AGENDA

Montana Sage Grouse Oversight Team (MSGOT)
May 4, 2018: 10:00 a.m. – 2:30 p.m.
Montana State Capitol, Room 152

10:00: Call to Order, John Tubbs, Chair and DNRC Director

- Administrative Matters:
  - Approve Minutes January 30, 2018
  - Future Meeting Dates
    - Confirm Friday September 14: 10:00 a.m. – 2:30 p.m.
    - Proposed Final Meeting: Tuesday, December 18: 11:00 a.m. – 2:30 p.m.

10:05: Reports and Implementation of Executive Order 12-2015

- Reports from Individual MSGOT Members
- Montana Sage Grouse Habitat Conservation Program
- MSGOT Discussion, if any

10:30 – 10:40: Initiation of Second Stewardship Account Grant Cycle

- Introduction: Carolyn Sime, Program Manager
- MSGOT Discussion
- Public Comment
- Potential MSGOT Executive Action to direct the Program to initiate the second grant cycle so MSGOT may select recipients by December 31, 2018

10:40 – 11:50: Draft Mitigation HQT Technical Manual

- Introduction: Program Presentation
- MSGOT Discussion
- Public Comment

11:50 – 12:20: LUNCH BREAK

12:20 – 1:30: Draft Mitigation Policy Guidance Document

- Introduction: Program Presentation
- MSGOT Discussion
- Public Comment

1:30 – 2:20: Proposed Administrative Rules to Adopt the Draft Mitigation HQT Technical Manual and the Draft Mitigation Guidance Document

- Introduction: Program Presentation
- MSGOT Discussion
- Public Comment
- Potential MSGOT Executive Action to initiate formal rulemaking

2:20: Public Comment on Other Matters

NOTE: Agenda item times are approximate. Actual times may vary by up to one hour. Attendees who may need services or special accommodations should contact Carolyn Sime (406-444-0554 or csime2@mt.gov) at least 5 working days before the meeting.

MONTANA SAGE GROUSE OVERSIGHT TEAM AGENDA ITEM BRIEF SHEET
MAY 4, 2018

AGENDA ITEM: INITIATION OF SECOND STEWARDSHIP ACCOUNT GRANT CYCLE

ACTION NEEDED: TAKE EXECUTIVE ACTION TO DIRECT THE PROGRAM TO INITIATE THE SECOND STEWARDSHIP ACCOUNT GRANT CYCLE TO ALLOW ENOUGH TIME FOR THE APPLICATION AND REVIEW PROCESS AND SO THAT MSGOT CAN SELECT RECIPIENTS DURING THE FINAL 2018 MEETING.

SUMMARY:

The Sage Grouse Stewardship Fund was established as a source of funding for competitive grants to establish ongoing free-market mechanisms for voluntary, incentive based conservation measures that maintain, enhance, restore, expand and benefit sage grouse habitat and populations on private lands, and public lands as needed.

During the first grant cycle in 2016, nine applicants requested $5,007,716 of Stewardship Account funds. Ultimately, MSGOT executed grant agreements for four conservation easements (44 Ranch, Hansen Livestock, Raths Livestock, and Watson). The 44 Ranch easement closed in 2017. A project to remove encroaching conifer was completed without Stewardship Account funds and MSGOT decided to reallocate those funds towards the Hansen Livestock easement. MSGOT approved a fifth easement (Weaver), but also placed a contingency requiring the grant applicant to secure additional funds to implement some habitat restoration on the parcel. To date, MSGOT has either been obligated through executed grant agreements or committed a total of $3,727,500.

Assuming the remaining four easements close successfully, a total of 43,148 acres of Core habitat and 9,870 acres of General Habitat will be placed under perpetual conservation easement. When MSGOT gives final completes administrative rulemaking to designate the habitat quantification tool (HQT) and the accompanying guidance, the conservation credits generated will be calculated using the (HQT) and made available as soon as the respective easements close.

With MSGOT's progress toward rulemaking and adoption of the HQT projected to be during the September 2018 meeting, the May 4th meeting is an appropriate juncture to contemplate a second cycle of Sage Grouse Habitat Conservation Grants. On July 1, 2018 a new state fiscal year begins (FY19). This means that $1.6 million of statutory authority provided by the 2017 Legislature becomes available for Stewardship Account grants. Therefore, beginning on July 1, 2018, MSGOT will have $1,472,500 available for a second grant cycle.

Explanation of the timeline: MSGOT is being asked to take executive action to direct the Program to initiate the second Stewardship Account grant cycle. To enable MSGOT's selection of grant recipients for FY19 funds before the end of the 2018 calendar year, the Program would need to initiate the process in the very near future.

Directing the Program to initiate the process soon allows enough time for would-be applicants to prepare their applications, for the Program to run the HQT, solicit peer review, and formulate recommendations, and thus enabling MSGOT to select recipients during the final meeting of 2018 (expected in December).

The final selection process and grant awards would be contingent of MSGOT completing administrative rulemaking in the fall.

[continued]

Potential future needs for MSGOT's consideration and guidance for the Program:

1. *Diversity of credit types*: In the mitigation system, credits can be created through preservation (easements or term leases), restoration, or enhancement. Credit duration should match duration of the development impact. Presently, all credits created by Stewardship Account projects are preservation credits (e.g. perpetual conservation easements). Perpetual easements are excellent conservation tools in a mitigation context due to their long-term durability—threats such as subdivision and land conversion to cultivated agriculture are avoided and removed from the landscape in perpetuity. However, the Montana mitigation system would benefit from a variety of credits of short-, medium-, and long-term duration so that developers with shorter duration projects do not have to secure perpetual credits.

   Short and medium duration credits are usually created through term leases, restoration, or enhancement projects. Term leases are similar to perpetual easements, but are in place for a specific number of years (typically less than 50 years) in the lease agreement. Restoration projects are actions that restore previously impacted habitat back to its original condition. Examples include removal of unnecessary anthropogenic features like abandoned power lines, removal of encroaching conifers, or converting cropland back to rangeland with a sagebrush component. Enhancement projects improve upon already suitable habitat. Examples of enhancement projects include increasing forb diversity in mesic areas.

2. *Diversity of credit location*: Developers will be required to obtain credits from within the same service area as their project impacts. Montana expects to have four total service areas. Presently, there are no credits available in the southeast corner of the state.

3. *Lack of a Habitat Exchange and/or Third Party*: The Stewardship Act contemplated that Montana's mitigation system would include a habitat exchange. The Act defines a habitat exchange as a market-based system that facilities the exchange of credits and debits between interested parties. Once MSGOT adopts the HQT and policy guidance for its use, the basic tools and regulatory requirements will be in place for a third party to open an exchange. In the meantime, MSGOT and the Program serve as the only source of credits and fulfill all facets of administration, including setting the price for credits created by Stewardship Account grants. Establishing a habitat exchange is an eligible expense of Stewardship Account funds.

4. *List of Eligible Projects*: The purpose of the Stewardship Act is to provide competitive grant funding and establish market mechanisms for voluntary, incentive-based conservation measures that emphasize maintaining, enhancing, restoring, expanding, and benefiting sage grouse habitat and populations on private lands, and public lands as needed, that lie within Core Areas, General Habitat, and the Connectivity Area.

   To be eligible to receive funds, a proposed grant project must maintain, enhance, restore, expand, or benefit sage grouse habitat and populations through voluntary, incentive-based efforts, including:
   - reduction of conifer encroachment;
   - reduction of the spread of invasive weeds that harm sagebrush health or sage grouse habitat;
   - maintenance, restoration, or improvement of sagebrush health or quality;
   - purchase or acquisition of leases, term conservation easements, or permanent conservation easements that conserve or maintain sage grouse habitat, protect grazing lands, or conserve sage grouse populations;

[continued]

- incentives to reduce the conversion of grazing land to cropland;
- restoration of cropland to grazing land;
- modification of fire management to conserve sage grouse habitat and populations;
- demarcation of fences to reduce sage grouse collisions;
- reduction of unnatural perching platforms for raptors;
- reduction of unnatural safe havens for predators;
- sage grouse habitat enhancement that provides project developers the ability to use improved habitat for compensatory mitigation;
- establishment of a habitat exchange to develop and market credits consistent with the purposes of this part. The habitat exchange must be authorized by the United States fish and wildlife service and must use the habitat quantification tool to quantify and calculate the value of credits and debits. Funds may be allocated to a habitat exchange:
    - if the funds are used:
        - to create and market credits in a manner consistent with the habitat quantification tool;
        - for operational purposes, including monitoring the effectiveness of projects; or
        - for costs associated with establishing the habitat exchange; and
    - if the habitat exchange reimburses the state for its proportionate share of proceeds generated from the sale of credits created with funds distributed pursuant to this part. Any proceeds received by the state pursuant to this subsection (1)(l)(ii) must be deposited in the sage grouse stewardship account established in 76-22-109 and must be used only to acquire additional credits or for operational purposes, including monitoring the long-term effectiveness of compensatory mitigation projects.
- other project proposals that the oversight team determines are consistent with the purposes of this part.

If MSGOT directed the Program to initiate the second grant cycle, the Program would issue a public notice through its Interested Parties list-serve, issue a statewide press release, and make information available on the Program's website. The Program would identify any guidance, MSGOT priorities, or criteria in conjunction with the announcement. A timeline would be established that allows MSGOT to consider applications and make selections during the final meeting in 2018.

PROGRAM RECOMMENDATIONS:
The Program recommends MSGOT it to initiate the second Stewardship Account grant cycle to allow enough time for the application and review process and so that MSGOT can select recipients during the final 2018 meeting.

DRAFT

Montana Mitigation System
Habitat Quantification Tool Technical Manual
For Greater Sage-Grouse

Version 1.0

May 2018

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ACKNOWLEDGEMENTS

The Montana Mitigation System Habitat Quantification Tool Technical Manual for Greater Sage-grouse was developed by the Montana Mitigation Stakeholder Team, hosted by the Montana Sage Grouse Conservation Program. This collaborative group met from September 2016 through June 2017 and provided significant input from a wide diversity of organizations and individuals, but does not represent the consensus opinions of that Team or the approval of any group or individual involved. Participants included:

ABS Legal	Montana Fish, Wildlife, and Parks
Browning, Kaleczyc, Berry & Hoven	Montana Land Reliance
Cloud Peak Energy	Montana Petroleum Association
Denbury Resources	Montana Rangeland Resources Committee
Diane Ahlgren (MSGOT)	Montana Sage Grouse Conservation Program
Environmental Defense Fund	Montana Stockgrowers Association
Great Northern Properties	Natural Resource Conservation Service
HC Resources	Renewable Northwest
Mike Lang (MSGOT and Montana Senate)	The Nature Conservancy
Montana Association of Land Trusts	Theodore Roosevelt Conservation Partnership
Montana Audubon	Treasure State Resources
Montana Coal Council	Trout Headwaters
MT Dept. of Natural Resources & Conservation	US Bureau of Land Management
Montana Electric Cooperatives' Association	US Fish and Wildlife Service
Montana Farm Bureau Federation	US Forest Service

SWCA Environmental Consultants provided technical support and led development of the Habitat Quantification Tool. Sara O'Brien and Bobby Cochran at Willamette Partnership provided facilitation and technical support for the Stakeholders Team's work on the companion Montana Mitigation System *Policy Guidance Document*. In addition, many individuals and organizations provided essential guidance, insight, and support to ensure that the document is consistent with Montana state policy and the needs of key constituents and is a viable means for species conservation

This content was created in part through the adaptation of procedures and publications developed by SWCA Environmental Consultants, but is not the responsibility or property of this entity.

CONTENTS OF THIS DOCUMENT

The Montana Mitigation System Habitat Quantification Tool (HQT): Technical Manual for Greater Sage Grouse defines the processes and information necessary to quantify gains and/or losses of greater sage-grouse (*Centrocercus urophasianus*) habitat caused by development, and alternatively to estimate conservation benefits resulting from activities which restore, enhance or preserve sage grouse habitat. The results of the HQT are expressed as Functional Acres gained or lost, and is reported as a Raw HQT Score. All other entities engaged in the Montana Mitigation System are expected to apply these processes, methods, standards and criteria when creating, buying, or selling credits in Montana.

The primary audiences of the Montana HQT Technical Manual are the Montana Sage Grouse Habitat Conservation Program, the Montana Sage Grouse Oversight Team (MSGOT), state regulatory agencies, federal land management agencies, current and potential credit providers and project developers, and any third parties engaged in Greater Sage-Grouse mitigation in Montana.

To further assist the reader, the document is organized into stand-alone sections to quickly locate information specific to their purpose. Appendix A describes the technical development of the Montana HQT Basemap and Appendices B through I include relevant supporting literature and technical methods of the variables incorporated in calculating the Raw HQT Score specific to various disturbance types for new projects. Credit Providers can focus on Section 3 for the HQT process specific to conservation actions. Append J is also relevant for Credit Providers by explaining the technical methodologies used for assessing Preservation, Restoration, or Enhancement projects. Project Developers can focus on Section 4 for the HQT process specific to Debit Projects. Depending on the primary project type. Appendices B through I are also relevant for Project Developers by describing relevant literature and the technical methodologies of the variables incorporated in calculating the Raw HQT Score specific to various project types. Appendix K describes habitat recovery from a Debit Project through the Reclamation process, Appendix M describes unsuitable and excluded land cover types, and Appendix N is a list of acronyms used in the Technical Manual.

This document is organized into ten major Sections, as follows.

Habitat Quantification Tool Technical Manual		
Section 1:	**Introduction**	Introduces the purpose of, the need for, and the goals of a multi-agency, multi-disciplinary, citizen-based approach to sage grouse mitigation; summarizes the processes for calculating functional acres and describes the HQT development process
Section 2:	**Overview of the Montana HQT**	Describes the framework for quantifying habitat function and summarizes the Functional Acre approach. Outlines the authority and HQT process and how it works
Section 3:	**Montana HQT Basemap**	Describes the process for the creation of the HQT Basemap, and how GIS is used to combine sage grouse population and habitat variables with existing anthropogenic disturbances
Section 4:	**HQT Calculation Process for Credit Providers**	Describes how the HQT calculates Functional Acres gained for Preservation, Restoration or Enhancement projects, and how the Basemap is incorporated into the calculations; outlines hypothetical credit project examples
Section 5:	**HQT Calculation Process for Developers**	Describes how the HQT calculates Functional Acres lost and quantifies Direct and Indirect Impacts for development/debit projects, and how the Basemap is incorporated into the calculations; outlines hypothetical debit project examples
Section 6:	**Adaptive Management and Monitoring**	Describes the Adaptive Management approach and how HQT components may be revised, replaced, changes, or updated
Section 7:	**Limitations of the Montana HQT**	Describes the capabilities and limitations of the HQT for application to the Montana Mitigation System process; explains how the HQT is policy-neutral and is based on the continued incorporation of the best available science for sage grouse ecology and habitat
Section 8:	**Glossary**	Defines the terms used in this HQT Technical Manual
Section 9:	**References**	Lists the references used and relied upon by the Mitigation Stakeholders Group and cited in the HQT Technical Manual
Section 10:	**Appendices**	The Appendices describe the HQT calculations in detail for the Basemap and anthropogenic disturbances, and provides the reader with information to effectively use the Technical Manual. Appendix A describes the Montana HQT Basemap. Appendices B – I describe Anthropogenic Variables applied to Oil & Gas, Tall Structures, Transmission Lines, Wind Facilities, Roads and Railways, Buried Utilities, Agriculture and Mines, and Compressor Stations and other Noise Sources. Appendix J describes habitat Preservation, Restoration and Enhancement for credit projects. Appendix K describes post-project habitat recovery through Reclamation. Appendix M is a summary table of unsuitable/excluded land cover types. Appendix N is a list of acronyms used in the HQT Technical Manual

1.0 INTRODUCTION

The State of Montana and a multi-agency, multi-disciplinary, citizen-based stakeholder group (hereafter Stakeholder Group) has developed a Habitat Quantification Tool (HQT) for purposes of quantifying gains and/or losses of greater sage-grouse (*Centrocercus urophasianus*, hereafter GRSG) habitat caused by development, and alternatively to estimate conservation benefits resulting from activities which restore, enhance or preserve sage grouse habitat.

The HQT considers the biophysical attributes of GRSG seasonal habitats to provide a measure of habitat function across multiple scales. These measures of Habitat Function expressed as Functional Acres (Raw HQT Score), are used for calculating conservation benefits (i.e., credits) from mitigation projects as well as project impacts (i.e., debits) from development projects (Figure 1. 1). These Functional Acres provide a common "habitat currency" that can be used for both credit and debit projects to ensure accurate accounting of habitat gains and losses. The HQT will be conducted for all debit producing projects, such as those seeking to undertake a new land use or activity, in sage grouse habitat on state lands and private and federal lands in GRSG habitat that receive state funding or are subject to state agency review, approval, or authorization (unless otherwise directed by Montana Sage Grouse Oversight Team [MSGOT] and described in the accompanying Montana Mitigation System Policy Guidance Document for Greater Sage-Grouse [hereafter *Policy Guidance Document*]). The Raw HQT Score results may be subsequently adjusted, as discussed in the *Policy Guidance Document*, to incentivize or disincentivize conservation or development practices.

This Technical Manual includes a description of the attributes measured by the HQT, methods for measuring those attributes, and supporting rationale (e.g., peer-reviewed literature, gray literature, expert opinion) for why those specific attributes and methods were chosen. A scoring approach to generate a single Raw HQT Score based on the measurements for a specific project type is also described.

