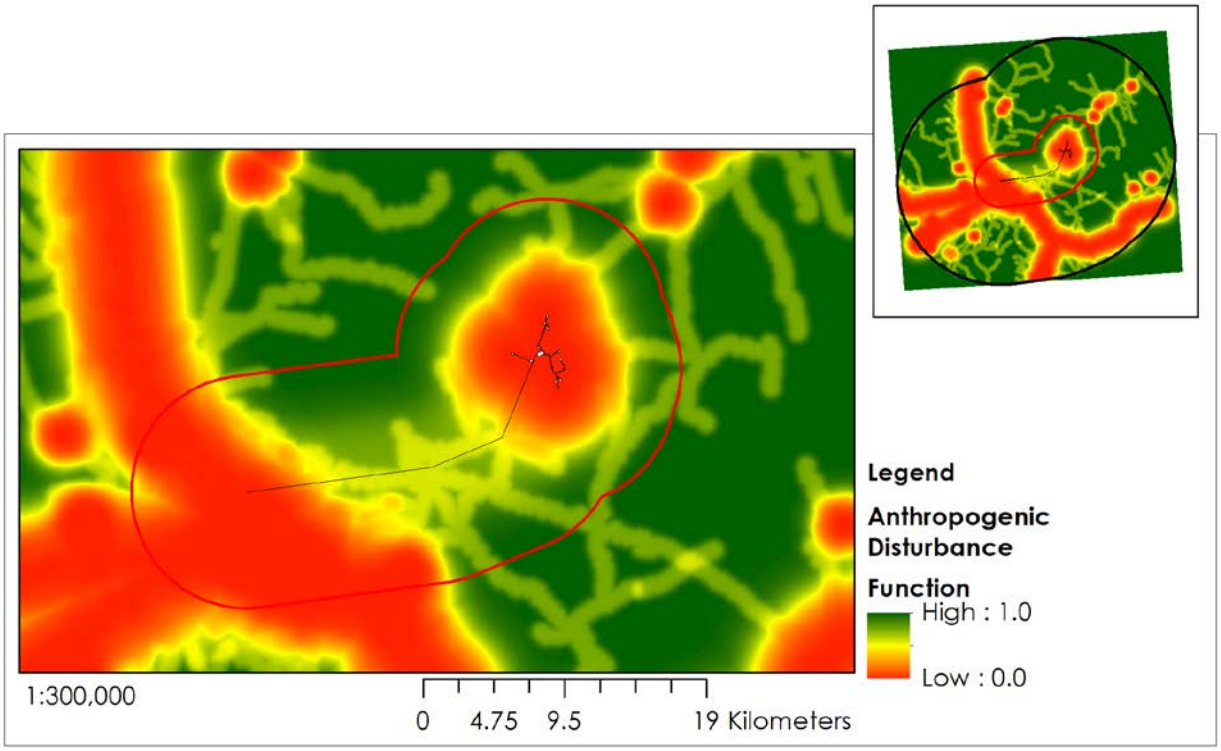


Figure 9. **Projected_Anthro_Disturbance** layer

1.10. Habitat Suitability Index Score

1.10.1 Using the Clip Raster tool, clip the **Spring_HSI** layer to the **Analysis_Area_6000m** layer (see step 1.3.1). Name this layer **Current_Spring_HSI**.

[ArcToolbox> Data Management Tools> Raster> Raster Processing> Clip]

- Input Raster = **Spring_HSI**
- Output Extent = **Analysis_Area_6000m**
- Use Input Features for Clipping Geometry = *checked*
- Output Raster Dataset = **Current_Spring_HSI**
- NoData Value = *blank*
- Maintain Clipping Extent = *unchecked*

1.10.2 Repeat step 1.10.1, replacing the **Spring_HSI** layer with the **Summer_HSI and Winter_HSI** layers. Name the outputs of step 1.10.1 **Current_Summer_HSI** and **Current_Winter_HSI,** respectively.

1.10.3 Using the Zonal Statistics as Table tool, average all pixels of the **Current_Spring_HSI** layer within each map unit. Name the output table **ZonalSt_Current_Spring_HSI**.

[ArcToolbox> Spatial Analyst Tools> Zonal> Zonal Statistics as Table]

- Input raster or feature zone data = **Map_Units_Dissolve** layer
- Zone Field = 'Map_Units_ID'
- Input value raster = **Current_Spring_HSI**
- Output table = **ZonalSt_Current_Spring_HSI**
- Ignore NoData in calculations = *checked*
- Statistics type = MEAN

1.10.4 Repeat step 1.10.3, replacing the **Current_Spring_HSI** layer with the **Current_Summer_HSI** and **Current_Winter_HSI** layers. Name the outputs of step 1.10.1 **ZonalSt_Current_Summer_HSI** and **ZonalSt_Current_Winter_HSI,** respectively.

1.10.5 Using the Join Field tool, join the MEAN field for the **ZonalSt_Current_Spring_HSI** table to the **Map_Units_Dissolve** layer.

[ArcToolbox> Data Management Tools> Joins> Join Field]

- Input Table = **Map_Units_Dissolve** layer
- Input Join Field = Map_Unit_ID
- Join Table = **ZonalSt_Current_Spring_HSI**
- Output Join Field = Map_Unit_ID
- Join Field = *check* 'MEAN'.

1.10.6 Change the field alias to indicate the table from which the field was joined:

1.10.6(a) Open the attribute table of the **Map_Units_Dissolve** layer.
1.10.6(b) Right-click the recently joined field 'MEAN' and click 'Properties'.
1.10.6(c) Change the Alias of the field to 'Current_Spring_HSI' and click 'OK'.

- Join Field = *check* 'MEAN'.

1.10.7 Repeat steps 1.10.5 and 1.10.6, replacing the **ZonalSt_Current_Spring_HSI** layer with the **ZonalSt_Current_Summer_HSI** layer with the **ZonalSt_Current_Winter_HSI** layers. In step 1.10.6, change the Alias of the field to 'Current_Summer_HSI' and 'Current_Winter_HSI'.

For credit projects that propose to modify conifer cover: Please contact and work with the SETT; the method is still in development.

1.11. Distance to Lek (Breeding)

1.11.1 Add the Dist_Lek layer to map project, if you haven't already.

NOTE: The **Dist_Lek** layer must be provided by NDOW. See the *Data Required* section for information on how to request this data. The **Dist_Lek** layer should be scaled from ≥0 to ≤1 and have the same extent as the **Analysis_Area_6000m** layer. Ensure that this is the case. The **Dist_Lek** layer will be used to calculate local-scale modifier values in step 1.13.

1.12. Distance to Late Brood-Rearing (Breeding)

1.12.1 Using the Clip Raster tool, clip the **Dist_Brood** layer to the **Project_Area** layer. Name this layer **Current_Dist_Brood**.

[ArcToolbox> Data Management Tools> Raster> Raster Processing> Clip]

- Input Raster = **Dist_Brood**
- Output Extent = **Project_Area**
- Use Input Features for Clipping Geometry= *checked*
- Output Raster Dataset = **Current_Dist_Brood**
- NoData Value = *blank*
- Maintain Clipping Extent = *unchecked*

NOTE: The **Current_Dist_Brood** layer will be used to calculate local-scale modifier values in step 1.13.