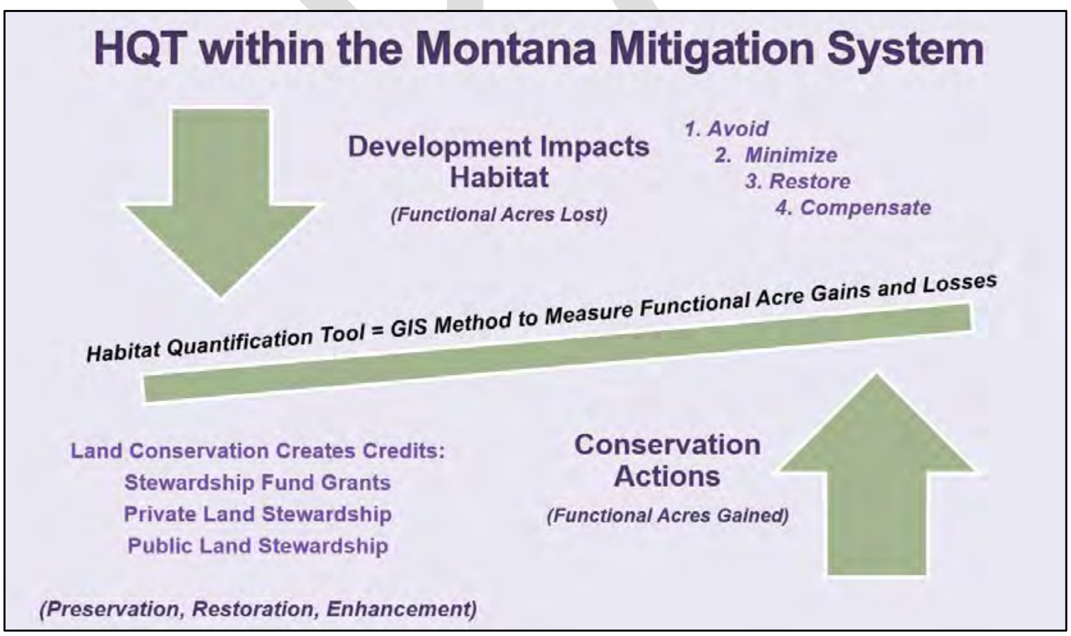

Figure 1. 1. The HQT supports the Montana Mitigation System by providing a scientific method for measuring impacts to habitat from development and improvements to habitat from conservation actions.

Users and Uses

The primary audiences of the Montana Mitigation System Habitat Quantification Tool Technical Manual for Greater Sage-grouse are the Montana Sage-Grouse Habitat Conservation Program (hereafter Program), MSGOT, regulatory agencies, current and potential Credit Providers (entities generating credits as compensatory mitigation for impacts to sage grouse habitat) or Project Developers (entities proposing an action that will result in a debit), and any third parties engaged in GRSG mitigation in Montana.

Development Process

The Montana HQT was first developed by the Stakeholder Group, with the first draft release of the technical document in May 2017. The technical document was revised based on stakeholder feedback and developed into The Montana Mitigation System Habitat Quantification Tool Technical Manual for Greater Sage-grouse (Montana HQT). It is based on the latest available peer-reviewed science related to GRSG and its habitat in Montana.

The Montana HQT incorporates elements from Nevada, Wyoming, and Oregon's Greater Sage-Grouse Habitat Quantification Tool Scientific Methods Documents and Wyoming Governor Mead's Compensatory Mitigation Framework. As new peer-reviewed science and agency information becomes available, the Montana HQT will be updated by the Program to reflect new understanding of GRSG and its habitat in Montana (see Section 6.0 on Adaptive Management and Monitoring).

2.0 OVERVIEW OF THE MONTANA HQT

The Montana HQT is a scientific approach for assessing Habitat Function and conservation outcomes for GRSG in Montana (Figure 2. 1). The purpose of the Montana HQT is to quantify Habitat Function for a given location with respect to GRSG needs. The Montana HQT uses a set of measurements and methods, applied at multiple spatial scales, to evaluate criteria related to GRSG Habitat Function. Estimates of Habitat Function in the Montana HQT are calculated using a multi-level assessment process (Figure 2. 2).

The First Level Assessment determines whether a project is located within currently defined boundaries of State-designated GRSG habitat and within the State's core, general, and connectivity habitat boundaries and U.S. Bureau of Land Management (BLM) or the U.S. Forest Service (USFS) Priority Habitat Management Areas (PHMA), General Habitat Management Areas (GHMA), and Restoration Habitat Management Areas (RHMA) where outside of state boundaries.

The Second Level Assessment is carried out for projects located within the habitat boundaries determined through the First Level Assessment. The Second Level Assessment is conducted in a geospatial platform to facilitate initial estimates of expected losses or gains of Habitat Function.

The Third Level Assessment is a field-based habitat assessment to confirm or adjust Second Level Assessment results and provide final estimates of GRSG Habitat Function. The Third Level Assessment is required for credit projects and voluntary for debit projects, although the Program may require it on debit projects in some cases.

The Montana HQT quantifies gains and/or losses of Habitat Function across multiple project milestones (e.g., baseline, construction, operation, reclamation) and spatial scales that may occur over the life of a project. Differences between Habitat Function before a project (baseline conditions) and the Habitat Function during each project milestone are quantified and summed to calculate the total habitat losses or gains that would result from project implementation. Estimated gains and/or losses of Habitat Function that result from a project, expressed as Functional Acres, become the base value from which final credits and/or debits can be calculated.

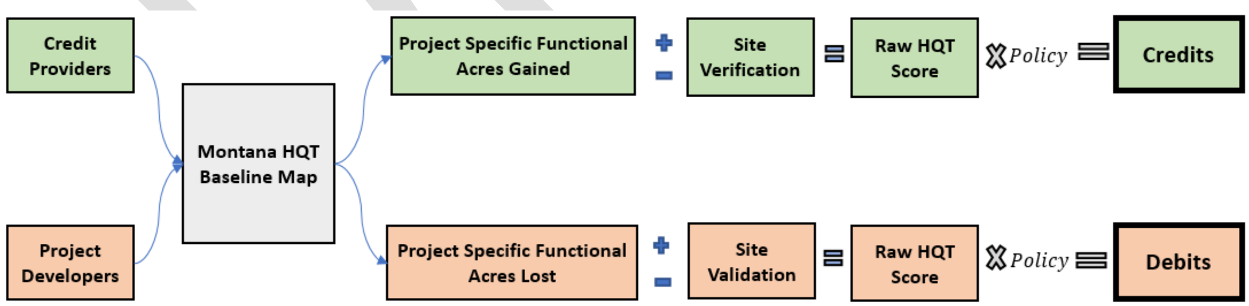

Figure 2. 1. General flow of events for determining the number of credits produced and the number of debits accrued during the life of a given project.

2.1. Framework for Quantifying Habitat Function

The Montana HQT consists of a three-level assessment of GRSG habitat that incorporates many of the concepts and scales associated with multi-level assessments of habitat use and selection (Johnson 1980). The First Level Assessment evaluates the availability of GRSG habitat across all of Montana and incorporates many aspects of the first level (broad-scale) and second level (mid-scale) assessments described in other GRSG habitat assessment frameworks (Boyd et al. 2014, Nevada Natural Heritage Program and the Sagebrush Ecosystem Technical Team [NNHP and SETT] 2014, Stiver et al. 2015, EDF 2015a, EDF 2015b). Similar multi-level approaches have also been used to evaluate GRSG habitat use and quality in Montana (Montana Sage Grouse Work Group [FWP] 2005, Doherty 2008).

The Montana HQT Second Level Assessment is completed in a geospatial platform. The geospatial layers represent the functionality of habitat, incorporate many aspects of Johnson's (1980) fine-scale habitat assessments, and also incorporate aspects of multi-level site-scale assessments. In the Montana Mitigation System, the field-based Third Level Assessment measures and quantifies site-specific habitat characteristics and will be used to confirm and/or adjust estimates of gains and losses of Habitat Function that are generated in the Second Level Assessment.

In all three levels of the Montana HQT, Habitat Function is quantified using scores ranging in value from 0 (unsuitable/excluded) to 100 (optimal). To receive a functional value of 100, habitat would be required to fall within the boundaries of the First Level Assessment area (core, general, or connectivity habitats or federal lands) and have habitat characteristics as quantified in the second and Third Level Assessment processes that are optimal for GRSG in Montana.

The use of multiple spatial scales results in a more ecologically comprehensive approach to broad-scale siting of anthropogenic features and conservation decisions in conjunction with site-based assessments of local environmental suitability conditions. Information provided at the respective scales can be used through either a top-down or a bottom-up manner. For example, using it in a top-down manner provides for effective conservation planning and targeting; applying the information in a bottom-up manner provides an essential perspective for understanding overall benefits and detriments to landscape integrity over time (Figure 2. 2).

HQT Assessment Levels

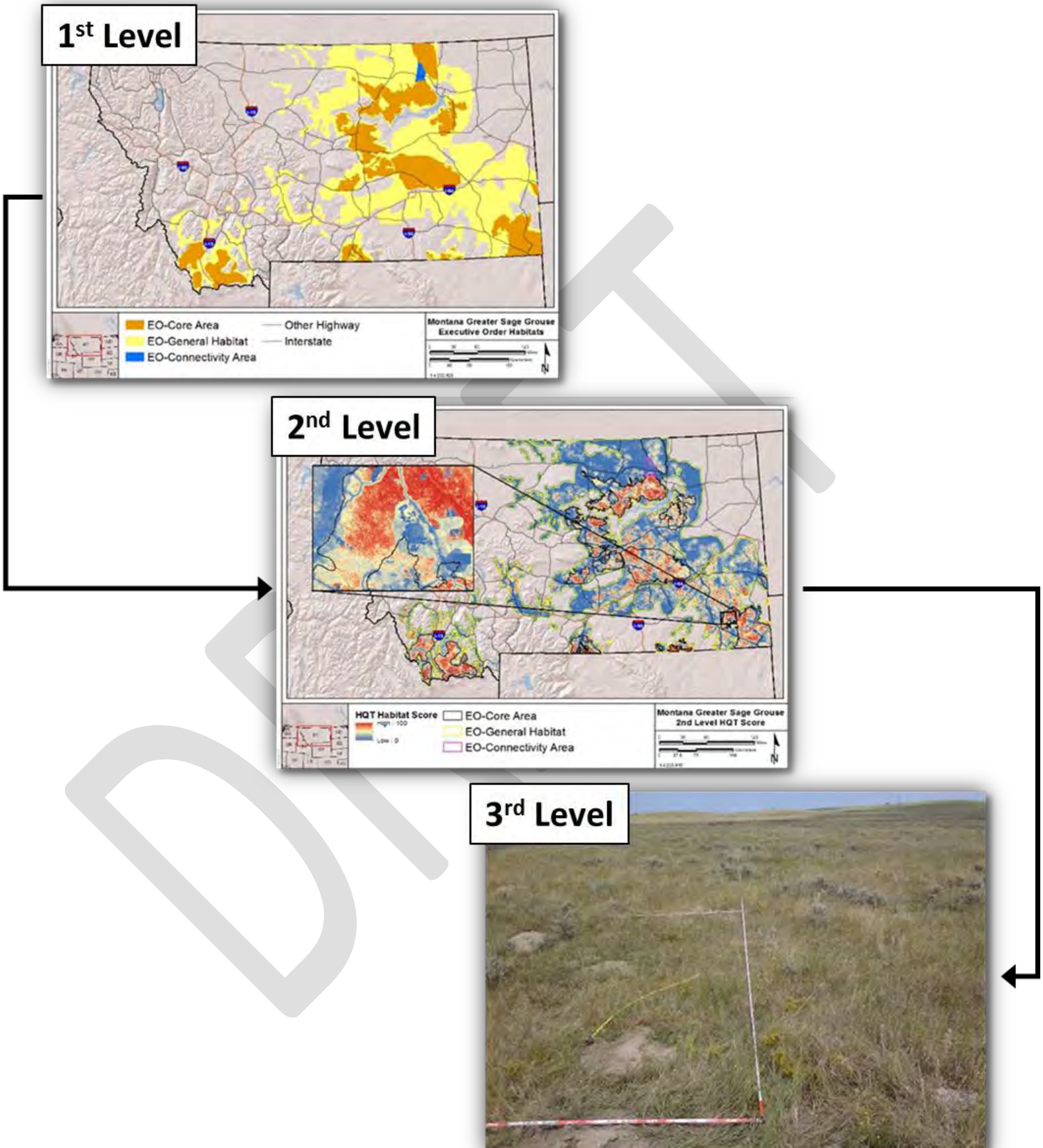

Figure 2. 2. Illustration of the three levels of assessment included in the Montana HQT.

2.2. Functional Acre Approach

The HQT measures the quantity and quality of habitat at a site for GRSG in terms of Functional Acres. Habitat Function refers to the quality of the habitat for meeting life history requirements (reproduction, recruitment, and survival) for GRSG at multiple spatial scales. Functionality includes Direct and Indirect Impacts of existing and proposed anthropogenic disturbances on and surrounding a given site.

Functional Acres are a product of the site-scale Habitat Function, the local-scale Habitat Function, and the area assessed. Landscape scale policy adjustments are brought into the quantification of credits and debits through mitigation defined in the *Policy Guidance Document*.

The Functional Acre approach has several advantages:

- **Establishes a common currency.** Functional Acres serve as the basis of the currency of the Montana Mitigation System: credits and debits. Functional Acres account for the quantity and quality of the habitat at multiple spatial scales and temporal intervals. The integration of habitat quantity and quality allows for direct comparison of detriments and benefits, which provides a clearer understanding of whether or not conservation goals are being met (McKenney and Kiesecker 2010, Gardner et al. 2013).

  A common currency allows for standardization in the calculation of credits and debits, which affords the opportunity to conduct mitigation consistently across projects, land ownership, and jurisdictional boundaries. It also provides a common language and metric for mitigation across agencies and industries, while striving to be responsive to new science as it emerges.

- **Provides full accounting of impacts.** Functional Acres account for both Direct and Indirect Impacts of anthropogenic disturbance as well as how those effects may change during the life of the project. Accounting for Indirect Impacts provides a more accurate representation of the full biological impact of a disturbance on GRSG. It also provides a strong incentive for targeting debit projects to the most appropriate places on the landscape, clustering development where it will have the least species impact. Mitigation obligations will be lowest when the fewest Functional Acres are impacted (i.e., the lowest Raw HQT Score).

- **Provides full accounting of benefits of conservation actions.** Functional Acres for credit projects account for the direct effects of the conservation actions. The Functional Acre approach allows for the full biological benefit of the conservation actions on GRSG to be quantified. Through this quantification, Credit Providers will directly be able to focus their efforts where they will have the greatest benefit across the landscape and to measure the success of their conservation actions. Conservation benefits will be highest when the most Functional Acres are conserved, restored, or enhanced (i.e., the highest Raw HQT Score).

- **Focuses on outcomes.** Rather than rewarding the completion of management actions or practices that may or may not succeed, the Montana Mitigation System focuses the activities of developers, ranchers, and conservationists on what matters most to GRSG – the resulting habitat outcomes of the practices. Paying for outcomes (i.e., effectiveness) rather than practices, (i.e., implementation) has been shown to achieve more conservation per dollar spent than paying for management practices (Just and Antle 1990, Antle et al. 2003). The outcomes-based Functional Acres approach of the HQT enables the Montana Mitigation System to provide strong incentives to achieve habitat benefits at the multiple scales relevant to GRSG.

- **Tracks the contribution of the Montana Mitigation System to species habitat and population goals in Montana over time.** The use of Functional Acres allows for a simple metric to measure the overall performance of the Montana Mitigation System, which aims to incorporate mitigation as one tool among many in Montana's GRSG Conservation Strategy so that listing under the federal Endangered Species Act is never warranted.

2.3. Authority of the HQT and How It Works

The Montana Greater Sage Grouse Stewardship Act establishes direction to the Program in implementing its mitigation responsibilities under the Act and relevant Executive Orders. The Act provides for creation of an HQT, which is an objective scientific method used to evaluate vegetation and environmental conditions related to the quality and quantity of sage grouse habitat and to quantify and calculate the value of credits and debits in a mitigation marketplace setting such as a habitat exchange.

Montana Executive Order No. 21-2015 identifies GRSG Core Areas and General Habitat in Montana. Montana Executive Order No. 12-2015 (hereafter, EO, EO 12-2015, or Order) requires that all new activities be regulated to maintain existing levels of suitable GRSG habitat in Core Areas to ensure the maintenance of GRSG abundance and distribution in the state. Stipulations for new activities are specified in the EO and are specific to various activity types. The EO is a regulatory mechanism for purposes of addressing identified threats to sage grouse and analyzing whether listing under the federal Endangered Species Act is warranted (Figure 2. 3).

The BLM and USFS have designated PHMA, GHMA, and RHMA within Montana through their agencies respective management Plans. The Program will conduct the HQT for projects located within federally designated sage grouse management areas through a memorandum of understanding. This approach is expected to provide a consistent and integrated approach to fulfilling mitigation requirements for impacts to sage grouse habitat on all private, state, and federal lands in Montana.

The Montana HQT is designed to work in concert with the *Policy Guidance Document* in accordance with the rules and regulations of the state of Montana and federal land management agencies. All projects using the Montana Mitigation System will ultimately be governed by these rules and regulations.

The Montana Mitigation System recognizes the full mitigation hierarchy (avoidance, minimization, restoration, and compensation). The HQT quantifies the change in quantity and quality of GRSG habitat resulting from new activities (Figure 2. 3). Quantified results equally measure impacts and/or benefits of a new activity in order to evaluate the Functional Acres gained for credit purposes and/or the Functional Acres lost for debit purposes.

The HQT is defined as the scientific method "used to evaluate vegetation and environmental conditions related to the quality and quantity of sage grouse habitat and to quantify and calculate the value of credits and debits" [MCA§ 76-22-103(9) (2017)]. The output of the HQT is a measure of the existing quality of the habitat relative to optimal conditions (Figure 2. 3). Quality is measured first by assessing the existing habitat conditions, including existing anthropogenic variables

(Montana HQT Basemap) on a particular credit (conservation) or debit (development) project location. The quality of the given site is then modified by the project-specific anthropogenic variables. Variables include project attributes such as: size, type, location, and duration. The result then becomes the Raw HQT Score expressed as "Functional Acres," which then becomes the "currency" whereby "debits" accrued as a function of actions that decrease habitat quality are offset by "credits" that accrue as a function of actions that preserve or increase habitat quality. One Functional Acre gained is the equivalent of 1 credit. One Functional Acre lost is the equivalent of 1 debit. Credits and debits are exchanged in a mitigation marketplace which is further discussed in the *Policy Guidance Document*.