1.13. Current Local-Scale Habitat Function

*In this step, you will combine the individual modifier layers (e.g., **Current_Spring_HSI**) together for each seasonal habitat type by multiplying the layers together (steps 1.13.1 to 1.13.2). In the next step, you will repeat the process for projected conditions, if applicable (step 1.14).*

For breeding habitat:

1.13.1 Using the Raster Calculator tool, multiply the **Current_Anthro_Disturbance** layer by the **Current_Spring_HSI** layer**, Current_Dist_Lek** layer and the **Current_Dist_Brood** layer to calculate local-scale habitat function for breeding habitat using the following expression. Name this file **Current_Local_Breed**.

[ArcToolbox> Spatial Analyst Tools> Map Algebra> Raster Calculator

Current_Anthro_Disturbance * Current_Spring_HSI * Current_Dist_Lek * Current_Dist_Brood

- Ouput raster = **Current_Local_Breed**
- Click on 'Environments' at the bottom of the tool window.
  1. Set the 'Processing extent' to be the same as **Analysis_Area_6000m.**
  2. Set the 'Snap raster' to the **Spring_HSI** layer.
  3. Click OK at the bottom of the Environmental Settings window and run the tool.

NOTE: The **Current_Local_Breed** layers should be scaled from ≥0 to ≤1 and have the same extent as the **Analysis_Area_6000m** layer. Ensure that this is the case.

For late brood-rearing and winter habitat:

1.13.2 Using the Raster Calculator tool, multiply the **Current_Anthro_Disturbance** layer by the **Current_Summer_HSI** layer to calculate local-scale habitat function for late brood-rearing and winter habitat using the following expression. Name this file **Current_Local_LBR**.

[ArcToolbox> Spatial Analyst Tools> Map Algebra> Raster Calculator

Current_Anthro_Disturbance * Current_Summer_HSI

- Ouput raster = **Current_Local_LBR**
- Click on 'Environments' at the bottom of the tool window.
  1. Set the 'Processing extent' to be the same as **Analysis_Area_6000m.**
  2. Set the 'Snap raster' to the **Summer_HSI** layer.
  3. Click OK at the bottom of the Environmental Settings window and run the tool.
  4. Environmental Settings window and run the tool.

1.13.3 Repeat step 1.13.1, replacing the **Current_Summer_HSI** layer with the **Current_Winter_HSI** layer. Name the output of step 1.13.2 **Current_Local_Winter**.

NOTE: The **Current_Local_Winter** and **Current_Local_LBR** layers should be scaled from ≥0 to ≤1 and have the same extent as the **Analysis_Area_6000m** layer. Ensure that this is the case.

1.14. Projected Local-Scale Habitat Function

NOTE: For credit projects that do not propose to modify landscape or local-scale factors, such as anthropogenic features or conifer cover no layers starting with '**Projected_**' will have been created, and this step can be skipped.

For breeding habitat:

1.14.1 Using the Raster Calculator tool, multiply the **Projected_Anthro_Disturbance** layer by the **Current_Spring_HSI,** the **Current_Lek_Dist** layer and the **Current_Dist_Brood** layer to calculate local-scale habitat function for breeding habitat using the following expression. Name this file **Projected_Local_Breed**.

[ArcToolbox> Spatial Analyst Tools> Map Algebra> Raster Calculator

Projected_Anthro_Disturbance * Current_Spring_HSI * Current_Lek_Dist* Current_Dist_Brood

- Ouput raster = **Projected_Local_Breed**
- Click on 'Environments' at the bottom of the tool window.
  1. Set the 'Processing extent' to be the same as **Analysis_Area_6000m.**
  2. Set the 'Snap raster' to the **Spring_HSI** layer.
  3. Click OK at the bottom of the Environmental Settings window and run the tool.

NOTE: The **Projected_Local_Breed** layers should be scaled from ≥0 to ≤1 and have the same extent as the **Project_Area** layer. Ensure that this is the case.

For late brood-rearing and winter and habitat:

1.14.2 Using the Raster Calculator tool, multiply the **Projected_Anthro_Disturbance** layer by the **Current_Summer_HSI** layer to calculate local-scale habitat function for late brood-rearing and winter habitat using the following expression. Name this file **Projected_Local_LBR**.

[ArcToolbox> Spatial Analyst Tools> Map Algebra> Raster Calculator

Projected_Anthro_Disturbance * Current_Summer_HSI

- Ouput raster = **Projected_Local_LBR**

- Click on 'Environments' at the bottom of the tool window.
  1. Set the 'Processing extent' to be the same as **Analysis_Area_6000m.**
  2. Set the 'Snap raster' to any of the **Summer_HSI** layer.
  3. Click OK at the bottom of the Environmental Settings window and run the tool.

1.14.3 Repeat step 1.14.2, replacing the **Current_Summer_HSI** layer with the **Current_Winter_HSI**. Name the output of step 1.14.2 **Projected_Local_Winter**.

NOTE: The **Projected_Local_LBR** and **Projected_Local_Winter** layers should be scaled from ≥0 to ≤1 and have the same extent as the **Analysis_Area_6000m** layer. Ensure that this is the case.

For debit projects with term impacts:

1.14.4 Repeat steps 1.14.1 to 1.14.3 , replacing the **Projected_Anthro_Disturbance** layer with the **Permanent_Anthro_Disturbance** layer. Name the output of step 1.14.1 **Permanent_Local_Breed**. Name the output of step 1.14.2 **Permanent_Local_LBR.** Name the output of step 1.14.3 **Permanent_Local_Winter**.

1.15. Export Data

*In this step, you will average the local-scale modifier layers (e.g., **Current_Local_Breed**) within each map unit using the Zonal Statistics tool (step 1.15.1), join the zonal statistics table to the **Map_Units** layer (steps 1.15.2 to 1.15.3), then repeat for each cumulative modifier layer (step 1.15.4). Then, you will export the **Map_Units** attribute table to a text file (step 1.15.5).*

1.15.1 Using the Zonal Statistics as Table tool, average all pixels of the **Current_Local_Breed** layer within each map unit. Name the output table **ZonalSt_Current_Breed**.

[ArcToolbox> Spatial Analyst Tools> Zonal> Zonal Statistics as Table]

- Input raster or feature zone data = **Map_Units_Dissolve** layer
- Zone Field = 'Map_Units_ID'
- Input value raster = **Current_Local_Breed**
- Output table = **ZonalSt_Current_Breed**
- Ignore NoData in calculations = *checked*
- Statistics type = MEAN

1.15.2 Using the Join Field tool, join the MEAN field for the **ZonalSt_Current_Breed** table to the **Map_Units_Dissolve** layer.

[ArcToolbox> Data Management Tools> Joins> Join Field]

- Input Table = **Map_Units_Dissolve** layer
- Input Join Field = Map_Unit_ID
- Join Table = **ZonalSt_Current_Breed**
- Output Join Field = Map_Unit_ID
- Join Field = *check* 'MEAN'.

1.15.3 Change the field alias to indicate the table from which the field was joined:

1.15.3(a)Open the attribute table of the **Map_Units_Dissolve** layer
1.15.3(b)Right-click the recently joined field 'MEAN' and click 'Properties'.
1.15.3(c)Change the Alias of the field to 'Current_Breed' and click 'OK'.

1.15.4 Repeat step 1.15.1 to 1.15.3 for all local-scale modifier layers created in steps 1.13 to 1.14.

For debit projects: four or six zonal statistics tables (step 1.15.1) should be created and four or six joins (step 1.15.2) should be performed, one each for pre-project and post-project conditions (including term and permanent) for breeding and for late brood-rearing and winter combined.

For credit projects: two or four zonal statistics tables (step 1.15.1) should be created and joins (step 1.15.2) should be performed, depending on whether existing anthropogenic features, conifer cover, or late brood-rearing habitat will be modified by the project.

1.15.5 Export the attribute table of the **Map_Units_Dissolve** layer to a text file named '**Map_Unit_Data**':

1.15.5(a) Open the attribute table of the **Map_Units_Dissolve** layer.

1.15.5(b) Under 'Table Options' ( ) select Export and save as a .txt file. Name this file **Map_Units_Data**.

1.15.5(c) When prompted to add the table to the current map, select 'No'.

1.16. Enter GIS Data into Credit or Debit Project Calculator

NOTE: The following instructions are for Microsoft Excel 2010. See relevant help documentation online to complete these steps in a different version of Excel.

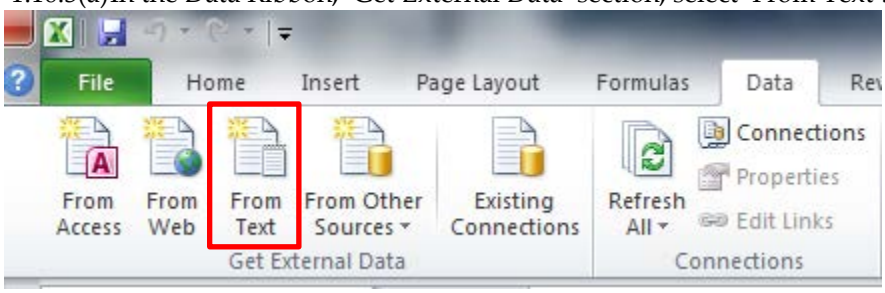
1.16.1 Open the Project Calculator.

1.16.2 Open a separate instance of Microsoft Excel.

TIP: To open a separate instance of Excel (2010 version or earlier), with the Calculator open, go to the Start menu and open Excel again. This will allow you to have two visible windows open at the same time.

1.16.3 Add the Export Table to the blank workbook:

1.16.3(a) In the Data Ribbon, 'Get External Data' section, select 'From Text'.



1.16.3(b) Navigate to the Export Table and Open the Export Table. When opening, specify the file is comma-delimited.

1.16.4 Copy the relevant columns from the Export Table into the corresponding worksheets and columns in the Project Calculator. See Table 4 for a list of Export Tables generated during the Desktop Analysis that must be inputted into the Calculator.

NOTE: Field Aliases, created in steps 1.10.7 and 1.15.3 to indicate the tables from which join fields were added, will not be transferred in this step. Refer back to the attribute table of the **Map_Units** layer and rename the column headers in Excel to 'Current_Spring_HSI', 'Current_Summer_HSI', 'Current_Winter_HSI', 'Current_Breed', 'Current_LBR' and 'Current_Winter' and ('Projected_Breed', 'Projected_LBR' and 'Projected_Winter' if applicable).

NOTE: Exported data should include six digits after the decimal point. To ensure consistent results, do not round or truncate the results when copying the data into the Project Calculator. Keep all six digits after the decimal point.

Table 4. Export Tables generated during the Desktop Analysis and corresponding Calculator Worksheet

	EXPORT TABLE	REFERENCE STEP	CALCULATOR WORKSHEET
☐	**Transects_Data**	1.6.6	1.2 Enter Transects Data
☐	**Mgmt_Cats_Data**	1.7.3	1.3 Enter Mgmt Cats Data
☐	**Map_Units_Data***	1.15.5	1.1 Enter Map Unit Data

* If waiting for field data before finishing the Desktop Analysis, complete step 1.15.5 and enter as much data as is available into the Calculator in order to calculate site-scale conditions from field data. Mgmt_Cats_Data does not need to be entered to generate a site-scale score.

NOTE: The Calculator includes more detailed instructions for how to input data from each field datasheet. See rows 1 and 2 in the relevant worksheet in the Calculator.

1.16.5 Review the desktop analysis results in worksheet 1.4 *Review Desktop Results* to ensure desktop analysis outputs were properly entered into the Calculator.

1.17. Current and Projected Local-Scale Habitat Function for Meadow Map Units

In this step, you will re-calculate the local-scale modifier layers (e.g. Current_Local_Breed) for meadow map units that are less than 0.5 acres or are of a shape that did not calculate a local scale habitat function in steps 1.13 and 1.14.

1.17.1 In the **Map_Units_Dissolve** layer, select the Meadow map units that did not calculate a local scale habitat function or are smaller than 0.5 acres.

1.17.2 Using the Buffer tool, buffer the **Map_Units_Dissolve** layer by 20m (Note: You may need to buffer by a greater distance, however we want to use the smallest buffer possible). Name this layer **Map_Units_Meadows**.

[ArcToolbox> Analysis Tools> Proximity> Buffer]

- Input Features = **Map_Units_Dissolve**,
- Output Feature Class = **Map_Units_Meadows**,
- Distance = 20 (in meters),
- Side Type = FULL,
- Method = PLANAR,
- Dissolve Type = ALL,
- Dissolve Fields = *none checked*.

TIP: You may delete all fields except for 'Map_Unit_ID', 'Map_Unit_Name', and 'Meadow' in the Field Map. Ensure that only the meadow map units that did not calculate a local scale habitat function are included in the **Map_Units_Meadows** layer.

1.17.3 Using the Zonal Statistics as Table tool, average all pixels of the **Current_Local_Breed** within each meadow map unit. Name the output tables as in **ZonalSt_Current_Breed_Meadows**.

[ArcToolbox> Spatial Analyst Tools> Zonal> Zonal Statistics as Table]

- Input raster or feature zone data = **Map_Units_Meadows** layer
- Zone Field = 'Map_Units_ID'
- Input value raster = **Current_Local_Breed**
- Output table = **ZonalSt_Current_Breed_Meadows**
- Ignore NoData in calculations = *checked*
- Statistics type = MEAN

1.17.3(a) Repeat step 1.17.3 above for all local scale modifiers calculated in steps 1.13 – 1.14

1.17.4 Using the Join Field tool, join the MEAN field for the **ZonalSt_Current_Breed_Meadows** table to the **Map_Units_Meadows** layer.

[ArcToolbox> Data Management Tools> Joins> Join Field]

- Input Table = **Map_Units_Meadows** layer
- Input Join Field = Map_Unit_ID
- Join Table = **ZonalSt_Current_Breed_Meadows**
- Output Join Field = Map_Unit_ID
- Join Field = *check* 'MEAN'.

1.17.4(a) Repeat step 1.17.4 above for all Zonal statistics layers calculated in step 1.17.3

1.17.5 Export the attribute table of the **Map_Units_Meadows** layer to a text file named '**Map_Unit_Meadows_Data**':

1.17.5(a) Open the attribute table of the **Map_Units_Meadows** layer.

1.17.5(b) Under 'Table Options' () select Export and save as a .txt file. Name this file **Map_Units_Meadows_Data**.

1.17.5(c) When prompted to add the table to the current map, select 'No'.

1.17.6 Add the Export Table to the blank workbook:

1.17.6(a) In the Data Ribbon, 'Get External Data' section, select 'From Text'.

1.17.6(b) Navigate to the Export Table and Open the Export Table. When opening, specify the file is comma-delimited.

1.17.6(c) Copy the relevant columns from the Export Table into the corresponding worksheets and columns in the Project Calculator. See Table 4 for a list of Export Tables generated during the Desktop Analysis that must be inputted into the Calculator.

1.17.6(d) Add the local scale modifier data for the meadow map units to the corresponding map unit IDs in the **Map_Units_Data** excel file prior to entering the data into the HQT calculator.

2. Field Data
Collection Method

2. FIELD DATA COLLECTIONS METHODS

The methods outlined below must be used for field data collection of attributes associated with the site scale, which defines habitat conditions at the site of proposed activities. Table 5 describes the attributes measured to calculate site-scale functional-acres for specified seasonal habitats.