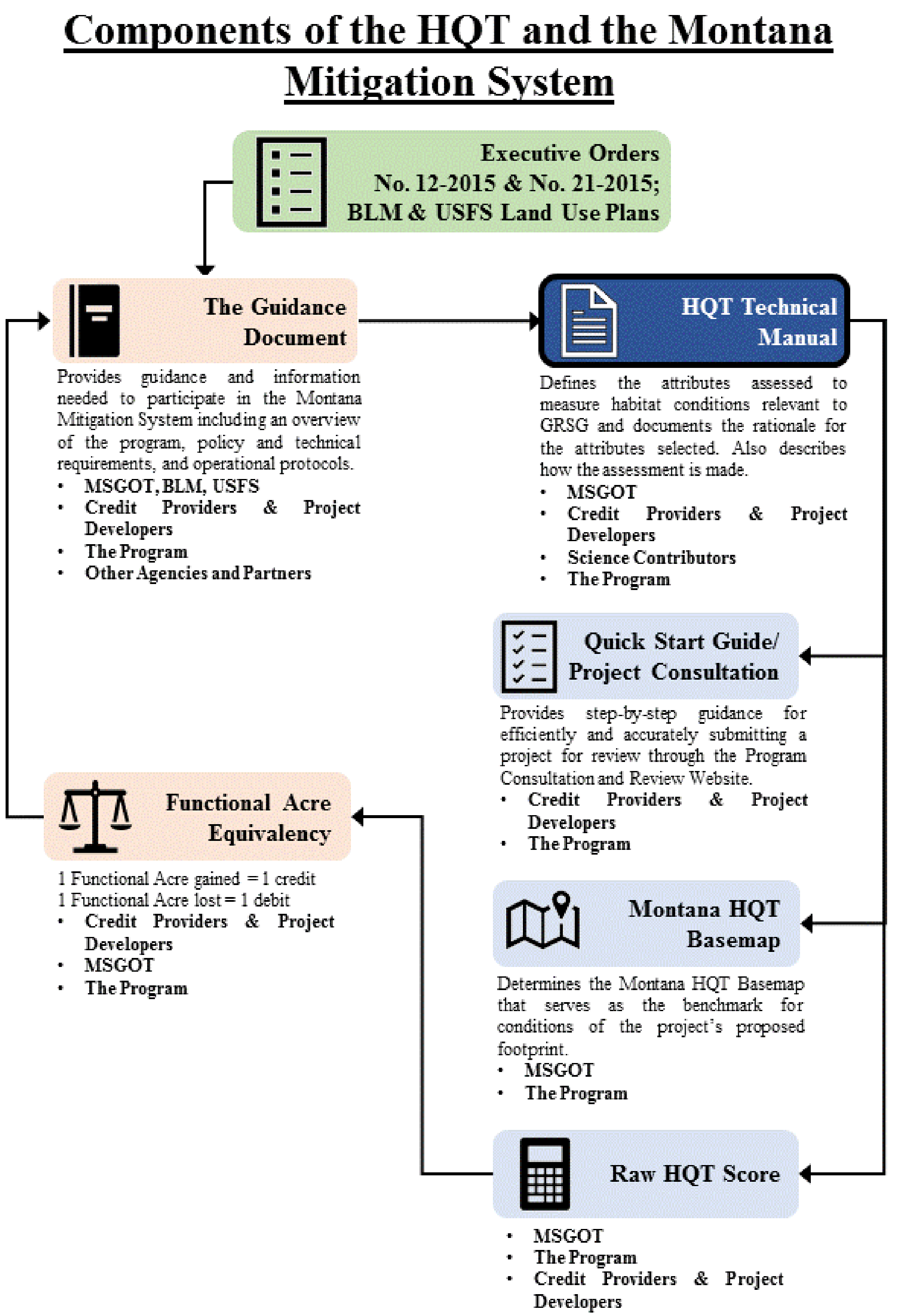

Figure 2. 3. Various components included in the Montana HQT and Montana Mitigation System Strategy.

3.0 MONTANA HQT BASEMAP: VARIABLES AND METHODS

The Montana HQT Basemap is used to provide the Program with a benchmark of existing Habitat Function that incorporates biological attributes important for GRSG. Existing surface disturbance has been mapped by the Program and is incorporated into the Montana HQT Basemap. Examples of existing surface disturbance include cultivation, highways, and existing rights-of-way. The Montana HQT Basemap is developed using the First and Second Level Assessments. Because Third Level Assessments are site-specific and the Montana HQT Basemap is statewide, Third Level Assessments were not incorporated in the Montana HQT Basemap, though may be permitted in the future as funding and Program needs allow.

3.1. FIRST LEVEL ASSESSMENT TO DETERMINE MAP EXTENT AND APPLICABILITY FOR DESIGNATED SAGE GROUSE HABITAT

The State has already completed the First Level Assessment of habitat in Montana. The First Level Assessment Area consists of the distribution of GRSG in Montana ("currently defined occupied habitat", Montana Fish, Wildlife, & Parks [MTFWP] 2015) and is confirmed by the boundaries of general habitat, core habitat, and connectivity habitat areas for GRSG (Montana EOs 12-2015 and 21-2015).

On federal lands, the BLM and the USFS GRSG habitats are delineated in the agency's respective land use plans, and do not align with some areas of the Montana GRSG habitat areas (i.e., Core Areas, General Habitat, Connectivity Area). Therefore, the Montana HQT Basemap is computed for Montana state GRSG habitat boundaries, as well as within the boundaries of the BLM or USFS PHMA, GHMA, and RHMA areas.

3.2. SECOND LEVEL ASSESSMENT TO DETERMINE HABITAT FUNCTIONALITY AND ESTIMATE FUNCTIONAL ACRES

The Second Level Assessment for the Montana HQT Basemap is the level at which the HQT quantifies Functional Habitat to provide a benchmark of GRSG Habitat Functionality for a specific credit or development project. It is computed using a geospatial platform (e.g., ArcGIS) using scores developed for selected Population and Habitat Variables associated with GRSG habitat selection and use.

The Population and Habitat Variables and scoring processes are similar to and consistent with multiple other habitat assessment frameworks for GRSG (Boyd et al. 2014, NNHP and SETT 2014, Stiver et al. 2015, EDF 2015a, EDF 2015b) but consider Montana-specific data and literature, when available. Selection of variables and scores were based on peer-reviewed literature, as well as those identified by the Stakeholder Group as being important for GRSG in Montana. Scores for each variable were developed by conducting a thorough review of available scientific information and using the following hierarchy in order of descending importance:

- Peer-reviewed literature, theses, and dissertations specific to GRSG habitat selection and use in Montana.

- Agency management reports or datasets specific to GRSG habitat selection and use in Montana.

- Peer reviewed literature, theses, and dissertations specific to GRSG habitat selection and use across the range of the species, with a greater emphasis on literature for the eastern, Rocky Mountain portion of the range (i.e. less reliance on literature from the Great Basin portion of the range).

- Professional judgment of the species' experts and habitat managers in the Stakeholder Group.

The ecological results presented in publications and extracted from datasets related to GRSG habitat suitability varied depending on geographic and climatic factors such as elevation, precipitation zone, and ecological site potential. To account for this variability, multiple datasets or literature sources were used or averaged to develop variable scores for the Montana HQT when possible.

Variable selection considered habitat requirements across all GRSG seasonal periods of use (nesting and breeding, brood-rearing and summer, and winter combined). For each of the selected variables, a Habitat Score ranging from 0.0 (unsuitable/excluded) to 100.0 (optimal) was assigned. Variables and variable scores were also developed to account for their effects on GRSG habitat through incorporation of Anthropogenic Variables. Scoring Population and Habitat Variables as well as Anthropogenic Variables are critical steps in the HQT process. Such scoring provides a way to quantitatively measure the quality of specific Habitat Functions.

Unsuitable/Excluded land cover types (Appendix M) are removed from the HQT geospatial layers during the Second Level Assessment. Unsuitable/Excluded Lands are assigned a score of 0.0, which produces a Habitat Score of 0.0 and effectively removes them from land cover datasets and subsequent calculations.

Scores for each variable were combined in a geospatial (i.e., raster-based GIS) platform to quantify estimates of Habitat Function. Layers representing each variable were developed at a 30.0-m resolution with each cell in a layer receiving a score between 0.0 and 100.0 based on the scores developed for that variable. Resampling to a finer resolution for each cell may be applied for more accurate spatial analysis. Layers for all variables were combined to develop a landscape-scale model representing Habitat Function in all Core Areas, General Habitat, and Connectivity Area and federal PHMA, GHMA and RHMA for GRSG. The Montana HQT Basemap is then used to compute the Raw HQT Score for projects proposed by credit providers and project developers to calculate the Functional Acres gained or lost, respectively, that equate directly to credits or debits. See the *Policy Guidance Document* for more information on how the total of credits and debits associated with projects are calculated and managed.

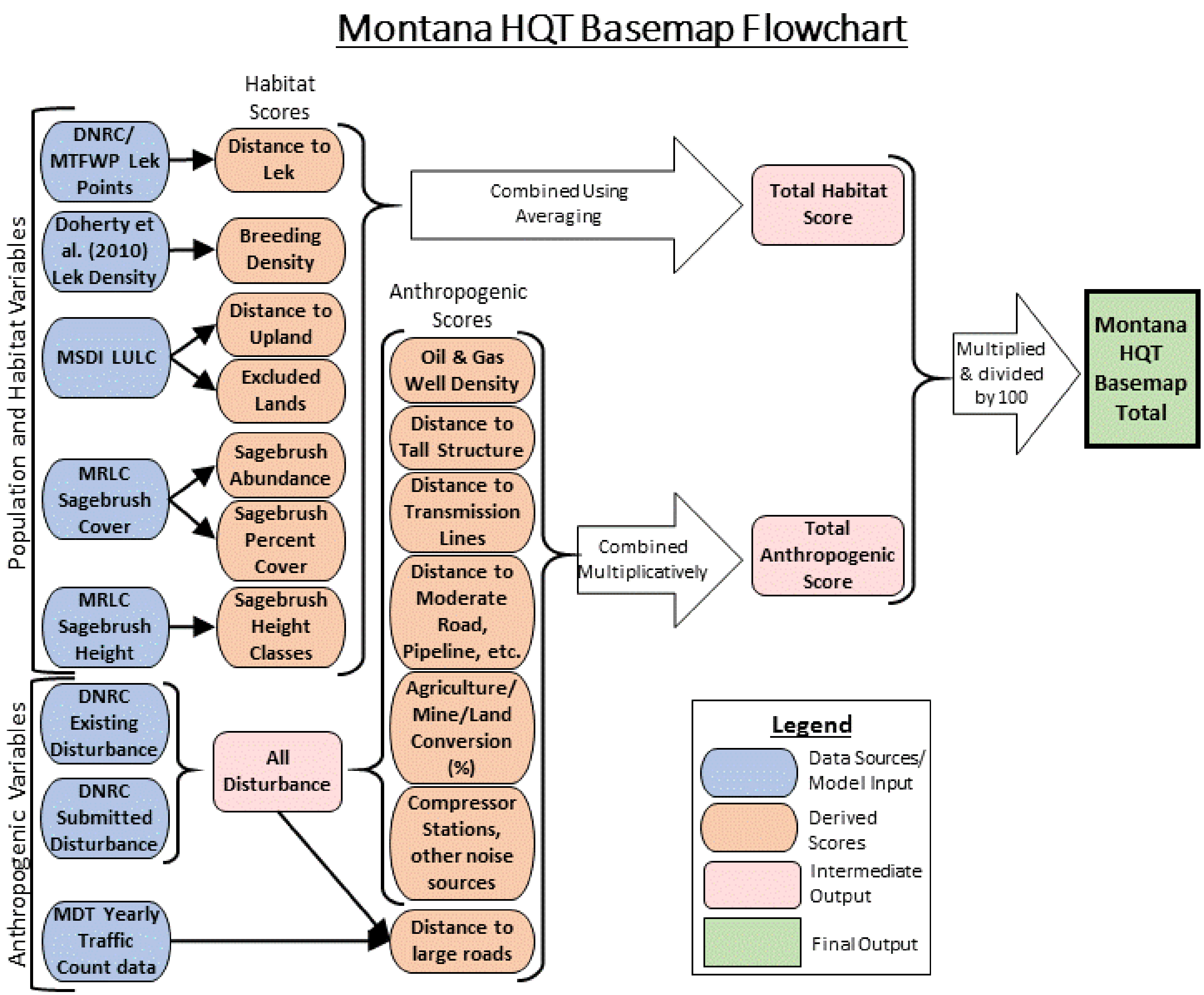

Figure 3. 1. The flowchart for the development of the Montana HQT Basemap.

3.2.1. Population and Habitat Variables Used to Create the Montana HQT Basemap

Habitat Function in the Second Level Assessment is calculated using Population and Habitat Variables to produce the Montana HQT Basemap. The Habitat Variables were developed to represent and account for impacts to winter, breeding, and nesting habitats specific to upland and mesic landscapes. Early and late summer brood-rearing habitats that are specific to mesic landscapes were also included.

Selection of the Population and Habitat Variables considered best available scientific information for GRSG habitat in Montana as well as the public availability of datasets and GIS layers to inform variable scores and resulting geospatial models of Habitat Function (See Appendix A for specific input data sources used).

Each Population and Habitat Variable listed in Appendix A is scored based on its Habitat Function value derived from the Habitat Variables, ranging from 0.0 (no value) to 100.0 (maximum value). Detailed descriptions of Population and Habitat Variables and their scoring are provided in Appendix A of this document. Score ranges were assigned based on the best available scientific information and peer-reviewed scientific literature using the hierarchy described in Section X. When possible, Montana-specific data and information were used to establish and/or adjust scores to better match known patterns of GRSG habitat use in Montana.

The Total Habitat Score is calculated by averaging all the Habitat Scores specific to the Population and Habitat Variables. The Total Habitat Score is a single continuous GIS layer that quantifies the important Population and Habitat Variables for GRSG within the First Level Assessment Area. The Total Habitat Score is then combined with the output of the Total Anthropogenic Score that affect GRSG Habitat Function to produce the final Montana HQT Basemap (a continuous GIS layer; see Section 3.2.2). The following sections describe the scoring process that was used for each Population and Habitat Variable used to calculate the Total Habitat Score.

3.2.1.1. Distance to Lek

Scores for this variable were developed using the MTFWP lek location database and associated geospatial layers. Leks classified by MTFWP as “confirmed active”, “unconfirmed”, and “confirmed inactive” were used to develop scores for this Population and Habitat Variable. Leks classified as “never confirmed active” or “confirmed extirpated” were not included in the scoring process for this variable. The distance to lek Population and Habitat Variable will be updated annually to reflect newly discovered leks, lek status changes, and leks removed from the MTFWP lek database.

Current GRSG habitat management guidance uses “active” leks as focal points for breeding nesting habitat management (Connelly et al. 2000; Connelly et al. 2011); therefore, distance to lek was used as a variable in the upland habitat calculations. This variable is intended to increase measures of Habitat Functionality of areas closer to leks where the majority of breeding and nesting activities occur. Leks also are often an indicator of high quality sagebrush habitat that is important during other seasons of use (Connelly et al. 2011).

Available literature and datasets related to lek-to-nest distances in Montana were used to establish scores for this variable. Generally, most available literature and datasets for Montana indicate that the nesting activities in the state occur within 10.0-km of a lek with two studies finding nests out to 20.0-km. Generally, distances less than 3.2-km of a lek were recognized as important nesting habitat across the state with decreased nest numbers with increased distance from a lek. Montana-specific datasets related to lek-to-nest distances are very similar to those observed elsewhere across the range of the GRSG.

Because of the similarities between Montana-specific data and range-wide datasets, variable scores for the distance to lek variable are based entirely on Montana data out to a distance of 10.0-km from a lek (Appendix A, Figure A. 2). Scores for the variable beyond 10.0-km use the analyses by Coates at al. (2013) and Holloran and Anderson (2005) and their reported observations of declining use beyond 10.0-km out to approximately 20.0-km.

To develop Habitat Scores for the Distance to Lek Population and Habitat Variable, the Montana-specific lek-to-nest distance data were analyzed to evaluate potential breakpoints and score magnitudes. Because the percent of nests within each distance is a cumulative total of all nests between the specified distance and the lek, it is difficult to directly use that measure to establish variable scores. To provide a measure better for analysis and scoring purposes, the percent of nests occurring beyond each distance [y = 1 - percent of nests within distance] was calculated (Appendix A, Figure A. 2). This provides a better measure for establishing scores because habitats closer to the leks receive higher values. See the subsection Population and Habitat Scores of Appendix A for the specific breakdown of the Distance to Lek Habitat Scores and the incorporation into the Montana HQT Basemap.

3.2.1.2. Breeding Density

Leks are widely recognized as a focal point for occupancy and seasonal use, and lek counts provide a reasonable index to relative abundance of GRSG populations (Reese and Bowyer 2007). Higher attendance leks likely influence GRSG populations more than lower attendance leks, and the birds using these leks may use habitats across broader spatial scales (Coates et al. 2013).

Breeding density models were used to identify areas with higher function for GRSG populations. Doherty et al. (2010a) developed a widely used spatial model of breeding density that was used in the HQT. The Doherty et al. (2010a) model provides a spatially explicit, continuous variable that identifies breeding density across the range of the species. Using the Doherty model, an updated breeding density model was run by USFWS in 2017, using more recent data. The model will be run on an as needed basis as updates from MFWP data allows, to maintain accuracy of this variable. See the subsection Population and Habitat Scores of Appendix A for the specific breakdown of the Breeding Density Habitat Scores and the incorporation into the Montana HQT Basemap.