TIMING OF FIELD DATA COLLECTION

Vegetation sampling of sage-grouse habitat attributes must be conducted during the peak of the growing season. The peak of the growing season on northern Nevada rangeland generally occurs between **April 15th and June 30th**. These dates may vary slightly annually due to temperature and precipitation. The peak of the growing season varies between sites based upon elevation, latitude, and winter and spring precipitation. Take annual and site variations into account when approximating the peak of the growing season within the permissible window for the site. Peak growing season is indicated when the culms of cool season grasses have fully elongated and seed heads have emerged (not necessarily seed-ripe) and the majority of forb species are between early bloom and seed set phenological stages.

Field data must be collected during the permissible window in order for functional acre scores to be official and approved by the Administrator; however shrub data may be collected during any time of year. When making repeat visits to a site, attempt to collect data at a phenologically-similar time, or within two weeks of the first data collection for the site.

FIELD MATERIALS REQUIRED

The following materials should be collected before the field visit:

1. Credit or Debit Project Calculator
2. Hand-held sub-meter accuracy GPS unit, preloaded with transect start points
3. Field maps, using aerial photos as background
4. Datasheets
5. Camera
6. 50-meter tape
7. Chaining pins
8. 1-meter tape or wooden ruler
9. PVC or wooden Daubenmire frame (20X50cm)
10. White board for photo of transects or photo transect datasheets (Appendix 5)
11. Rangefinder or 100-meter tape for distance to sagebrush
12. Plant field guides for the area
13. Walkie talkies (optional)
14. Resistance & Resilience Scorecard & Guide, available at: http://www.fs.fed.us/rm/pubs/rmrs_gtr322.pdf
15. A User's Guide to Assessing Proper Functioning Condition and the Supporting Science for Lentic Areas and Lentic Checklist (if applicable), available at: http://www.blm.gov/or/programs/nrst/files/Final%20TR%201737-16%20.pdf>
16. A User's Guide to Assessing Proper Functioning Condition and the Supporting Science for Lotic Areas and Lotic Checklist (if applicable), available at: http://www.blm.gov/nstc/library/pdf/Final%20TR%201737-15.pdf>
17. Ability to Control Wildfire Scorecard: *Contact the Sagebrush Ecosystem Technical Team (SETT).*

Table 5. Attributes measured and summary of data collection methods

ATTRIBUTE	RESOURCE	SAGE-GROUSE SEASON	DATA COLLECTION SUMMARY
Sagebrush canopy cover	Cover	▪ BREEDING ▪ LATE BROOD-REARING	The percent canopy cover is estimated with line intercept (% of sagebrush canopy intersecting transect line).
	Cover and Foraging	▪ WINTER	
Total shrub canopy cover (including sagebrush)	Cover	▪ BREEDING	The percent canopy cover is estimated with line intercept (% of total shrub canopy intersecting transect line).
Sagebrush height	Cover and Foraging	▪ WINTER	The sagebrush height is determined by measuring the tallest point of a shrub that is intersecting the transect line.
Distance to sagebrush cover	Cover -Trigger	▪ LATE BROOD-REARING	Distance to nearest sagebrush cover (cover equivalent to area of at least ~30x30 m, with density of 10% canopy cover, and average height of 30cm) is measured from the 30 m point along each 50 m transect.
Perennial forb canopy cover	Foraging	▪ BREEDING ▪ LATE BROOD-REARING	Percent cover of perennial forbs is determined by sampling within a standard-sized Daubenmire plot (20x50 cm) at 10 meter increments along a 50 m transect (5 plots total/ transect).
Forb species richness (# of species)	Foraging	▪ BREEDING ▪ LATE BROOD-REARING	Abundance of forbs (annual and perennial) is determined by sampling within a standard-sized Daubenmire plot (20x50 cm) at 10 meter increments along a 50 m transect (5 plots total/ transect).
Perennial grass canopy cover	Cover-Trigger	▪ BREEDING	Species and percent cover of perennial grasses is determined by sampling within a standard-sized area of Daubenmire plot (20x50 cm) at 10 meter increments along a 50 m transect (5 plots total/ transect).
	Cover	▪ LATE BROOD-REARING	
Invasive annual grass canopy cover	Modifier	▪ BREEDING ▪ LATE BROOD-REARING	Percent cover of annual grasses is determined by sampling within a standard-sized area of Daubenmire plot (20x50 cm) at 10 meter increments along a 50 m transect (5 plots total/ transect).

DETAILED INSTRUCTIONS

2.1. Conduct Site Reconnaissance

Upon arrival at the site, field crews should walk the site together to quality-check the map unit delineations. Map units, especially in agricultural and meadow areas, often change from year to year, and may not reflect even relatively recent aerial photography. As well, changes in some vegetation communities may not be evident on aerial photographs, such as understory composition. Crews should be prepared to modify map unit boundaries (both further sub-dividing maps units and conglomerating existing maps units) in the field based on observations, and should also come to a common understanding of the plants present, and the protocol that follows. Any changes to map units must be noted and map unit and relevant GIS data files must be corrected after field work is complete. In addition, if sites have high variability that cannot be accounted for through changes in map unit delineations, additional transects should be added to the protocol based on the best judgement of the verifier.

2.2. [Repeat Steps 2.3 - 2.11 for each Map Unit]

2.3. Complete Map Unit Datasheet

The map unit datasheet should be the first form filled out when arriving at the site and continued to be filled out as the sampling is completed (see Appendix 3). For each map unit, record the date, map unit description, and other mandatory information. The total number of map units sampled within the project site should be counted and recorded after all map units have been sampled.

2.4. Complete Resistance & Resilience Scorecard

Complete the Resistance and Resilience Score Sheet for each ecological site/map unit within the project area (see *Field Materials Required*, the Resistance & Resilience Scorecard should have been partially filled out during the Desktop Analysis), referring to the accompanying field guide[3]. Once the score cards are complete, an area weighted average score for the project site should be calculated and entered into the Calculator on the Baseline and Reserve Account tab.

2.5. Complete Ability to Control Wildfire Scorecard

Complete Wildfire Score Sheet for each ecological site/map unit within the project area (see *Field Materials Required*, the Wildfire Scorecard should have been partially filled out during the Desktop Analysis), referring to the accompanying field guide. Once the score cards are complete, an area weighted average score for the project site should be calculated and entered into the Calculator on the Baseline and Reserve Account tab.

2.6. Complete Lentic or Lotic PFC Checklist (if applicable)

Complete the Lentic or Lotic PFC Assessment Checklists for the credit projects only.

2.7. [Repeat Steps 2.8 - 2.11 for each Transect]

2.8. Navigate to Transect and Begin Data Collection

2.8.1 Establishing a Transect

2.8.1(a) Navigate to a transect start point via hand-held GPS. Insert a chaining pin in the ground, and lay out or thread a 50-meter transect using the random bearing generated for that transect (see step 1.6 in *Desktop Analysis*). Pull the tape taut and anchor the 50 m end with a chaining pin. Populate all fields at the top of transect

[3] Miller, Richard F.; Chambers, Jeanne C.; Pellant, Mike. 2014. A field guide for selecting the most appropriate treatment in sagebrush and piñon-juniper ecosystems in the great basin: Evaluating resilience to disturbance and resistance to invasive annual grasses, and predicting vegetation response. Gen. Tech. Rep. RMRS-GTR-322 REVISED. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 66 p.

datasheet (Appendix 5), with the date, observer initials, site name, map unit number, the transect number and UTMs (including UTM Zone and Datum), GPS type, transect bearing, whether the transect is within an altered or unaltered meadow, photo point numbers, and camera type.