3.2.1.3. Sagebrush Abundance

This variable describes the proportion of the land cover that is classified as sagebrush, i.e. spatial extent, as opposed to canopy cover of sagebrush plants within sagebrush patches. The latter is measured separately by the Sagebrush Cover variable. Those areas in the Multi-Resolution Land Characteristics Consortium National Land Cover Database (MRLC NLCD) sagebrush cover layer for Montana classified as having 3% or more sagebrush cover were considered sagebrush habitat for purposes of developing scores for this variable. This variable will be updated as the MRLC NLCD datasets are updated.

Available literature did not use consistent analysis areas for purposes of calculating scores for this variable. A 3.14-km^2 (1-km radius circle) window size was selected for the HQT because it better characterized habitat heterogeneity at a scale useful for project siting and mitigation than a larger window (e.g., 6.4-km radius circle) would. Additionally, more areas will receive high scores using a

3.14-km^2 window size versus a 6.4-km buffer from a lek center point, especially in areas that have fragmented or converted to non-sagebrush cover by past land use activities. See the subsection Population and Habitat Scores in Appendix A for the specific breakdown of the Habitat Scores and the incorporation into the Montana HQT Basemap.

3.2.1.4. Sagebrush Canopy Cover

The presence of sagebrush is an essential characteristic of GRSG habitat (Connelly et al. 2000, Hagen et al. 2007, Connelly et al. 2011). However, literature recommendations for sagebrush canopy cover for GRSG habitat varies seasonally and regionally. Scores for this Population and Habitat Variable were calculated by evaluating average seasonal sagebrush requirements for GRSG populations in Montana. Sagebrush canopy cover was characterized for winter, nesting/breeding, and brood/summer use periods, respectively.

Sagebrush canopy cover is an important attribute of nesting habitat because hens nest almost exclusively under sagebrush plants, with some limited exceptions documented in Montana.

In Montana, sagebrush canopy cover used during nesting and breeding periods are similar to those reported elsewhere across the range of GRSG. However, GRSG in Montana use a wide range of sagebrush canopy cover classes and use is based on availability and spatial variation across the GRSG habitats in Montana. The range of sagebrush canopy cover classes is critically important to provide a variety of cover and forage resources that change seasonally. Sagebrush canopy cover is also an important attribute of brood-rearing habitat. Sagebrush canopy cover is an essential component of winter habitat because GRSG winter diets are almost exclusively sagebrush leaves. See the subsection Population and Habitat Scores of Appendix A for the specific breakdown of the Habitat Scores and the incorporation into the Montana HQT Basemap. Updates to datasets used for sagebrush canopy cover will be made as new data becomes available.

3.2.1.5. Sagebrush Height

Sagebrush canopy height is an important aspect of all GRSG seasonal habitats. However, literature recommendations for sagebrush height for GRSG habitat varies seasonally and regionally. Scores for this Population and Habitat Variable were calculated by evaluating reported average seasonal sagebrush requirements for GRSG populations in Montana. Sagebrush height was characterized for winter, nesting/breeding, and brood/summer use periods, respectively.

Sagebrush height is an important attribute of GRSG nesting habitat. Heights of 40.0-cm to 80.0-cm are rarely reported in literature sources specific to GRSG in Montana. Because of the differences in reported Montana sagebrush height values and values reported elsewhere across the range of the species, Montana-specific data and literature were used to evaluate height requirements during the nesting season. During the brood rearing season, GRSG may use habitats that are not dominated by sagebrush. Important structural components in winter habitat include medium to tall (25.0-cm to 80.0-cm) sagebrush stands (Crawford et al. 2004). Ranges for winter use developed across the range of the GRSG may not be representative of conditions in Montana because of differences in sagebrush communities as well as snowfall depths and winter conditions. See the subsection Population and Habitat Scores of Appendix A for the specific breakdown of the Habitat Scores and the incorporation into the Montana HQT Basemap. Updates to datasets used for sagebrush canopy cover will be made as new data becomes available.

3.2.1.6. Distance to Suitable Upland

The mosaic of upland and mesic habitat is important to support populations of GRSG (Connelly et al. 2000, Schreiber et al. 2015). Donnelly et al. (2016) used an internal buffer of 400.0-m from the edge of mesic habitats to remove areas inside large wet meadow, hay, or other mesic habitat complexes. An internal buffer with multiple distances has been developed as the basis for determining scores for this variable. While vegetation and forage characteristics within mesic areas may not vary with distance to upland habitats, mesic habitats closer to adjacent upland habitats are expected to have a higher level of functionality because they are closer to adjacent escape and roost cover.

Mesic habitats within 50.0-m and 100.0-m of upland habitat receive higher variable scores than those mesic habitats that are between 100.0-m and 400.0-m from the upland-mesic edge (Appendix A, Figure A. 7). Consistent with Donnelly et al. (2016) areas more than 400.0-m from upland habitats will receive a score of 0.0 for this variable. See the subsection Population and Habitat Scores of Appendix A for the specific breakdown of the Habitat Scores and the incorporation into the Montana HQT Basemap.

3.2.2. Anthropogenic Variables Used to Adjust the Montana HQT Basemap

Anthropogenic factors affect the functionality of GRSG habitat. Each Anthropogenic Variable (e.g., oil and gas wells, transmission lines, agriculture, mining, roads) is thoroughly described along with the spatial data sources in Appendices B – I. Anthropogenic Variables are incorporated into the Montana HQT Basemap and result in the computation of Habitat Function lost for newly proposed development projects.

3.2.2.1. Oil and Gas

Numerous studies have shown that oil and gas well pads consistently have a deleterious effect on habitat selection by GRSG and on lek persistence and attendance, although the size of the effect varied by region, development type, and season. Research indicates that anthropogenic features, including oil and gas well pads, negatively affect GRSG habitat (including lek persistence and winter habitat use) at various spatial scales. Dinkins et al 2014 notes that sage grouse selected habitat with lower densities of oil and gas structures at all reproductive stages.

See the subsection Anthropogenic Variables of Appendix A for the specific calculation of the Anthropogenic Score for existing oil and gas well pads and the incorporation into the Montana HQT Basemap, as well as Appendix B for the literature review and the specific calculation of the Anthropogenic Score as it pertains to new Oil and Gas projects.

3.2.2.2. Tall Structures

While research is needed to fully assess the effects of tall structures (e.g., cellular towers, transmission line towers, substations), there is a growing body of evidence that tall structures impact GRSG, primarily by increasing predation risks and fragmenting habitat. Here, we consider impacts distinct to tall structures on the landscape that could provide avian perching or nesting subsidies. Anthropogenic structures such as transmission towers, cooling towers, communication towers and weather stations provide perching and nesting subsidies for avian predators (Coates et al. 2014a, Dinkins et al. 2014a). Tall structures provide improved avian predator hunting efficiency in an otherwise relatively flat open landscape (Connelly 2004, Dinkins et al. 2014a). GRSG select nest sites and brood rearing habitat further away from tall structures, partially based on a perceived risk of predation (Braun 1998, Dinkins et al. 2012, Dinkins et al. 2014). Land cover, topography and cumulative human activity contribute to the level of impacts from tall structures.

See the subsection Anthropogenic Variables of Appendix A for the specific calculation of the Anthropogenic Score for existing tall structures and the incorporation into the Montana HQT Basemap, as well as Appendix C for the literature review and the specific calculation of the Anthropogenic Score as it pertains to new Tall Structure projects.

3.2.2.3. Transmission Lines

The linear characteristics of transmission lines result in both Direct and Indirect Impacts to GRSG populations through habitat fragmentation and increased predation. The effects of transmission lines on GRSG have been considered in several recent studies of habitat use and lek attendance (e.g., Walker et al. 2007, Dinkins et al, 2014b; Knick et al. 2013; LeBeau 2012, Johnson et al. 2011; Hanser et al. 2011; Gillan et al. 2013; Shirk et al. 2015; Gibson et al. *In Review*). Literature sources provide evidence of transmission line impacts suggesting that avoidance behavior has the potential to result in a population-level effect. Highly territorial, breeding ravens exploit anthropogenic features common to transmission corridors and are more likely to predate sage grouse nests (Bui et al. (2010) more often than migrant raven. For the purposes of this document, transmission lines will be considered as co-located if they are within 1 km of each other.

See the subsection Anthropogenic Variables of Appendix A for the specific calculation of the Anthropogenic Score for existing transmission lines and the incorporation into the Montana HQT Basemap, as well as Appendix D for the literature review and the specific calculation of the Anthropogenic Score as it pertains to new Transmission Line projects.

3.2.2.4. Wind Facilities

Disturbances created by wind facilities likely include increased predation to GRSG due to the presence of human development and edge effects. Because scientific research on the effects of wind energy is limited, a conservative approach was used to develop scores for this Anthropogenic Variable.

See the subsection Anthropogenic Variables of Appendix A for the specific calculation of the Anthropogenic Score for existing wind facilities and the incorporation into the Montana HQT Basemap, as well as Appendix E for the literature review and the specific calculation of the Anthropogenic Score as it pertains to new Wind Facility projects.

3.2.2.5. Roads, Railways and Active Construction Sites

Research on the effects of roads on GRSG indicates that there are variable levels of disturbance based on distance to roads, size of roads, traffic frequency, and associated noise. Seasonal and daily timing of traffic and its associated noise is an important aspect of managing disturbance of GRSG because animal behaviors such as attracting mates, or males competing on leks, often occur in the morning or evening, the same time as rush hour traffic. The frequency of the sound waves produced by traffic on roads can mask these important behavioral communications, which occur at the same or similar frequencies (Blickley and Patricelli 2012).

A related source of disturbance is intermittent traffic on smaller roads. This type of activity and noise may be more difficult for species to habituate to due to its unpredictable nature (Blickley et al. 2012).

See the subsection Anthropogenic Variables of Appendix A for the specific calculation of the Anthropogenic Score for existing roads, railways, and active construction sites and the incorporation into the Montana HQT Basemap, as well as Appendix F for the literature review and the specific calculation of the Anthropogenic Score as it pertains to new Road, Railway, and Active Construction Site projects.

3.2.2.6. Pipelines, Fiber Optic Cable, and Buried Utilities

Major or minor pipelines, buried fiber optic cable, and other types of buried utilities projects have in common a high level of surface disturbance and human activity during the construction phase, followed by a relatively short time frame for reclamation of grasses. The operations phase is different from most project types in that, although the lifetime of the project would be considered permanent (longer than 25 years), a buried pipeline or cable typically creates a temporary linear disturbance requiring a relatively brief disturbance phase.

It is important for the HQT to accurately quantify the initial disturbance, however, and then estimate the timeframe for the reestablishment of native vegetation. Depending on the type of project, surface disturbance could be a corridor of several hundred feet using backhoes and tracked equipment for a major gas pipeline and associated activities, or minimal disturbance for fiber optic cable or other utilities using a single cable plow or micro-trenching machine. After the construction phase, the primary concern for GRSG habitat conservation is controlling for invasive weeds or erosion within the disturbance area.

Relatively few studies have been conducted on the Indirect Impacts of pipelines on GRSG distribution. We are not aware of any studies specifically addressing effects of buried utilities, but the common characteristic is the duration of the construction and reclamation phases. Where the effects of pipelines have been considered, the results are inconclusive because the pipelines are included as one factor among several potential explanatory variables, many of which have confounding effects since they are often co-located with other infrastructure (Knick et al. 2013; Johnson et al. 2011).

See the subsection Anthropogenic Variables of Appendix A for the specific calculation of the Anthropogenic Score for existing pipelines, fiber optic cables, and buried utilities and the incorporation into the Montana HQT Basemap, as well as Appendix G for the literature review and the specific calculation of the Anthropogenic Score as it pertains to new Pipeline, Fiber Optic Cable, and Buried Utility projects.

3.2.2.7. Agriculture, Mines, and Other Large-scale Land Conversion Processes

Conversion of GRSG habitat to agricultural lands is another source of habitat loss and degradation of habitat value at the landscape scale (e.g., Knick et al. 2013; Smith et al. 2016, and Aldridge et al. 2008). This same conversion process may also be present for other moderate to large-scale land uses, including mining. The effects of mines on GRSG have not been specifically studied and are likely to vary widely based on the type of mine (e.g., surface or below ground) and infrastructure. Removal of vegetation during surface mining would likely make the area unsuitable for GRSG and may be similar to the conversion of sagebrush to agriculture.

See the subsection Anthropogenic Variables of Appendix A for the specific calculation of the Anthropogenic Score for existing agriculture, mines, and other large-scale land conversion processes and the incorporation into the Montana HQT Basemap, as well as Appendix H for the literature review and the specific calculation of the Anthropogenic Score as it pertains to new Agriculture, Mine, and other Large-scale Land Conversion projects.

3.2.2.8. Compressor Stations & Other Noise Producing Sources

Noise disturbance has been documented in literature to have deleterious effects on GRSG activities. Recent research has demonstrated that noise from natural gas development negatively affects GRSG abundance, stress levels, and behaviors. Other types of anthropogenic noise sources are similar to gas-development noise and, thus, the response by GRSG is likely to be similar. The results of research suggest that effective management of the natural soundscape is critical to the conservation and protection of GRSG (Patricelli et al. 2013). Acoustic communication is very important in the reproductive behaviors of GRSG, and energy exploration and development activities generate substantial noise (Blickley and Patricelli 2012). Such a disruption in GRSG communication may interfere with the ability of females to find and choose mates and ultimately negatively affect mating success (Blickley and Patricelli 2012).

For a prey species, such as GRSG, noise may also increase predation risk by masking the sounds of approaching predators (e.g., coyote, badger), and contribute to behavioral disruptions such as elevated heart rate, interrupted rest, and increased stress levels, all of which may affect health and reproduction or cause avoidance of noisy areas (Patricelli et al. 2013).

The effects of noise production (and, conversely, noise mitigation techniques) have the potential to vary greatly by source, type, and location. The study of noise impacts is an emerging science and this variable may be changed to better represent new findings as required to maintain consistency with the best available science.

See the subsection Anthropogenic Variables of Appendix A for the specific calculation of the Anthropogenic Score for existing compressor stations and other noise producing sources and the incorporation into the Montana HQT Basemap, as well as Appendix I for the literature review and the specific calculation of the Anthropogenic Score as it pertains to new Compressor Station and other noise producing projects.

3.2.3. Creating the Final Montana HQT Basemap

Habitat Scores are averaged together to compute the Total Habitat Score. The Anthropogenic Scores are multiplied together to compute the Total Anthropogenic Score. The Total Habitat Score and the Total Anthropogenic Score are multiplied together to produce the Montana HQT Basemap Total. See Appendix A for more details regarding the specific data sources and technical methodology used for developing the Montana HQT Basemap.

There is one single basemap for the state and it is used as the basis for calculating Functional Acres Gained and Lost for projects. Project specific Raw HQT Scores are computed using the results of the Montana HQT Basemap Total. The technical methodologies for calculating the Raw HQT Score differ for new debit and credit projects, but generally assess the characteristics of the new project and compare the new project with the Montana HQT Basemap Total. See Sections 4.0 for more information related to Credit Providers and Section 5.0 for Debit Producers.

4.0 THE HQT CALCULATION PROCESS FOR CREDIT PROVIDERS

Mitigation credits are created by removing or limiting a threat to GRSG through preservation or by improving habitat quantity and/or quality through restoration or enhancement actions. (Appendix J). The HQT calculates Functional Acres gained, which are then made equivalent to credits at a ratio of 1:1 in the mitigation marketplace through application of policy described in the *Policy Guidance Document*. A Functional Acre is a single unit that expresses the assessment of quantity (acreage) and quality (function) of habitat or projected habitat through the quantification of a set of local and landscape conditions. The Raw HQT Score is the final output of the Montana HQT after all Functional Acres gained have been summed for the life of the project and Third Level Assessments results are incorporated.

For a project area to be eligible for credits, it must first score 1.0 in the First Level Assessment. This means that the credit project area must be located within designated sage grouse habitats. Credit-eligible habitat must be in context with all essential habitats required annually by GRSG within a fully functioning landscape. For example, an acre of nesting habitat not adjacent and accessible to breeding areas, brood-rearing areas and winter habitat has no value to GRSG and therefore would not qualify as a credit source. Credit sites likely to provide the highest quality habitats and greatest number of Functional Acres will be those that are consistent with the guidance provided in the EO, such as: total disturbance (e.g. DDCT score) is less than 5%, and no overhead transmission lines are found within four miles of active leks. See the *Policy Guidance Document* for more details on qualifying credit projects.

Credits may be generated on a property through preservation. Montana has large tracts of intact sagebrush habitats that provide year-round habitat for GRSG. These intact areas can be preserved, for example, through conservation easements or lease agreements that avoid future habitat loss or fragmentation by the voluntary, legal removal of identified threats such as subdivision or cultivation.

Credits may be generated on a property through restoration. Restoration can be defined as the process of assisting the recovery of a resource (including its values, services, and/or functions) that has been degraded, damaged, or destroyed to the condition that would have existed if the resource had not been degraded, damaged, or destroyed (BLM 2016). Restored areas can be important links for connectivity, provide important mesic habitat for late summer brood rearing, or can provide other seasonal habitat components, thereby increasing the value of surrounding, intact sagebrush lands.

Examples of restoration include the re-establishment of suitable GRSG habitat on abandoned mining claims, abandoned industrial sites, eradication of invasive plant species, removal of encroaching conifers, removal of abandoned transmission lines and towers or other anthropogenic structures, converting cropland back to rangeland with a sagebrush component, or restoration of wet meadows by restoring proper hydrology and plant communities.

Credits may be generated on a property through enhancement. Enhancement requires an increase or improvement in quality, value, or extent of sage grouse habitat that has been degraded, or could be managed to increase the value of that habitat over its current value (BLM 2016). For credit projects, this approach can be used to increase existing credits by improving the habitat quality or function to GRSG, thereby increasing the Raw HQT Score and the amount of credits available to the market. Examples include improving existing suitable GRSG habitat by adding a sagebrush component to existing native grasslands, or increasing native forb diversity in mesic areas.

The following sections describe how the HQT calculates the Functional Acres of a credit project. Two examples of calculating Functional Acres gained for credit projects are presented in Appendix L that includes a perpetual conservation easement and a term lease agreement.