NOTE: If a transect crosses a map unit boundary into another map unit or outside of the project area, the transect will need to be reflected back into the map unit by 90 degrees, priority to the right, if not, then left. If that doesn't work pick the next randomly generated point in that map unit.

NOTE: If a transect passes through a shrub thicket too dense to sample properly (i.e., willow, serviceberry, mahogany, desert peach, etc.) at a distance of greater than 50 m, reflect the transect 90 degrees to the right, then left. If reflecting does not work pick the next randomly

2.8.1(b)Transects will be named as followed: **XXX-MU#-T#**

2.8.1(c)**XXX** is three letter abbreviation for project site, **MU#** is the map unit number, and **T#** is the transect number, all of which should be named based on information from the pre-field work desktop analysis.

2.8.2 Photo Points

2.8.2(a)Using a white board label it with the project site, date, transect name, and transect direction. Lean it next to the chaining pin it at the 0 meter mark of the transect.

2.8.2(b)Align camera in direction of the transect so that the bottom of the white board is at the photo's bottom center (Figure 11).

2.8.2(c)Take photo and, if using GPS camera, name the photo using transect name.

NOTE: For data collection: Always stand on the right side of the transect. Field data should be collected on the left side of the transect.

Figure 10. Transect photo example

NOTE: All species from Line intercept, Daubenmire plots, and general species lists, should be recorded using the following nomenclature. Species names should be recorded using full scientific name or the USDA PLANTS database species code (http://plants.usda.gov/).

If you can identify the genus, but not the species either use the PLANTS database genus code (http://plants.usda.gov). ALWAYS define the genus portion of the code in the notes section of the transect datasheet (e.g., *Artemisia* species = AR01). In addition, note if it is annual or perennial for forbs and graminoids.

Do not use common names.

If you *cannot* identify the genus, use the following codes and a short description/drawing:

- **AF#** = Annual forb (also includes biennials)
- **PF#** = Perennial forb
- **AG#** = Annual graminoid
- **PG#** = Perennial graminoid
- **SH#** = Shrub

2.9. Daubenmire Plots

2.9.1 Daubenmire Frame Placement

2.9.1(a) Place the top of a Daubenmire frame on the left side of the transect line starting at the 10 meter mark (see Figure 12). The frame should be placed with the long side parallel to the transect. Take care not to damage any vegetation. Repeat these placements every 10 m, for a total of 5 plots along the 50 m transect.

2.9.2 Grass and Forb Cover

2.9.2(a) Record all grass and forb cover that falls within the plot using the following cover classes listed in Table 6. If the plant is rooted outside the plot, but its cover falls within the plot, those estimates should be counted towards cover. Do not include cover of a plant that falls outside of the plot, even if the plant is rooted within the plot.

2.9.2(b) Identify cover for each of the following functional group categories:

- PF = perennial forb (live cover only)
- PG = perennial grass (live or residual)
- IAG = invasive annual grass (live or residual)

Table 6. Cover classes for use when estimating cover in Daubenmire frames

COVER CLASS	RANGE OF COVER (%)	MID-POINT OF CLASS (%)
1	0-5	2.5
2	5-25	15.0
3	25-50	37.5
4	50-75	62.5
5	75-95	85.0
6	95-100	97.5

NOTE: The following invasive annual grass species should be included, but not limited to, in the estimate of annual invasive grass cover:

- Cheatgrass (*Bromus tectorum*)
- Medusahead (*Taeniatherum caput-medusae*)
- Red Brome (*Bromus rubens*)
- Rattlesnake chess (*Bromus briziformis*)

2.9.3 Forb Species Count

2.9.3(a) For each Daubenmire plot, record the USDA PLANT code or scientific name for each forb species that are rooted within the plot, annual and perennial. Once all 5 plots are completed for a transect, tally and record the count of all forb species identified within the 5 plots, this will give you a total forb species count per transect.

2.9.3(b) Record all plant species encountered along the transect in the notes section of the datasheet.

2.10. Distance to Sagebrush Cover

2.10.1 Measure the distance to the nearest sagebrush, or sagebrush mixed shrub community, cover from the 30 m mark of the transect and record the distance in meters on the datasheet.

2.10.1(a) Sagebrush or sagebrush mixed shrub community cover must have at least of 10% canopy cover in a minimum 30x30 m patch size with average height of 30 cm.

2.10.1(b) If the transect is located within sagebrush cover, then record distance as 0 m.

2.11. Line Intercept

2.11.1 Shrub Canopy Cover

2.11.1(a) You can begin at the 0 m or the 50 m mark for line intercept. For the entire length of the transect, record start and stop locations (in centimeters) for all shrub species intercepting the transect using the following categories:

- Low sagebrush
- Big sagebrush
- Other

2.11.1(b) Interceptions less than 5 cm are not recorded as canopy cover.

2.11.1(c) If a gap is greater than 5 cm stop your intercept recording. Resume intercept once you reach canopy cover that is greater than 5 cm.

2.11.1(d) Canopy cover for each shrub species is recorded, even if multiple species are overlapping.

NOTE: The total lengths of shrubs will be added together over the 50 meters to calculate the percent canopy cover of sagebrush and total shrubs.

NOTE: The following sagebrush species are the species of sagebrush in Nevada that the CCS recognizes. No other species should be counted as sagebrush. For example, *Artemisia spinescens*, *Artemisia ludoviciana*, while they are "sage" species, they should not count as sagebrush, but are considered as "other" shrub canopy cover.

- *Artemisia arbuscula*
- *Artemisia cana*
- *Artemisia frigida*
- *Artemisia longiloba*
- *Artemisia nova*
- *Artemisia papposa*
- *Artemisia tridentata ssp. tridentata*
- *Artemisia tridentata ssp. vaseyana*
- *Artemisia tridentata ssp. wyomingensis*
- *Artemisia tripartita*

2.11.2 Sagebrush Height

2.11.2(a) For each sagebrush plant intercepting the transect, record the tallest vegetative portion to the nearest cm. Do not include the inflorescence of sagebrush as height.

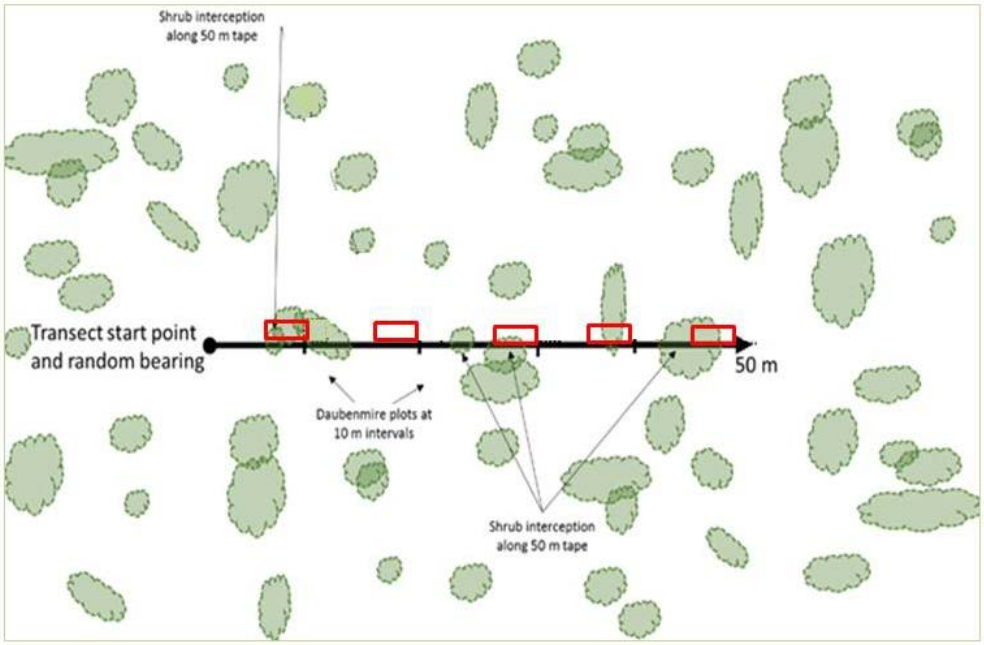


Figure 11. Diagram of transect and plots

2.12. Document Anthropogenic Features

2.12.1 The anthropogenic features map developed in the pre-field desktop analysis should be ground-truthed on foot or in a vehicle. Additional features that are identified should be marked on the map and digitized in the office in ArcGIS; similarly GPS coordinates collected and recorded in the field should be added to ArcGIS in the office.