4.1. First Level Assessment for Credit Sites in Designated Sage Grouse Habitat

The State completed the First Level Assessment of GRSG habitat in Montana in 2015, mapping currently defined occupied habitat (FWP 2015). The habitat was defined as General Habitat, Core Area, or Connectivity Areas for GRSG (Montana EOs 12-2015 and 21-2015). On federal lands, the U.S. Bureau of Land Management (BLM) and the U.S. Forest Service (USFS) GRSG habitats are delineated in the agency's respective land use plans.

Projects located in the First Level Assessment area receive a score of 1.0 and are evaluated in the Second Level Assessment process. Projects located entirely outside of designated state or federal habitat for GRSG receive a score of 0.0 and are not further evaluated as part of the Montana HQT.

4.2. Second Level Assessment for Credit Sites to Estimate Functional Acres

Credit projects that received a First Level Assessment score of 1.0 complete the Second Level Assessment for an HQT estimate of Functional Acres for the project area (Figure 4. 1 and Figure 4. 2). The Second Level Assessment considers the details of a credit project site such as location, size, type, and duration. Together, these project details define the Project Assessment Area component of the HQT. The Third Level Assessment (site-specific) is required for all credit projects (Section 4.4)

The HQT process converts the physical acres identified in the Project Assessment Area to Functional Acres for analysis. A Functional Acre is a single unit of value that expresses the assessment of quantity (acreage) and quality (function) of habitat or projected habitat through the quantification of a set of local and landscape conditions. The Raw HQT Score (the final output of the HQT) is used for calculating, quantifying, expressing, and exchanging credits and debits.

For credit projects, the Project Assessment Area is the property boundary or the conservation easement agreement boundary. The Project HQT Basemap is extracted from the Montana HQT Basemap based on the Project Assessment Area footprint. The pixel values within the Project HQT Basemap are then averaged and the result is multiplied by the total area (physical acres) of the Project Assessment Area. A pixel is the smallest unit of information in an image or raster map. A pixel is usually square or rectangular and is often used synonymously with cell.

The result is then multiplied by the number of years defined for the project (perpetual conservation easements: 100 years; term leases: number of years of the lease). The final result is the Raw HQT Score (or the Functional Acres gained, including as a result of avoided loss, during the life of the project) which is used to calculate available credits. In some cases, the process can be repeated to calculate subsequent Raw HQT Scores for a project to compare changes in habitat over time after management treatments are applied.

4.2.1. How the HQT is Used to Calculate Functional Acre Scores Depends on the Type of Credit Project

Project milestones can be identified in a credit site management plan to determine how often the HQT should be run to detect changes in the Raw HQT Score because of restoration or enhancement actions (See *Policy Guidance Document*). Habitat uplift can be measured, based on performance standards, by the difference between the Montana HQT Basemap and the milestone HQT score(s) when the HQT is run at intervals. The Third Level Assessment can be used to quantify habitat uplift and inform changes in the habitat values for pixels that are assessed at a site-specific scale. See Appendix J for more details.

- **Preservation** – This type of credit project will not require re-running the HQT (Figure 4. 1). The Raw HQT Score for the Project Assessment Area will be applied in conjunction with policy considerations to calculate the amount of credits available for the preservation project.
- **Restoration** — For this type of project, the Raw HQT Score for the Project Assessment Area will be applied in conjunction with policy considerations to calculate the amount of credits available prior to habitat management actions (Figure 4. 2). This type of credit project will require re-running the HQT at pre-determined milestones to detect changes in habitat variables over time due to habitat management actions. The milestone(s) will set the desired future Raw HQT Score for the Project Assessment Area to calculate uplift after restoration actions are completed. The increase in available Functional Acres is dependent on the species of vegetation being restored, and the expected growth and recovery rates for each species.
- **Enhancement --** For this type of project, the Raw HQT Score for the Project Assessment Area will be applied in conjunction with policy considerations to calculate the amount of credits available prior to habitat management actions (Figure 4. 2). This type of credit project will require re-running the HQT at pre-determined milestones to detect changes in habitat variables over time due to habitat management actions. The milestone(s) will set the desired future Raw HQT Score for the Project Assessment Area to calculate uplift after enhancement actions are completed. The increase in available Functional Acres is dependent on the success of the habitat enhancement actions, and the expected growth and recovery rates for each species.

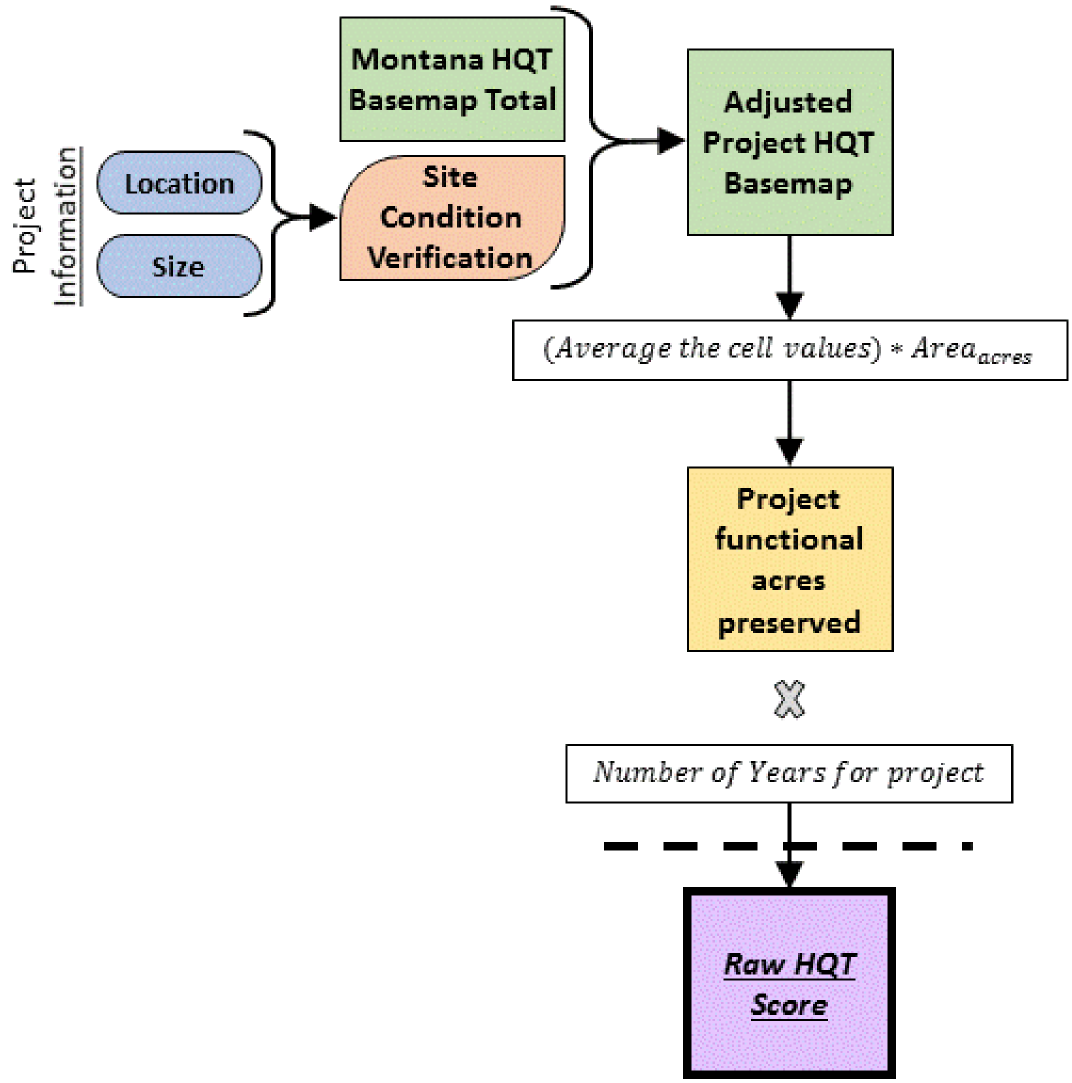

Figure 4. 1. Flowchart for the development of the Raw HQT Score for Preservation Projects.

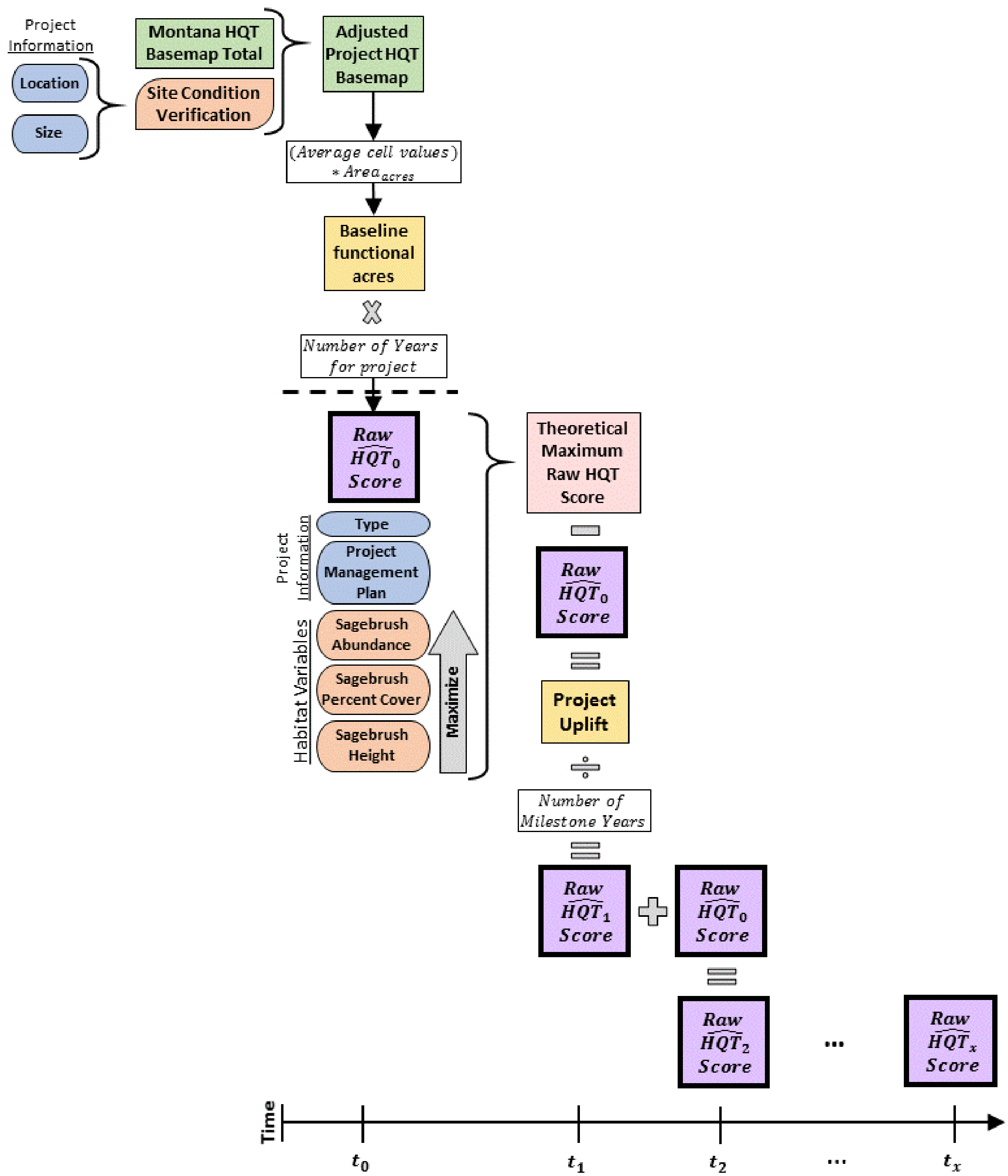

Figure 4. 2. Flowchart for the development of the Raw HQT Scores for Restoration and Enhancement Projects.

4.3. SECOND LEVEL ASSESSMENT EXAMPLES FOR A HYPOTHETICAL CREDIT PROJECT

Two hypothetical credit projects were created to illustrate important concepts in applying the HQT and generating Raw HQT Scores to which policy is applied. One example is for an 18,000-acre perpetual Conservation Easement credit project, the other for an 18,000-acre term lease agreement credit project (Appendix L).

To demonstrate the implications for landscape scale impacts from project location, the hypothetical projects were placed in a Core Area location and a General Habitat location. The projects are identical other than their location. This comparison illustrates the differences in habitat quality reflected in the HQT score between the two management areas, Core Area and General Habitat, and highlights the incentive to locate development projects in lower quality habitats where possible and alternatively, to locate credit projects in higher quality habitat.

The hypothetical projects apply the Montana HQT Basemap to characterize realistic potential projects and their raw Functional Ares score. The results are used to determine available credits using policy and market valuation described in the *Policy Guidance Document*.

The HQT results for credit projects can also identify properties that have the highest Raw HQT Score values, and therefore the highest quality habitats with the lowest anthropogenic impacts. These properties will generate the most credits in the mitigation marketplace.

4.4. THIRD LEVEL ASSESSMENT VERIFICATION OF THE SECOND LEVEL RESULTS AT THE LOCAL/SITE-SPECIFIC SCALE FOR CREDIT PROVIDERS

The Third Level Assessment will consist of field verification of scores from the Second Level Assessment and consider variables that are not captured in the Second Level geospatial assessment. Field verification of Habitat Function is an important step in the Montana HQT and is similar to other habitat assessment frameworks for GRSG (Boyd et al. 2014, NNHP and SETT 2014, Stiver et al. 2015, EDF 2015a, EDF 2015b).

Credit Producers are encouraged to contemplate local knowledge of a specific site, when proposing a credit site due to the coarse scale of the Second Level Assessment data. A Third Level Assessment is required for credit generation projects to accurately report baseline conditions and opportunity for credit gains not captured in the Second Level Assessment.

The Third Level Assessment (field-based verification) is conducted after the Second Level Assessment has been completed. The assessment process provides a site-scale verification of Habitat Function using detailed vegetation data and allows project proponents to field verify existing conditions and vegetation calculations in the project area. Vegetation variables measured in the Third Level Assessment include: sagebrush canopy cover, sagebrush canopy height, invasive plant species cover, conifer cover, forb cover and unmapped anthropogenic disturbances. The HQT Functional Acres score from the Second Level Assessment may then be adjusted by changing pixel values, based on the results of the Third Level Assessment to accurately characterize on the ground conditions.

Subsequent Third Level Assessments are conducted to verify changes through time and document project success where a credit project Plan outlines specific milestones. Each subsequent Third

Level Assessment would be compared to the prior assessment to measure trends. How often Third Level Assessments would be necessary will be identified in the project-specific Plan according to the project type and objectives.

Data collection will be the responsibility of the project proponent/applicant. These data will be submitted to the State for verification purposes. The State may conduct field visits to the site to field verify site conditions. Additional site-specific field-based data collection may be required by federal land management or state agencies following respective agency requirements.

The main goals of Third Level Assessment for credit projects are:

1. to verify the data and output from the Second Level Assessment including sagebrush canopy cover, and sagebrush canopy height habitat variables; and potentially unmapped anthropogenic disturbances or variables on the landscape;

2. to measure important GRSG habitat variables not directly characterized in the Second Level Assessment due to lack of spatial data, including invasive plant species cover, conifer canopy cover, and forb cover; and

3. to verify project trends in meeting specified milestones and performance standards.

4.4.1. Field Protocol

Verification of Second Level Assessment results will be accomplished through low-intensity field sampling. At a minimum, Third Level Assessment data will be collected within the project footprint but should be collected across the entire assessment area (including the footprint for both Direct and Indirect Impacts) if the proponent chooses to do so and has legal access to survey outside of the project footprint.

Data will be collected in general categories (i.e., tree, shrub, grass/forb). These general categories will be surveyed using line-point intercept (LPI; Herrick et al. 2016). Data collection will include sagebrush canopy cover, sagebrush height, grass/forb cover, invasive plant species cover and, conifer canopy cover. Additionally, the presence of anthropogenic or wildfire disturbances not captured by the Second Level Assessment should be noted and delineated.

The Program will provide protocols to be followed for field verification/data collection. The Program protocols will generally follow standardized data collection methods outlined in the Sage-Grouse Habitat Assessment Framework (HAF; Stiver et al. 2015) and BLM Assessment Inventory and Monitoring protocols (AIM; Herrick et al. 2016) to provide consistent data collection across projects. If projects are required to collect other, similar data, using protocols designed for purposes other than use in the HQT (reclamation planning, ecological site or habitat mapping, etc.), proponents should coordinate with the Program to ensure methods and results will provide the information necessary for use in the Third Level Assessment process. All data will be submitted to the State on the required State forms.

Data may be collected by the project proponent or a representative selected by the proponent. State or federal agency cooperators will provide Third Level Assessment field verification training workshops. All individuals completing Third Level Assessment field surveys must attend at least one training workshop. The State and collaborative partners will develop a Third Level Assessment verification field sampling guide, protocols and required data forms.

Sample locations within a project footprint (and surrounding assessment area as appropriate) will be randomly selected by the Program and located in a representative area that reflects the general conditions of the larger assessment area.

Figure 4.3 describes the transect pattern for a linear project. A single 50-m transect will be run in a manner which represents all vegetation types present (tree, shrub, forb/grass). The transect should be run perpendicular to but within the project boundary, for every half mile. A minimum number of data transects will be determined on a specific project basis included in the project Plan.

Transects (Figure 4.3) will be run in manner which represents all vegetation types present (tree, shrub, forb/grass). A minimum of one data point per meter will be collected, resulting in 50 data sample points per transect. These transects will be run for linear projects, such as removal and restoration of a road or transmission line.

The spoke design includes a center point with three 50-m transect lines radiating out from the center (Figure 4.4). One data point is collected for each meter along the transect lines. If the site is a monoculture of only one dominant vegetation type (tree or shrub or grass/forb dominated types) each spoke design transect can be randomly selected. If the site is comprised of varied vegetation types, one spoke design transect should be placed within each dominant vegetation type (tree, shrub or forb/grass dominated area) where the dominant vegetation type represents more than 20% of the site.

Each individual transect will include a minimum of one set of photo points. Spoke Design samples will have three separate photo points; one per spoke. Additional photos may be required to document habitat variables. Photo points will correspond with the associated field transect/point locations and be collected using provided forms and protocols.

A minimum number of data transects and photo points will be determined on a project specific basis included in the project Plan.

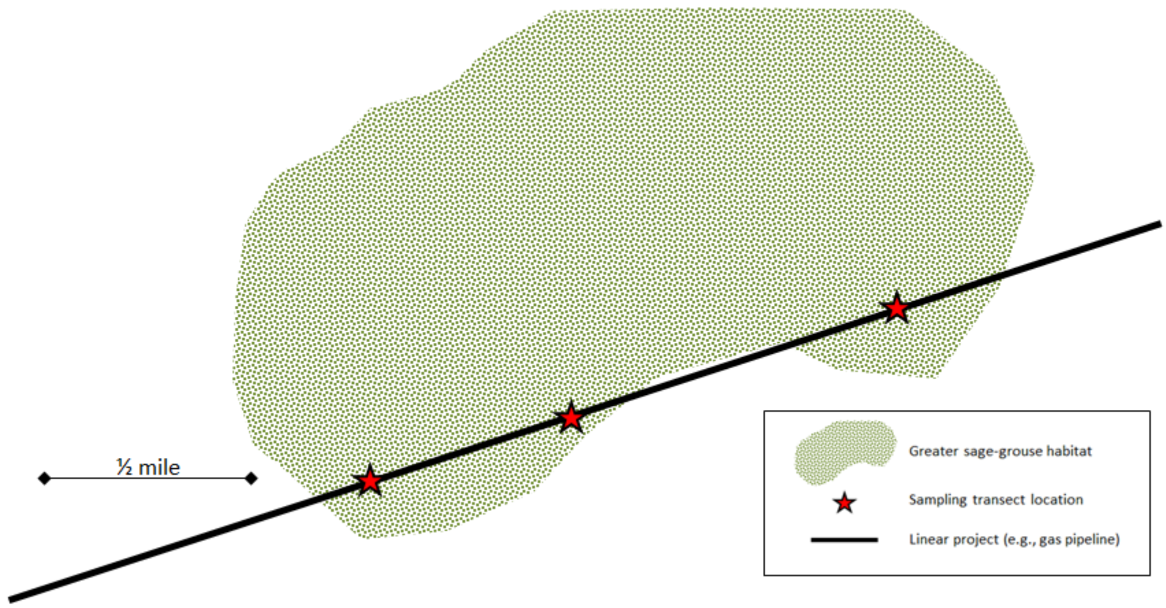

Figure 4. 3. The Linear Design is best for crossing the linear features. Transects are placed perpendicular to the linear feature.

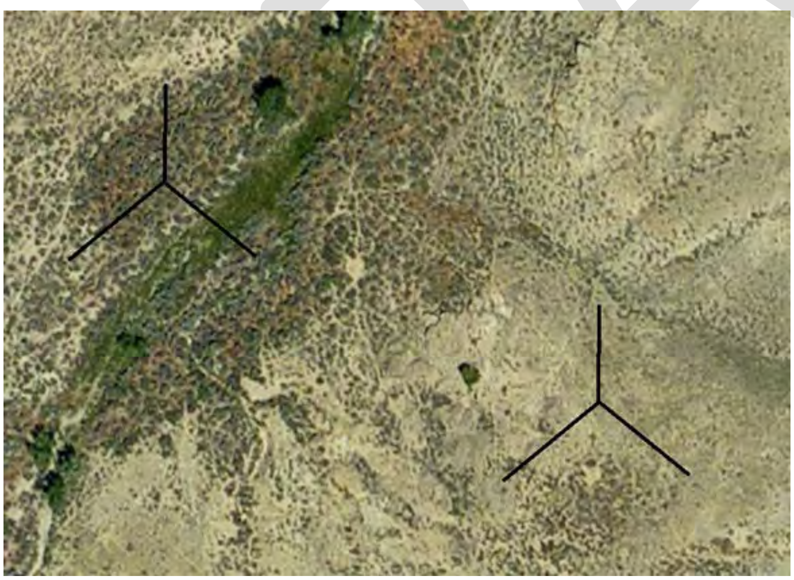

Figure 4. 4. Spoke Design will be used for non-linear projects (Herrick et al. 2016). Example of a project with an area larger than 20.0-acres, requiring two spoke design points with three 50.0-m transects each. Transects are located in a way to capture variation of dominant vegetation.

4.4.2. Updates to Second Level Assessment Results for Credit Projects

The Third Level Assessment is intended to provide a more accurate characterization of the credit project area. Results of Third Level Assessment field data collection efforts will be used to confirm, and where needed, revise Second Level Assessment Habitat or Anthropogenic Variable Scores. The Second Level Assessment provides estimates of sagebrush canopy cover and height (scores range from 0.0-100.0 for each) from publicly available datasets, but these data are reported at a coarse scale and may not always accurately reflect the existing on-the-ground conditions at a given site. Invasive plant species, conifer cover, and forb availability Habitat Variables are not directly assessed in the Second Level Assessment, but are treated as though they provide the maximum suitability for GRSG and are given an adjustment factor of 100, as a default.

The results of the Third Level Assessment field verification will inform Variable Scores and allow for a Final Raw HQT Score, specific to the credit project Assessment Area. Variables used in the Second Level Assessment results would be adjusted, where appropriate, then the HQT model would be run, using the adjusted variables, to generate an updated calculation of Montana HQT Basemap. The revised project-specific Montana HQT Basemap will represent the baseline condition from which the final Raw HQT Score is calculated and projected Functional Acres gained or preserved (avoided loss) are calculated.

The Third Level Assessment is required to provide a more accurate appraisal of the Assessment Area and could produce a score that is lower or higher than the original Second Level results. Third Level Assessment field data used to adjust the Second Level Assessment variables will initially apply only to the site-specific individual project it was collected for. All Third Level Assessment field data will be compiled by the Program and incorporated into the Montana HQT Basemap on a regular basis, determined by the Program.

5.0 THE HQT CALCULATION PROCESS FOR DEVELOPERS

Debits are created by an action that reduces habitat quantity and/or quality. Reclamation is the habitat recovery approach available for project developers to bring development sites back to pre-project conditions (Appendix K). The HQT calculates Functional Acres lost, which are then made equivalent to debits at a ratio of 1:1 in the mitigation marketplace through application of policy described in the Policy Guidance Document. A Functional Acre is a single unit that expresses the assessment of quantity (acreage) and quality (function) of habitat or projected habitat through the quantification of a set of local and landscape conditions. The Raw HQT Score is the final output of the Montana HQT after all Functional Acres lost have been summed for the life of the project and voluntary Third Level Assessments results are incorporated.

Debit projects that received a First Level Assessment score of 1.0 complete the Second Level Assessment for an HQT estimate of Functional Acres for the project area. The Second Level Assessment considers the details of a debit project site such as location, size, type, and duration. Together, these project details define the Project Assessment Area component of the HQT.

The HQT process converts the physical acres identified in the Project Assessment Area to Functional Acres for analysis. A Functional Acre is a single unit of value that expresses the assessment of quantity (acreage) and quality (function) of habitat or projected habitat through the quantification of a set of local and landscape conditions. The Raw HQT Score is the final output of the Montana HQT after all Functional Acres lost (or gained) have been summed for the life of the project and Third Level Assessments results (as needed) are incorporated. The Raw HQT Score is used for quantifying, expressing, and exchanging credits and debits.

For debit projects, the Project Assessment Area is the direct footprint of the project infrastructure (Direct Impacts) and the largest buffer boundary for anthropogenic effects of the project (Indirect Impacts). The Project HQT Basemap is extracted from the Montana HQT Basemap based on the Project Assessment Area footprint. The pixel values within the Project HQT Basemap are then averaged and the result is multiplied by the total area (acres) of the Project Assessment Area. A pixel is the smallest unit of information in an image or raster map. A pixel is usually square or rectangular and is often used synonymously with cell.

The result is then multiplied by the number of years defined for the life of the project, producing the Raw HQT Score (or the Functional Acres lost during the life of the project) which is used to calculate debits.

The distinct phases in the life of a development project are construction, operation, reclamation, and abandonment. From a project planning standpoint, the HQT can be used to evaluate project alternatives and identify least cost development solutions for business decisions.

The following sections describe the implementation of the HQT to quantify Functional Acre losses produced over the life of a project. Functional Acre losses, along with application of policy considerations, will determine the total mitigation obligation. For disturbance specific metrics, see Appendices B – I. For a definition of Reclamation for debit projects, and descriptions of how it can be used to shorten life of project debit calculations, see Appendix K. For examples of hypothetical debit project scenarios, see Appendix K. See the *Policy Guidance Document* for details on credit calculations.

5.1. First Level Assessment for Development Projects in Designated Sage Grouse Habitat

The State completed the First Level Assessment of GRSG habitat in Montana in 2015, mapping currently defined occupied habitat (FWP 2015). The habitat was then defined as General Habitat, Core Area, or Connectivity areas for GRSG (Montana EOs 12-2015 and 21-2015). Projects located in the First Level Assessment area receive a score of 1.0 and are evaluated in the Second Level Assessment process. Projects located entirely outside of designated state or federal habitat for GRSG receive a score of 0.0 and are not further evaluated as part of the Montana HQT and no mitigation is required.

5.2. Second Level Assessment to Estimate Functional Acres Lost from Development Projects

All development (debit) projects that received a First Level Assessment score of 1.0 must complete the Second Level Assessment. The Second Level Assessment calculates the number of Functional Acres lost during the construction, operation, reclamation, and abandonment phases in the life of a project. This produces a final Raw HQT Score, which is used to calculate the total number of debits for the project.

The HQT enables project developers to evaluate multiple project sites and configurations to minimize habitat losses. This utility enables HQT users, land managers, and others to make informed choices before making final project decisions and implementing the field-based Third Level Assessment (Section 5.4).

The Second Level Assessment begins when the proponent submits a description for all project activities and geospatial files that detail the physical footprint of the project infrastructure. This information is necessary to identify the type of project being proposed, the duration of the project, and the Project Assessment Area, which is defined by the potential Direct and/or Indirect Impacts that may result from its implementation (Figure 5. 1).

The Project Assessment Area is the combined area of the direct project footprint (where the project removes vegetation from the landscape) and the spatial extent of the Indirect Impacts (the influence of project activities or infrastructure beyond the footprint), if any (Appendices B – I). This is the area from which the number of Functional Acres lost is calculated. The HQT score for each project phase is then multiplied by the number of years for each phase to get the Raw HQT Score for the given project phase (Figure 5. 1).

An important aspect of calculating Raw HQT Scores for a development project is the function of time. The Second Level Assessment considers the details of a debit project such as location, size, type, and duration (i.e., timeframe), and the HQT quantifies functional habitat acres present during each phase (e.g., construction duration, operations duration, reclamation duration). The HQT calculates both the Functional Acres present in a project site, the temporal availability of those Functional Acres, and Functional Acres lost as project activities are implemented and habitat conditions change. After a project and all infrastructure is removed from the landscape, the habitat can begin to recover within the first year. The Raw HQT Score considers the gradual return of suitable GRSG habitat function and vegetation cover because of reclamation activities in disturbed areas.

Changes in the Functional Acres score over the life of a project, in conjunction with policy considerations outlined in the companion *Policy Guidance Document*, determine the final number of debits. Because the HQT is an objective estimate, calculations of Functional Acres lost over time will likely be different from the Reclamation timeframe considered by permitting agencies for regulatory purposes. In addition, the Reclamation time frame may be accelerated by habitat management actions in the project footprint, thereby reducing the Raw HQT Score and resulting debits required for the project. Such actions might include planting containerized stock plants or confirmation of accelerated reclamation through verified monitoring. Calculation of the Reclamation phase is discussed in greater detail in Appendix K.

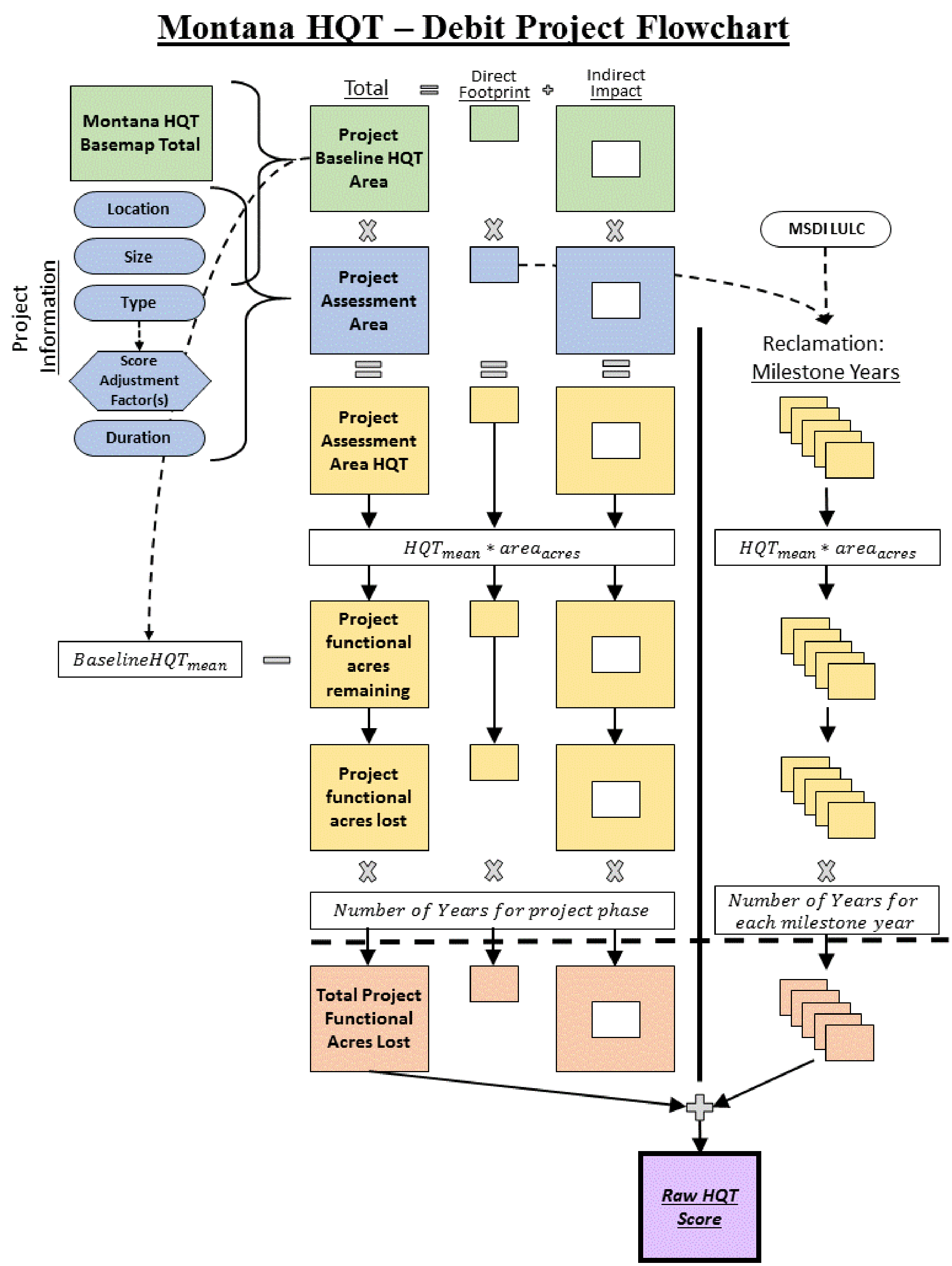

Figure 5. 1. The workflow for computing the total Project Functional Acres lost during the life of the project for debit projects.

Functional Acre scores are estimated for the following project phases (duration of the project phase). The Functional Acre scores are then used to calculate the Raw HQT Score (Figure 5. 1):

- **Construction** — The construction phase quantifies Functional Acres present in the Project Assessment Area during construction. Construction impacts are dependent on the project type, location, and duration of construction.
- **Operations and Maintenance** — This phase quantifies the Functional Acres present for the Project Assessment Area after the project has been constructed, interim reclamation activities have been initiated (where applicable, such as reduction in well pad size), and operations and maintenance activities are ongoing. During this period, habitat function is gradually returned in areas that have been reclaimed (i.e., construction areas that are outside the operations and maintenance footprint).
- **Reclamation** — This phase quantifies Functional Acres present for the Project Assessment Area after project activities are complete and final reclamation has been initiated. For reclamation to occur, all project infrastructure (e.g., road alignments, transmission lines, well pads) must be removed from the landscape and reseeding activities completed. Generally, Indirect Impacts of a project cease in the first year of the reclamation phase and the remaining Functional Acre losses from Direct Impacts are gradually reduced as vegetation regrows. The return of Functional Acres is dependent on the vegetation being reclaimed and the expected duration of reclamation (Figure 5. 1). This is likely to require more time than regulatory requirements imposed by permitting agencies, but reclamation in the HQT is predicated on those lands providing ecosystem services and suitable habitat for GRSG.
- **Abandonment** — The abandonment phase quantifies Functional Acres present in the Project Assessment Area after the habitat has been reclaimed to the greatest extent expected. For projects with no permanent impact, the Functional Acres habitat present in the Project Assessment Area at this phase is equal to the pre-construction HQT Basemap value.

Once the Functional Acre estimates are calculated for each project phase, the Raw HQT Score (or the Functional Acres lost during the life of the project) is finalized.

Reclamation is an important phase in the life of a project because it can be a significant portion of the overall Raw HQT Score (Figure 5. 1, Figure 5. 2). As vegetation reclamation takes hold, habitat function increases and the proportion of Functional Acres lost gets smaller (Figure 5. 2).

Accounting for reclamation activities over time must consider the expected reclamation success and timeframe for each vegetation community. For projects with multiple implementation or reclamation stages, a phased assessment may be needed to determine credit needs of different durations. See the *Policy Guidance Document* for policy details on phased release of credits.