2.12.2 Newly identified features should be noted on the anthropogenic features datasheet for the project site.

2.12.2(a) If features are marked on the map, be sure to attach map to the anthropogenic features datasheet.
2.12.2(b) If features are marked using GPS, be sure to record GPS unit name and use the following naming code: **XXX-** # where **XXX** is the three letter abbreviation for project site, and # is a unique sequential number for each feature identified in the field.

2.13. Input Data into Credit or Debit Project Calculator

DATA REQUIRED: All Field Datasheets completed during the Desktop Analysis, Credit or Debit Project Calculator

2.13.1 Open the Project Calculator.

For each Field Datasheet:

2.13.2 Enter the relevant data into the corresponding worksheets and columns in the Calculator. See Table 7 for a list of field datasheets completed during the field data collection that must be inputted into the Calculator.

Table 7. Field Datasheets completed during the Field Data Collection and corresponding Calculator Worksheet

	FIELD DATASHEETS	REFERENCE STEP	CALCULATOR WORKSHEET
☐	**Map Unit Datasheets**	2.3	2.1 Track Field Sheets
☐	**Resistance & Resilience Scorecard**	2.4	3.1 Enter Baseline & Rsrv Acct
☐	**Proper Functioning Condition Checklist**	2.5	2.1 Track Field Sheets
☐	**Ability to Control Wildfire**	2.6	2.1 Track Field Sheets
☐	**Transect Datasheets**	2.8 - 2.11	2.2 Enter Field Info 2.3 Enter Shrub Data 2.4 Enter Forbs & Grass Data

NOTE: The Calculator includes more detailed instructions for how to input data from each field datasheet. See row 1 in the relevant worksheet in the Calculator.

3. Credit/Credit Obligation Calculation

3. CREDIT/CREDIT OBLIGATION CALCULATION

This section provides a step-by-step overview of the process for generating credits and securing credits to offset a credit obligation. These steps will be completed by the Credit Developer/Credit Buyer, Technical Service Providers, Verifiers and the Credit System Administrator, depending on their roles and skillsets. Please contact the Sagebrush Ecosystem Technical Team (SETT) with questions on any step in this process.

TOOL PREREQUISITES

- Credit or Debit Project Calculator (NOTE: *Section 1: Desktop Analysis* and *Section 2: Field Data Collection Methods* contain critical information on completing the Calculator.)
- Credit Projects
  - Validation Checklist (completed)
  - Verifier Conflict of Interest Form
  - Management Plan
  - Participant Contract
  - Annual Monitoring Form
  - Notice of Validation
- Debit Projects:
  - SETT Consultation Form
  - Verifier Conflict of Interest Form
  - Anthropogenic Disturbance Review Form
  - Verification Contract
  - Credit Purchase Agreement
  - Credit Transfer Form
  - Notice of Transfer
- Recommended: Current versions of the Nevada Conservation Credit System Manual and HQT Methods document for reference.

DETAILED STEPS TO CALCULATE CREDITS

The User's Guide covers steps D2 in *Section 3.1: Generating Credits* of the Nevada Conservation Credit System Manual (Figure 14).

Figure 12. Overview of the process steps to generate credits

D2.1 CALCULATE PRE-PROJECT CONDITIONS

3.1. Calculate Credits for Pre-Project Conditions

3.1.1 Open the Credit Project Calculator.

3.1.2 Review habitat function and functional acre scores based on current conditions presented in worksheet 3.2 *Review Credit/Debit Amount* to ensure data has been inputted accurately. If not, review *Section 1: Desktop Analysis* or *Section 2: Field Data Collection Methods* for instructions for generating and entering local-scale and site-scale data.

3.1.3 Enter relevant WAFWA Management Zone and factors that determine the reserve account contribution into worksheet 3.1 *Enter Baseline & Rsrv Acct*.

3.1.4 Conduct quality assurance effort by thoroughly reviewing the GIS process and products, baseline habitat function, current habitat function, current functional acres, current mitigation ratio and current credits generated values in worksheet *Summary* to ensure values makes sense based on general and observational understanding of the project site.

D2.2 DEFINE & SUBMIT PROJECT DESIGN INFORMATION

3.2. Complete Section I of the Management Plan

3.2.1 Complete Section I of the Management Plan according to guidance provided in the form. For restoration or enhancement projects, use a draft Management Plan to outline design options for the project and describe expected outcomes. These design options will be evaluated in the Calculator to calculate expected credits generated by the project.

3.3. Estimate Post-Project Credits

3.3.1 In the Calculator, estimate post-project credits by entering projected post-project conditions based on project design options in the Management Plan into worksheet 2.7 *Enter Projected Conditions*.

3.3.1(a) Projected post-project conditions are entered into the Projected Post-Project Habitat Function and Projected Post-Project Mitigation Ratio data entry columns. For cells left blank in these data entry columns, the current conditions are used for calculating projected post-project conditions.

3.3.2 Review the projected post-project credit calculations in worksheet *Summary*.

3.3.3 Print the updated Credit Summary from worksheet *Summary* and copy/paste Credit Summary into the corresponding section of the draft Management Plan.

D2.3 IMPLEMENT PROJECT, REFINE CALCULATIONS & SUBMIT

3.4. Confirm or Refine Credit Calculations

3.4.1 Implement the project and repeat the credit calculation if the project was not consistent with the draft Management Plan. Modify the Calculator and repeat steps in the Desktop Analysis if necessary. This is the final, official credit calculation. If changed, print the updated Credit Summary from worksheet *Summary* and copy/paste Credit Summary into the corresponding section of the draft Management Plan.

3.5. Determine Reserve Account Contribution

3.5.1 Enter the area-weighted Resistance and Resilience scores from the Score Sheets completed in step 2.4 into worksheet 3.1 *Enter Baseline & Rsrv Acct* of the Calculator.

3.5.2 Enter the area-weighted Ability to Control Wildfire Score Sheet score for the credit project.

3.5.3 Complete the Competing Land Use assessment and input contribution percentage from Table 8 for projects on private land into Worksheet 3.1 *Enter Baseline & Rsrv Acct* of the Calculator. See the Management Plan for information necessary to complete the Competing Land Use assessment. Projects on public lands have not yet been approved by federal land management agencies; please contact the Administrator for more information.