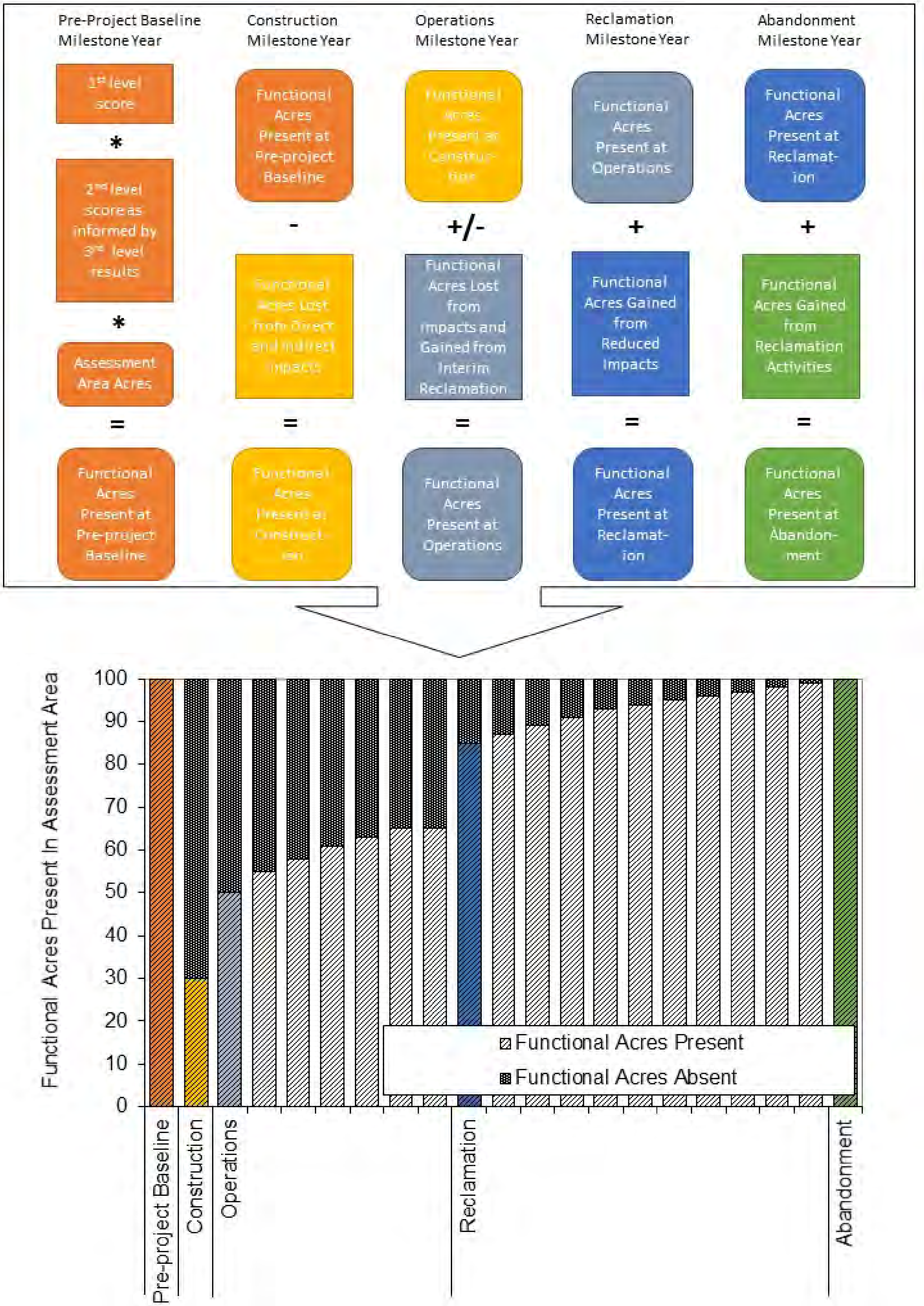

Figure 5. 2. Hypothetical example of Functional Acres present and absent over the life of a debit project as apportioned to each project phase.

Vegetation recovery times incorporated into the HQT must consider that the type of impact to the vegetation, such as bladed and cleared habitat, recovers at a different rate than mowed habitat, and mowed habitat recovers at a different rate than crushed habitat.

To account for these differences, reclamation recovery timeframes have been developed for each of these scenarios (Table 5. 1). As necessary, these recovery timeframes will be updated in the HQT as additional data become available. See Section 6.0 for Adaptive Management and Monitoring information on updating HQT data layers.

Reclamation timeframes for cleared vegetation were estimated as the average time to obtain Class A and Class B seral stages among the specific vegetation types within the aggregate in LANDFIRE Rapid Assessment Modeling and Mapping Zones: Northern and Central Rockies, Great Basin, and Northwest (U.S. Geological Survey). Seral stages used in LANDFIRE are described by the overall structural component and successional progression to a climax plant community (potential vegetation type [PVT]): class A is low cover, low height; and class B is high cover, low height.

The timeframe necessary for full recovery of sagebrush varies widely in the literature. Bunting et al. (2002) stated that recovery times of sagebrush communities vary, and may be as short as 15 years for mountain big sagebrush or as long as 50 to 75 years for Wyoming big sagebrush.

Cooper et al. (2007) looked at post-fire recovery of sagebrush shrub-steppe communities in central and southeast Montana and found that full recovery of Wyoming big sagebrush took over 100 years and that recovery of mountain big sagebrush cover took slightly more than 30 years. They found that the mean recovery rate for Wyoming big sagebrush canopy cover was 0.16% per year in the study area, and the fastest recovery rate was 0.72% per year (Cooper et al. 2007).

Wambolt et al. (2001) reported 72% recovery of Wyoming big sagebrush after 32 years at one site in southwestern Montana, and 96% recovery after only 9 years at another site. Baker (2006) found that recovery times for mountain big sagebrush ranged from 35 to 100 years, and that recovery times for Wyoming big sagebrush ranged from 50 to 120 years.

Table 5. 1 was formulated based on published literature available for reclamation of GRSG habitat vegetation types.

Table 5. 1. Percent of habitat restored/reclaimed in each year of reclamation by habitat and disturbance type.

Years After Implementation of Reclamation (Reclamation Milestone)	Cleared Habitat	Mowed Habitat	Drive and Crush Habitat
0 (Year of Implementation)	• 0% of all vegetation communities	• 0% of agriculture, developed, badland/break, grassland, and riparian/wetland • 0% of remaining classes	• 0% of ag, developed, badland/break, grassland, and riparian/wetland • 0% of remaining classes
1 year	• 100% of agricultural and wetland • 20% of grassland and riparian • 5% shrub • 1% of low and big sagebrush	• 100% of agricultural, wetland, grassland, and riparian • 10% shrub and low sagebrush • 2% of big sagebrush	• 100% of agricultural, wetland, grassland, and riparian • 20% shrub and low sagebrush • 7% of big sagebrush
5 years	• 100% of agricultural, wetland, grassland, and riparian • 25% shrub • 5% of low and big sagebrush	• 100% of agricultural, wetland, grassland, and riparian • 50% shrub and low sagebrush • 10% of big sagebrush	• 100% of agricultural, wetland, grassland, and riparian, shrub and low sagebrush • 33% of big sagebrush
10 years	• 100% of agricultural, wetland, grassland, riparian, and shrub • 10% of low and big sagebrush	• 100% of agricultural, wetland, grassland, and riparian, shrub and low sagebrush • 20% of big sagebrush	• 100% of agricultural, wetland, grassland, and riparian, shrub and low sagebrush • 67% of big sagebrush
15 years	• 100% of agricultural, wetland, grassland, riparian, and shrub • 15% of low and big sagebrush	• 100% of agricultural, wetland, grassland, and riparian, shrub and low sagebrush • 30% of big sagebrush	• 100% of agricultural, wetland, grassland, and riparian, shrub and low sagebrush, big sagebrush
25 years	• 100% of agricultural, wetland, grassland, riparian, and shrub • 20% of low and big sagebrush	• 100% of agricultural, wetland, grassland, and riparian, shrub and low sagebrush • 40% of big sagebrush	• 100% of agricultural, wetland, grassland, and riparian, shrub and low sagebrush, big sagebrush
50 years	• 100% of agricultural, wetland, grassland, riparian, and shrub • 50% of low and big sagebrush	• 100% of agricultural, wetland, grassland, and riparian, shrub and low sagebrush, big sagebrush	• 100% of agricultural, wetland, grassland, and riparian, shrub and low sagebrush, big sagebrush
75 years after Reclamation	• 100% of agricultural, wetland, grassland, and riparian, shrub and low sagebrush, big sagebrush	• 100% of agricultural, wetland, grassland, and riparian, shrub and low sagebrush, big sagebrush	• 100% of agricultural, wetland, grassland, and riparian, shrub and low sagebrush, big sagebrush

5.3. Hypothetical Development (Debit) Project for Demonstration Purposes

Four hypothetical projects were created to illustrate important concepts in applying the HQT and generating Raw HQT Scores for development projects to which policy is applied. The projects include a five-acre gravel pit, a 1000-acre solar farm, a 30-mile major pipeline, and a 30-mile transmission line (Appendix L).

Each hypothetical project is placed in a Core Area location and a General Habitat location. The projects are identical other than their location. This comparison illustrates the underlying differences in habitat quality reflected in the HQT Raw Score between the two management areas, Core Area and General Habitat. The examples also highlight the incentive to locate projects in lower quality habitats where possible because the underlying HQT Basemap scores indicate lower functional habitat even prior to siting the project at that location. Core Areas are the best of the best habitat, and therefore debit project impact scores are higher than an identical project in General Habitat.

The hypothetical debit projects apply the Montana HQT Basemap, anthropogenic disturbance buffers, construction, operations and reclamation phases with Direct and Indirect Impacts, and a plausible duration for life of project, to characterize realistic potential projects and their raw Functional Ares scores. In the hypothetical examples, the HQT Functional Acres raw scores are shown for each project. This result is then used to determine mitigation obligation using policy and market valuation described in the *Policy Guidance Document*.

5.4. Third Level Assessment to Validate the Second Level Results at the Local/Site-specific Scale for Development Projects

The Third Level Assessment will consist of field validation of scores from the Second Level Assessment and consider variables that are not captured in the second level geospatial assessment. Field validation of habitat function is an important step in the Montana HQT and is similar to multiple other habitat assessment frameworks for GRSG (Boyd et al. 2014, NNHP and SETT 2014, Stiver et al. 2015, EDF 2015a, EDF 2015b).

The Third Level Assessment (field-based validation) is conducted after the Second Level Assessment has been completed. The voluntary Third Level Assessment process provides a site-scale evaluation of Habitat Function using detailed vegetation data and allows project proponents to field verify existing conditions in their project Assessment Area. Vegetation variables measured in the Third Level Assessment include: sagebrush canopy cover, sagebrush canopy height, invasive plant species cover, conifer cover, forb cover and unmapped anthropogenic disturbances. The HQT Functional Acres score may then be adjusted by changing pixel values, based on the results of the Third Level Assessment, to accurately characterize on the ground conditions.

Third Level Assessment field surveys are generally recommended for all project types. However, the third level field surveys are voluntary for development projects if the project developer chooses to accept the Second Level Assessment score. Project Developers should contemplate actual on the ground conditions of their project specific Assessment Area. Due to the coarse scale of some vegetation data used in the Montana HQT Basemap, site-specific variables may not be accurately represented. Invasive plant species, conifer cover and forb cover are not directly assessed in the HQT. These Habitat Variables are treated as though they provide the maximum suitability for GRSG and are given an adjustment factor of 100 as a default. This could inflate the value of given pixels in the project Assessment Area.

Data collection will be the responsibility of the project proponent/applicant; these data will be submitted to the State for validation purposes. The State may conduct field visits to the site to field verify site conditions. Additional site-specific field-based data collection may be required by federal land management or state agencies following respective agency requirements.

The main goals of the Third Level Assessment are:

1. to validate the data and output from the Second Level Assessment including sagebrush canopy cover, and sagebrush canopy height habitat variables; and potentially unmapped disturbances or modifiers on the landscape; and

2. to measure important sage grouse habitat score modifiers not directly characterized in the Second Level Assessment due to lack of spatial data, including invasive plant species cover, conifer canopy cover, and forb cover.

5.4.1. Field Protocol

Validation of Second Level Assessment results will be accomplished through low-intensity field sampling. At a minimum, Third Level Assessment data will be collected within the project footprint but should be collected across the entire assessment area (direct and indirect footprint) if the proponent chooses to do so and has legal access to survey outside of the project footprint.

Data will be collected in general categories by vegetation type (i.e., tree, shrub, grass/forb). These general categories will be surveyed using line-point intercept (LPI; Herrick et al. 2016). Data collection will include sagebrush canopy cover, sagebrush height, forb cover, invasive plant species cover and, conifer canopy cover. Additionally, the presence of anthropogenic or wildfire disturbances not captured by the Second Level Assessment should be noted and delineated.

The Program will provide protocols to be followed for field validation/data collection. The Program protocols will generally follow standardized data collection methods outlined in the Sage-Grouse Habitat Assessment Framework (HAF; Stiver et al. 2015) and BLM Assessment Inventory and Monitoring protocols (AIM; Herrick et al. 2016) to provide consistent data collection across projects. If projects are required to collect other, similar datasets, using protocols designed for purposes other than use in the HQT (reclamation planning, ecological site or habitat mapping, etc.), proponents should coordinate with the Program to ensure methods and results will provide the information necessary for use in the Third Level Assessment process. All data will be submitted to the State on the required State forms.

Data may be collected by the project proponent or a representative selected by the proponent. State or federal agency cooperators will provide Third Level Assessment field validation training workshops. All individuals completing Third Level Assessment field surveys must attend at least one training workshop. The State and collaborative partners will develop a Third Level Assessment validation field sampling guide, protocol and required data forms.

Sample locations within a project footprint (and surrounding assessment area as appropriate) will be randomly selected by the Program and located in a representative area that reflects the general conditions of the larger assessment area.

Figure 5. 3 describes the transect pattern for a linear project. A single 50-m transect will be run in a manner which represents all vegetation types present (tree, shrub, forb/grass). The transect should be run perpendicular to but within the project boundary, for every half mile of line (i.e. pipeline,

cable, transmission line). A minimum of one data point per meter will be collected, resulting in 50 sample points per half mile.

For a project with a contiguous area of five acres, one 50-m linear transect (Figure 5. 3) will be run in a manner which represents all vegetation types present (tree, shrub, forb/grass). A minimum of one data point per meter will be collected, resulting in 50 data sample points. Table 5. 2 describes the Score Sampling Density for Third Level Site validation.

One spoke design point transect will be run for every five acres, for projects having more than five and up to 20-acres of contiguous area (Figure 5. 4). The spoke design includes a center point with three 50-m transect lines radiating out from the center. One data point is collected for each meter along the transect lines. If the site is a monoculture of only one dominant vegetation type (tree or shrub or grass/forb dominated types) each spoke design transect can be randomly selected. If the site is comprised of varied vegetation types, one spoke design transect should be placed within each dominant vegetation type (tree, shrub or forb/grass dominated area) where the dominant vegetation type represents more than 20% of the site.

Each transect will include a minimum of one set of photo points (Spoke Design samples will have three separate photo points; one per spoke). Additional photos may be required to document habitat variables. Photo points will correspond with the associated field transect/point locations and be collected using provided forms and protocols.

Table 5. 2. Score Sampling Density for Third Level Site Verification (Minimum Sampling Density).

Size (acres)	No. of Transects (1 point has 3 transects in a spoke design pattern)
≤ 5	1 linear transect
> 5 and ≤ 20	1 Spoke Design point
> 20 and ≤ 100	2 Spoke Design points. 1 Spoke Design point per category*
> 100 and ≤ 400	3 Spoke Design points per 100-acres per category
> 400	1 Spoke Design point per 100-acres per category
Linear features	One linear transect any time the linear feature crosses sage-grouse habitat (core, general, connectivity). If the linear feature crosses greater than ½ mile of designated sage-grouse habitat, then the desired sampling frequency is 1 linear transect every half mile randomly placed.

*For sites larger than 20.0-acres, the category (e.g. tree, shrub, or grass/forb) must comprise at least 20% of a site to be sampled separately. Categories comprising less than 20% of a site would be considered small inclusions and would not need to be separated out for sampling purposes.

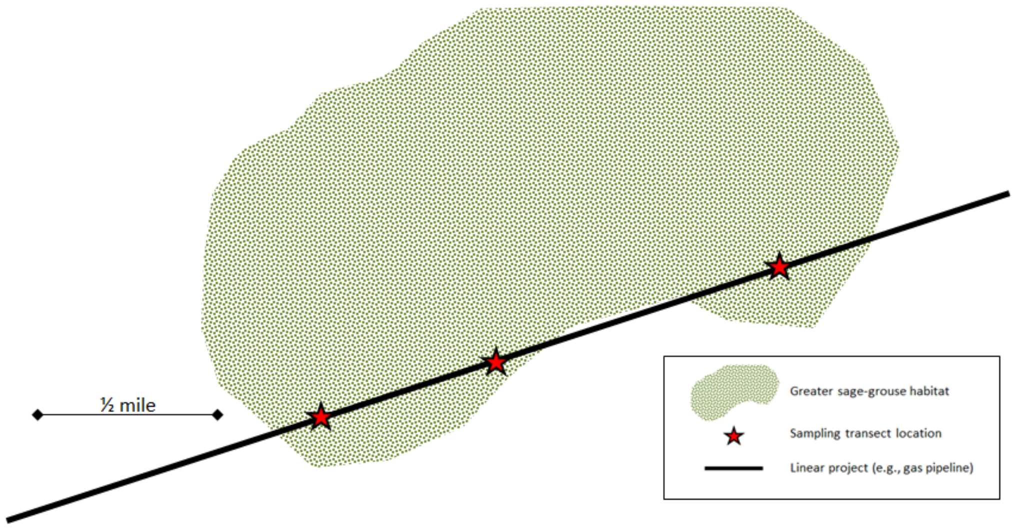

Figure 5. 3. The Linear Design is best for crossing linear features such as proposed transmission lines, pipelines. Transects are placed perpendicular to the linear feature.