Table 8.Competing Land Uses reserve account categories and contribution percentages for credits on privately-owned land

MINIMUM COMPETING LAND USE RELATED REQUIREMENTS	CONTRIBUTION PERCENTAGE
Participant Contract and Conservation Easement and Ownership of Subsurface Rights	0%
Participant Contract and Conservation Easement	1%
Participant Contract and Ownership of Subsurface Rights	3%
Participant Contract	4%

NOTE: After you feel confident in all your results, you are now ready to place Post-Field Work Submittals in a folder on the ftp site for SETT Review. This folder should include all GIS data within a geodatabase with the appropriate naming conventions, transect datasheets, photo-point-datasheets, field maps, meaningful notes, anthropogenic disturbance review forms, PFC checklists for each riparian area, R&R and Wildfire scorecards representing each map unit, the completed HQT calculator indicating the credit estimate, the Verifier Project Assessment Submission Form, as well as notes on any assumptions made, potential discrepancies, issues, etc. Please download the Post-Field Submission Guidance folder from the ftp site for further details and the necessary forms,

3.6. Determine Credit Release Schedule

3.6.1 Review the pre-project credit calculation to the expected post-project credit calculation in worksheet *Summary*. Use this information to fill out the Credit Release Schedule in Section II of the Management Plan.

3.7. Calculate Financial Assurances

3.7.1 Complete the management actions table in Section III of the Management Plan to estimate the cost for long-term management of the credit project. Use this section to determine the amount required for financial assurances for the project. Fill out Section IV of the Management Plan with financial assurance information. Contact the Administrator for any needed guidance.

3.8. Set Verification Schedule

3.8.1 Complete the independent verification schedule in Section III of the Management Plan.

3.9. Complete Participant Contract

3.9.1 Fill out and sign the Participant Contract.

DETAILED STEPS TO CALCULATE CREDIT OBLIGATION

The User's Guide covers steps B2 – B3 in *Section 3.2: Acquiring Credits* of the Nevada Conservation Credit System Manual for regulatory offset credit Buyers only (Figure 15). Before beginning, ensure the project has been planned in a way that avoids and minimizes residual impact to the maximum practical extent. Review *Section 3: Credit System Operations* of the Manual for more information.

Figure 13. Overview of the process to calculate credit obligation and acquire credits

B2.1 DETERMINE CREDIT OBLIGATION AMOUNT

3.10. Establish Verification Contract

3.10.1 Complete a Verification Contract with the Credit Buyer.

3.11. Estimate Credit Obligation

3.11.1 Open the Debit Project Calculator.

3.11.2 Review all tabs to ensure data has been inputted accurately. If not, review *Section 1*: *Desktop Analysis* or *Section 2*: *Field Data Collections Methods* for instructions.

3.11.3 In the Debit Project Calculator, review preliminary credit obligation calculation in worksheet *Summary*. This is the pre-implementation credit obligation estimate.

3.12. Verify Debit Estimates

3.12.1 If field data was collected by the Credit Buyer, verify that field data collection was completed accurately.

3.13. Verify Post-Project Conditions

3.13.1 After the project has been implemented, verify that project design plans were followed and that the original credit obligation estimate is still accurate. If not, repeat Desktop Analysis steps necessary to recalculate credit obligations based on actual post-project conditions.

3.14. Purchase Credits

3.14.1 The Credit Buyer will be provided a list of credit projects that could meet the Credit Buyer's credit obligation. The Credit Buyer then selects one or more potential credit projects and contacts the Credit Developer. The Credit Developer and Credit Buyer come to agreement on credit quantities, price, timing of funding, and other terms. Once an agreement is complete, the Credit Buyer or Credit Developer submits the Credit Transfer Form to the Administrator.

APPENDICES

APPENDIX 1. PROTOCOLS FOR USING RECOMMENDED ANTHROPOGENIC DATA

This appendix provides guidance for the use of datasets provided in the recommended anthropogenic data geodatabase in the Nevada Data Package.

ROADS_LINE (NDOT ROADS LAYER)

1. Using the Clip tool, clip the **Roads_Line** layer from the **Recommended_Anthro_Data** geodatabase to the **Analysis_Area_6000m** layer. Name this file **Roads_Line_Clip**.
   [ArcTools> Analysis> Extract> Clip]
   - Input Features = **Roads_Line,**
   - Clip Features = **Analysis_Area_6000m**,
   - Output Feature Class = **Roads_Line_Clip**,
   - XY Tolerance = *blank*.
2. Digitize any proposed commercial roads not included in the **Roads_Line_Clip** layer. Commercial roads (High Use) are roads that lead to existing anthropogenic features. They may also be the widening, extending, or improvement of existing low use roads or two tracks.
   a. Right click on the layer in the Table of Contents, click 'Edit Features', then click 'Start Editing'.
   b. Digitize the probable locations of the center line of the proposed roads that are not included in the **Roads_Line_Clip** layer.
   c. For other roads that are not included in the **Roads_Line_Clip** layer that meet the definitions within Table 1 contact the SETT for consultation.
   d. Populate the 'Type', 'Subtype', 'Dist' and 'Weight' field for each feature with the correct data from Table 1. Populate the 'Buff_Dist' field with an estimate of half of the width of the road (i.e., the distance from the center line to the outer extent of the associated surface disturbance, including any road shoulder present). Be sure to save edits and stop editing when done.
3. Using the Buffer tool, buffer the **Roads_Line_Clip** layer using the 'Buff_Dist' attribute from the attribute table. Name this file **Roads**.
   [ArcToolbox> Analysis Tools> Proximity> Buffer]
   - Input Features = Roads_Line_Clip
   - Output Feature Class = Roads
   - Distance = the 'Buff_Dist' field from the attribute table (select the 'Field' radio button and choose 'Buff_Dist' from the dropdown menu),
   - Side Type = FULL,
   - Method = PLANAR,
   - Dissolve Type = ALL,
   - Dissolve Fields = none checked.
4. Continue with step 1.3.3 for all other anthropogenic features listed in Table 2.

URBAN

1. Using the Clip tool, clip the **Urban** layer from the **Recommended_Anthro_Data** geodatabase to the **Analysis_Area_6000m** layer. Name this file **Urban_Clip**.
   [ArcTools> Analysis> Extract> Clip]
   - Input Features = **Urban,**
   - Clip Features = **Analysis_Area_6000m**,
   - Output Feature Class = **Urban_Clip**,
   - XY Tolerance = *blank*.

2. Continue with step 1.3.3 for all other anthropogenic features listed in Table 2.

MINES

1. Using the Clip tool, clip the **Mines_Point** layer from the **Recommended_Anthro_Data** geodatabase to the **Analysis_Area_6000m** layer. Name this file **Mines_Clip**.
   [ArcTools> Analysis> Extract> Clip]
   - Input Features = **Mines_Point,**
   - Clip Features = **Analysis_Area_6000m**,
   - Output Feature Class = **Mines_Clip**,
   - XY Tolerance = *blank*.
2. Digitize the outer extent of the surface disturbance associated with any mines in the Mines_Clip layer:
   a. Create a new feature class type— "Polygon Features". Name this file **Mines**.
   b. Right click on the layer in the Table of Contents, click 'Edit Features', then click 'Start Editing'.
   c. Using the most recent NAIP aerial imagery or similar imagery at 1:5000 scale, digitize the outer extent of the surface disturbance associated with any mines, including active and inactive. See Table 1 for guidance on digitizing mines.
   d. Populate the 'Type', 'Subtype', 'Dist' and 'Weight' field for each feature with the correct data from Table 1. Be sure to save edits and stop editing when done.

Appendix 2. Resistance & Resilience Scorecard

Score Sheet for Rating Resistance and Resilience to Disturbance to Invasive Annual Grasses in the Great Basin (adapted from Miller et al. 2014						
Ecological Site Name and Number		PLOT SCORE				
% of Project Area:	UTMs:					
SITE CHARACTERISTICS	DESCRIPTION OF SCORES	1	2	3	4	5
Temperature (Soil temperature regime + Species or subspecies of sagebrush)						
Soil temperature regime	**1**=hot-mesic; **2**=warm-mesic; **3**=cool-mesic or cool-cryic; **4**=warm frigid; **5**=cool-frigid; **6**=warm-cryic					
Species or subspecies of sagebrush	**1**=Wyoming, low, black, or Lahontan; **2**=basin, Bonneville, or xeric, **3**=mountain					
A. Temperature Score =	Subtotal					2/9
Moisture (Precipitation = Soil Texture = Soil Depth)						
Precipitation in inches (in)	**1**= <10; **2**= 10-12; **3**= 12-14; **4**= >14					
Soil texture	**1**=clay, sand, or silt; **2**=silty, sandy, or clay loam; **3**=loam					
Soil depth in inches (in)	**0**= very shallow (<10); **1**= shallow (10-20); **3**= moderately deep to deep					
B. Moisture Score =	Subtotal					2/10
Vegetation (Plant groups modified by soil depth)						
Plant Groups Deep-rooted perennial grasses (DRPR) potentially dominant in shallow to deep soils >10 in. Sandberg bluegrass (POSE) potentially dominant in very shallow soils <10 in. Perennial forbs (PF) Invasive annual grasses (IAG)	**0**=DRPG and POSE scarce to severely depleted (DRPG < 2-3/m^2) and less than 5% foliar cover **3**= DRPG on soils >10 in. scarce, but POSE of PF >50% foliar cover **6**= DRPG on soils >10 in. depleted (2-3/m^2 or about 5-10% foliar cover) and/or co-dominant with IAG, **or** on soils < 10 in. POSE and PF 5-15% foliar cover and co-dominant with IAG. **9**= DRPG and PF dominant on soils > 10 in. **or** POSE and PF dominant on soils < 10 in.					0/9
C. Vegetation Score	Subtotal					
SITE SCORE = A + B + C						4/28
R & R RATING (circle one)	**Very low** < 10; **Low** = 10-14; **Moderate** = 15-20; **High** > 20					

Appendix 3: Map Unit Datasheet

Project Site Name:		Page 1
Total number of Map units within Project Site:		Version: SETT 093014

Map Unit Number:	Dates of map unit transects:
Total number of transects: Names of transects:	Total number of photos: Aspect of MU: Slope of MU:
Map Unit Description (1 to 2 sentences describing vegetation, topography, and other features relevant to sage-grouse within map-unit):	
Season during which was this map unit evaluated (circle): nesting late brood rearing winter	
Indicate potential seasonal habitats in this map unit (circle): nesting late brood rearing winter	
Should this map unit be revisited to complete additional seasonal habitat evaluation? If yes, which ones?	

Map Unit Number:	Dates of map unit transects:
Total number of transects: Names of transects:	Total number of photos: Aspect of MU: Slope of MU:
Map Unit Description (1 to 2 sentences describing vegetation, topography, and other features relevant to sage-grouse within map-unit):	
Season during which was this map unit evaluated (circle): nesting late brood rearing winter	
Indicate potential seasonal habitats in this map unit (circle): nesting late brood rearing winter	
Should this map unit be revisited to complete additional seasonal habitat evaluation? If yes, which ones?	

Map Unit Number:	Dates of map unit transects:
Total number of transects: Names of transects:	Total number of photos: Aspect of MU: Slope of MU:
Map Unit Description (1 to 2 sentences describing vegetation, topography, and other features relevant to sage-grouse within map-unit):	
Season during which was this map unit evaluated (circle): nesting late brood rearing winter	
Indicate potential seasonal habitats in this map unit (circle): nesting late brood rearing winter	
Should this map unit be revisited to complete additional seasonal habitat evaluation? If yes, which ones?	

Appendix 4: Ability to Control Wildfire Scorecard

ABILITY TO CONTROL WILDFIRE SCORE CARD

Site Name:		Date:
SITE CHARACTERISTICS	**SITE CONDITION (select one)**	**SITE SCORE**
Vegetation/Fuel Type/Ignition Risk		
Dominant fuel type in project area (Fire Behavior Fuel Models based on USDA Forest Service Gen. Tech. Rep. RMRS-GTR-153. 2005)	Irrigated pasture (NB3) = 0 Riparian wet meadow(GR3) = 1 Perennial Grass (GR1, GR2) = 3 Shrub (SH1, SH2) = 5 Grass/Shrub (GS1, GS2) = 7 Heavy Shrub/Grass (SH5, SH7) = 8 Pinyon/Juniper (TU4) =10	
Dominant fuel type adjacent to the project area (w/in 1 mile)	Irrigated (NB3)/Riparian(GR3) = 0 Perennial Grass (GR1, GR2) = 1 Shrub (SH1, SH2) = 5 Shrub/Grass (GS1, GS2) = 7 Heavy Shrub/Grass (SH5, SH7) = 8 Pinyon/Juniper (TU4) = 10	
Invasive Annual Grass Cover (Based on HQT data)	0% = 0 1-5% = 5 >5= 10	
Vegetation Condition Class VCC (departure from historic conditions) LANDFIRE Map	Low = 1 Moderate = 2 High = 3	
Topography/ Access/ Response Time		
Average percent slope in project area (GIS)	0-10% = 1 11-25% = 3 greater than 25% = 5	
Access to project area for suppression resources	paved road = 1 improved dirt road = 2 unimproved two-track = 4 hike or aircraft = 5	
Response Time of Fire Suppression Resources for Initial Attack	Less than 1 hour = 1 1-2 hours = 3 greater than 2 hours = 5	
Average aspect of project site (GIS)	N,NE = 1 NW, E = 2 W. SE = 3 S, SW, Flat = 4	
Road Distance to Available Water Sources	<1 mile = 0 1 to 3 miles = 3 >3 miles = 5	
	TOTAL:	

Appendix 5: Transect Datasheet

NEVADA CONSERVATION CREDIT SYSTEM HABITAT QUANTIFICATION TOOL Revised 08-20-15 (SETT)

Site-Scale (4th Order) Attribute Measurements

Site Name:			
Date:	Observers:	Start time:	End time:
Transect name:	Transect UTM E:	Transect UTM N:	
Transect Sample Bearing:	GIS/Camera / Photo #'s:		
Is transect located within what would generally be called a meadow? Yes No			
What sagebrush species is the transect dominated by? Big Low/Black N/A			

DISTANCE TO SUITABLE SAGEBRUSH COVER (10% PER 30M X 30M AREA)

Distance from 30m mark: ____________ *if transect within suitable cover, distance = 0

LINE INTERCEPT (SHRUB COVER)

Low/Big Sagebrush/ Other	Start	Stop	Shrub Height (cm)	Low/Big Sagebrush/ Other	Start	Stop	Shrub Height (cm)

Shrub species encountered along transect:	Notes for Line Intercept:

Appendix 6: Photo Transect Datasheet

Project site:

Date:

Transect name:

Transect direction:

Appendix 7. Anthropogenic Features Datasheet

Project Site Name:	Version: SETT 092614
Marked on map or with GPS unit (circle one).	GPS Unit name if applicable:

ANTHROPOGENIC FEATURES

Feature Type	Camera/ Photo #	Name (if marked using GPS)	UTM E	UTM N	Notes

Notes :	

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For information and questions about the Nevada Conservation Credit System, please contact:

Sagebrush Ecosystem Technical Team (SETT)
(775) 684-8600