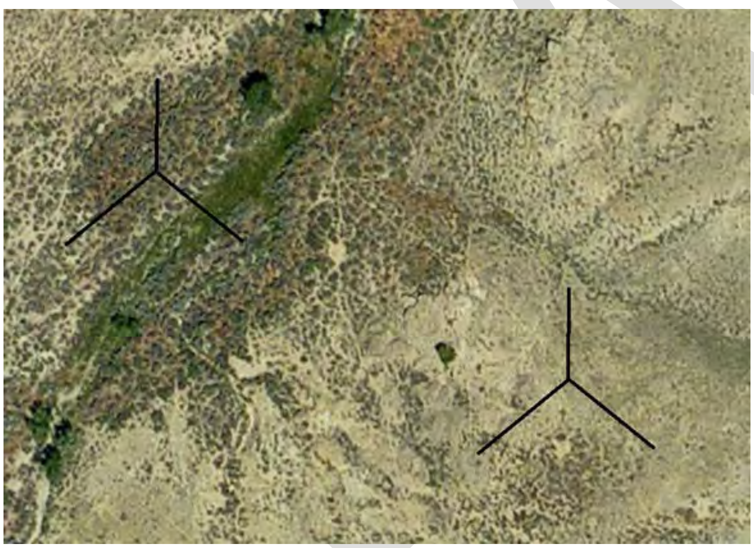

Figure 5. 4. Spoke Design will be used for non-linear projects (Herrick et al. 2016). Example of a project with an area larger than 20-acres, requiring two spoke design points with three 50-m transects each. Transects are located in a way to capture variation of dominant vegetation.

5.4.3. Updates to Second Level Assessment Results for Debits Projects

Results of Third Level Assessment is intended to provide a more accurate characterization of the development project Assessment Area. Results of Third Level Assessment field data collection efforts will be used to confirm, and where needed, revise Second Level Assessment Habitat or Anthropogenic Variable Scores. The Second Level Assessment provides estimates of sagebrush canopy cover and height (scores range from 0.0-100.0 for each) from publicly available datasets, but these data are reported at a coarse scale and may not always accurately reflect the existing on-the-ground conditions at a given site. Invasive plant species, conifer cover, and forb availability Habitat Variables are not directly assessed in the Second Level Assessment, but are treated as though they provide the maximum suitability for GRSG and are given an adjustment factor of 100, as a default.

The results of the Third Level Assessment field verification will inform Variable Scores and allow for a Final Raw HQT Score, specific to the development project Assessment Area. Variables used in the Second Level Assessment results would be adjusted, where appropriate, and then the HQT model would be run, using the adjusted variables, to generate an updated calculation of Montana HQT Basemap. The revised project-specific Montana HQT Basemap will represent the baseline condition from which the final Raw HQT Score is calculated and projected Functional Acres gained are calculated.

The Third Level Assessment is intended to provide a more accurate appraisal of the Assessment Area and could produce a score that is lower or higher than the original Second Level results. Third Level Assessment field data used to adjust the Second Level Assessment variables will initially apply only to the site-specific individual project it was collected for. All Third Level Assessment field data will be compiled by the Program and incorporated into the Montana HQT Basemap on a regular basis, determined by the Program.

6.0 ADAPTIVE MANAGEMENT

Adaptive management is a fundamental principle of the Montana Mitigation System. When it comes to conserving GRSG populations, much is known about the species' habitat preferences. However, less is known about how GRSG populations respond to anthropogenic disturbance. For this reason and others, it is necessary that the Montana Mitigation System implements an adaptive management approach to periodically evaluate whether mitigation is effectively offsetting impacts in space and through time.

Adaptive management is defined as the structured dynamic process of addressing uncertainty in management outcomes through the incorporation of procedures that seek to periodically review, revise and update tools, strategies and approaches in response to changing conditions or new information. Adaptive management strategies allow for changes to the overall conservation strategy to occur in response to changing conditions or new information, including those identified during monitoring. Adaptive approaches to management recognize that not all the answers to management questions are known and some answers may be obtained through a well-documented management process of trial and error. Adaptive management also includes, by definition, a commitment to change approaches when appropriate and necessary.

The HQT specifically warrants an adaptive management approach. This is because it relies heavily on data that are subject to change through time. For example, as new debit and credit projects are added to the landscape, the HQT Basemap will change through time. Wildfire can lead to sudden, and potentially significant losses of habitat in a single year. New research can and likely will shed new light on how sage grouse respond to anthropogenic changes on the landscape.

6.1. POTENTIAL CHANGES TO THE HQT

Adaptive management of the HQT entails changes that update data sources and GIS processes and calculations, consistent with best available science and monitoring information provided by entities engaged with the Montana Mitigation System. Updates to the HQT will also be informed more broadly by the status of sage grouse populations and any changes to the Policy Guidance Document.

Once MSGOT designates the HQT, the Program and entities engaged in the Montana Mitigation System will undertake an annual review. The review will focus on questions such as whether new data are available and whether any new science is available that warrants revision of mathematical formulas used to calculate Functional Acre gains or losses, respectively.

On an annual basis, the HQT will be updated to perform website or data maintenance functions such as updating publicly available data layers or refining methodologies. Additionally, on an annual basis, the Program will update the HQT Basemap layer that is used to calculate functional acres gained or losses by credit or debit projects, respectively. This entails updating the anthropogenic disturbance layer, incorporating any new credit site data where it can be demonstrated that functional acres have been increased, and replacing any of the other data layers included in the HQT Basemap.

MSGOT and the Program may implement changes identified during the annual review if MSGOT and the Program believe the HQT's methods and data sources require revision so as to be consistent with the best available science, improve methodologies, or incorporate new data. MSGOT may only adjust the HQT's methodologies or underlying data sources after a publicly announced MSGOT meeting and after accepting written and oral comment. Soliciting independent peer reviews may be warranted, but not required.

Once every five years, MSGOT and the Program will undertake a more thorough review. HQT methods and data sources will be thoroughly scrutinized. Because these changes are likely to be more substantive and material, MSGOT will be required to undertake rulemaking to formally designate the new HQT. Independent peer review is required. MSGOT may only designate the new HQT after a publicly announced MSGOT meeting and after accepting written and oral comment.

7.0 LIMITATIONS OF THE MONTANA HQT

The HQT is the scientific underpinning of the Montana Mitigation System and is policy-neutral. The credibility of the Montana Mitigation System and its effectiveness hinges upon the quality of the science upon which it is based and the integrity with which it is applied. The HQT is based on the best available science and best professional judgment. However, there are aspects of its content and potential uses that can be improved as it is adaptively managed over time. These limitations should be kept in mind and addressed through time as issues are revealed with use.

7.1. LINKING TO POPULATION OUTCOMES

The ultimate objective of the Montana Mitigation System is to contribute to conservation of the GRSG, which ultimately leads to larger and more secure GRSG populations. Therefore, the Montana Mitigation System must have a means of measuring aggregate cumulative habitat impacts and benefits, and relating the results to populations.

To make this link, an estimate of population impacts from activities related to credit and debit projects is needed. Unfortunately, it is not currently possible to make this link directly through published literature and thus site-level management actions cannot be quantified for the number of birds “produced” or “eliminated.” However, additional research could contribute to a greater understanding of how cumulative habitat changes contribute to population viability. Furthermore, as long as debits are offset by credits, the Montana Mitigation System will have contributed to avoided loss of habitat that can help to sustain resilient populations over time. The State of Montana and its partners will continue to monitor GRSG populations across the state.

7.2. IMPORTANCE OF TEMPORAL SCALE

Temporal scales must be taken into consideration when establishing a mitigation project, and as spatial scales of a project or evaluation area increase, so should temporal scales.

Temporal scales vary among ecological processes and may not be linear especially in varying environments (Wiens 1989). The time required for a vegetation community to respond to management practices or changes in habitat and its influence on GRSG vital rates varies by ecosystem, geography, climate, and land use. For GRSG, time lags of two to ten years have been observed for population response to infrastructure development (Holloran 2005; Harju et al. 2010; Walker et al. 2007) or even longer with changes in habitat structure (e.g., fire; Connelly et al. 2011b). Temporal scale for sagebrush projects deserves especially close consideration given that recovery of sagebrush is an especially difficult and slow process due to abiotic variation, short-lived seedbanks, and long regeneration time of sagebrush; where soils and vegetation are highly disturbed, sagebrush restoration can be challenging if not impossible (Pyke et al. 2011, Monsen 2005).

7.3. ANTHROPOGENIC IMPACTS LITERATURE

Much of the literature used to estimate the distance effects associated with anthropogenic disturbance is derived from analyses of the response of GRSG on leks (i.e., number of males occupying leks) to that infrastructure (see Appendices B-I) as leks are relatively easy to monitor and provide surrogate information for seasonal habitat quality in the vicinity of leks. As studies become available that more explicitly quantify demographic impacts to GRSG during specific seasonal periods (i.e., breeding, summer and winter), weights and distances for each season may be developed and incorporated into the HQT to fine-tune the relative impacts by season from different types of anthropogenic activity. Where literature is available specific to a type of anthropogenic disturbance, that literature is used to determine Indirect Impacts distances where applicable.

7.4. VEGETATION SAMPLING PROTOCOL

The HQT currently relies on a standardized, site-specific vegetation sampling protocol to establish vegetation conditions for the Montana HQT Basemap. Standardizing vegetation sampling protocols over space and time has its challenges, which could be problematic in situations where quantifying vegetation change is the objective of monitoring (Seefeldt and Booth 2006). Aerial imagery and other remotely sensed information offer the opportunity for more objective measurement of vegetation across space and time, but in most instances the products derived from these data are too coarse to effectively detect small-scale changes in the vegetation (Seefeldt and Booth 2006). As remote-sensing platforms and sensors mature, spatial and temporal resolution are expected to improve and costs decrease, making it easier to effectively quantify change in relevant vegetation attributes for the Montana HQT Basemap

8.0 GLOSSARY

Anthropogenic Score: Adjustments made in the Second Level Assessment to account for anthropogenic impacts from the project in the Raw HQT Score. For a credit project, this score is incorporated into the HQT Basemap as existing disturbance. In a development project, this is accounted for with the Indirect Impacts buffers.

Anthropogenic Variable: Where human activity has substantially modified an area's primary ecological functions and species composition. For sage grouse, examples include wind farms, transmission lines, or gravel pits.

Assessment Area: The geographic area associated with a development project's impact or credit project's benefit. This defines the boundaries of the calculation of Functional Acres in the habitat quantification tool using the Montana HQT Basemap.

Baseline: The pre-existing condition of a resource, at all relevant scales, as quantified by application of the HQT.[1]

Connectivity Area, State of Montana: Areas that provide important linkages among populations of sage-grouse, particularly between Core Areas or priority populations in adjacent states and across international borders.[2]

Core Area, State of Montana: An area that has the highest conservation value for sage grouse and has the greatest number of displaying male sage grouse and associated sage grouse habitat, as presently delineated by Executive Order 21-2015.[3]

Credit: A defined unit of trade representing the accrual or attainment of resource functions or value at a proposed project site.[4]

Credit Provider: An entity generating credits as mitigation for impacts to sage grouse habitat.

Debit Project: A development action proposed in sage grouse habitat that requires state or federal agency review, approval, or authorization and is required to avoid, minimize, reclaim, and/or compensate for impacts to sage grouse habitat.

Direct Impacts: Effects that are caused by a development activity. Direct effects are the footprint of a project and usually occur from construction or operation activities, or project infrastructure.

Enhancement: An increase or improvement in quality, value, or extent (of a resource) that has been degraded or could be managed to increase the value of that habitat over its current value.[5]

First Level Assessment: The First Level Assessment area consists of the distribution of GRSG in Montana. For the State, GRSG range is defined as General Habitat, Core Area, and Connectivity. On BLM and USFS federal lands, GRSG range is defined as Priority or General Habitat Management Areas.

Functional Acre: A single unit that expresses the assessment of quantity (acreage) and quality (function) of habitat or projected habitat through the quantification of a set of local and landscape conditions. A Functional Acre

[1] Bureau of Land Management. 2016. Manual Section 1794: Mitigation.
[2] MCA § 76-22-103(1) (2017).
[3] MCA § 76-22-103(3) (2017).
[4] MCA § 76-22-103(4) (2017).
[5] Bureau of Land Management. 2016. Manual Section 1794: Mitigation.

is the metric for outputs from the habitat quantification tool and for quantifying, expressing, and exchanging credits and debits.

Functional Habitat: The expression of the assessment of quality (function) of habitat or projected habitat through the quantification of a set of local and landscape conditions.

General Habitat, State of Montana: An area providing habitat for sage grouse but not identified as a core area or connectivity area.[6]

General Habitat, BLM and US Forest Service (GHMA): BLM or USFS-administered sage grouse habitat that is occupied seasonally or year-round and is outside of PHMAs, where some special management would apply to sustain sage grouse populations. The boundaries and management strategies for GHMAs are derived from and generally follow the preliminary general habitat (PGH) boundaries.

GIS terms: pixel, pixel resolution, GIS, continuous data layer: Pixel: The smallest unit of information in an image or raster map, usually square or rectangular. Pixel is often used synonymously with cell. Pixel resolution: The dimensions represented by each cell or pixel in a raster. GIS: Geographic Information System. A computer mapping system designed to capture, store, manipulate, analyze, manage, and present all types of geographical data. Continuous data layer: Values that are assigned to the cells of a surface can be represented as either discrete or continuous data. Continuous data, or a continuous surface, represents phenomena where each location on the surface is a measure of the concentration level or its relationship from a fixed point in space or from an emitting source. Continuous data is also referred to as field, non-discrete, or surface data.

Habitat Function: The degree of effectiveness of a sage grouse habitat component to provide services for sage grouse use and survival. The HQT measure increase or decrease in habitat function to quantify management or debit project impacts to habitat.

Habitat Metric Score: A unit of measure the HQT uses to quantify suitable annual habitat values for GRSG. These include an upland metric & mesic metric.

Habitat Quantification Tool (HQT): The scientific method used to evaluate vegetation and environmental conditions related to the quality and quantity of sage grouse habitat and to quantify and calculate the value of credits and debits.[7]

Habitat Variables: vegetation community proportion of sagebrush, sagebrush canopy cover, sagebrush canopy height, distance to shrub habitat, average upland habitat score used in the Montana HQT Basemap.

Habitat Score: Combined score of all Habitat and Population Variables within a Montana HQT Basemap.

Indirect Impacts: Effects that are caused by or will ultimately result from a development activity. Indirect effects usually occur later in time or are removed in distance compared to Direct Impacts, but are still reasonably foreseeable. Indirect Impacts may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.[8]

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[6] MCA § 76-22-103(7) (2017).
[7] MCA § 76-22-103(9) (2017).
[8] 40 CFR § 1508.8.

LANDFIRE: Landscape Fire and Resource Management Planning Tools. A GIS layer used in the HQT. Used to describe vegetation, wildlife fuel, and fire regimes across the U.S. to support cross-boundary planning, management, and operations between agency wildland fire management programs.

Lek: Traditional areas where male sage grouse gather during early spring to conduct a courtship display, attract females, and breed.[9]

Mesic Habitat: Habitat containing a moderate amount of moisture with unique plant and insect species not found in upland habitats.

Milestone Recovery Year (MRY): Designated increments of scoring for Functional Acre habitat scores in the assessment area over the life of the project. Typically, these are designated as year 1 through 15, then 25, 50, and 75.

Minimum Sampling Density: Minimum number of transects (sample size) necessary for valid Third Level site validation.

Mitigation Credit Project: Conservation actions, including enhancement, restoration, creation, or preservation, taken by an entity on a mitigation credit project site.

Montana HQT Basemap: The pre-existing Functional Acre condition of GRSG habitat, as quantified by the HQT Model using anthropogenic, population and habitat variable scores.

Montana Mitigation System: The framework of the Montana Mitigation System Policy Guidance for Greater Sage-grouse and Montana Mitigation System Habitat Quantification Technical Manual for Greater Sage-grouse processes.

Montana Mitigation System Policy Guidance Document for Greater Sage-grouse, *Policy Guidance Document*: A companion document to the Montana Mitigation System Habitat Quantification Technical Manual for Greater Sage-grouse. The *Policy Guidance Document* outlines how HQT results are applied in a decision process.

MSGOT or Oversight Team: Montana Sage Grouse Oversight Team[10]

Multi-Resolution Land Characteristics Consortium National Land Cover Database (MRLC NLCD): A GIS layer used in the HQT. Multi-Resolution Land Characteristics (MRLC) consortium comprehensive land cover product termed the National Land Cover Database (NLCD), from decadal Landsat satellite imagery and other supplementary datasets.

Population Variable: includes sage grouse population variables (distance to lek, breeding density) used in the Montana HQT Basemap.

Predicted Uplift: The Final Raw Score for a restoration or enhancement project calculated after making Third Level Assessment adjustments.

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[9] Montana's Greater Sage-grouse Habitat Conservation Advisory Council. Greater Sage-Grouse Habitat Conservation Strategy (2014) (hereafter "2014 Recommendations"), available at http://governor.mt.gov/Portals/16/docs/GRSG%20strategy%2029Jan_final.pdf.

[10] MCA § 76-22-103(10) (2017).

Preservation: The removal of a threat to, or preventing the decline of, resources. Preservation may include the application of new protective designations on previously unprotected land or the relinquishment or restraint of a lawful use that adversely impacts resources.[11]

Priority Habitat Management Area, BLM and US Forest Service (PHMA): BLM or USFS-administered lands identified as having highest habitat value for maintaining sustainable sage grouse populations. The boundaries and management strategies for PHMAs are derived from and generally follow the preliminary priority habitat (PPH) boundaries. PHMAs largely coincide with areas identified as priority areas for conservation (PACs) in the Conservation Objectives Team (COT) Report.

Project Assessment Area: Project specific Assessment Area that defines the spatial extent of a project, based on the largest Indirect Impact buffer for Debit Projects and based on the Direct Impact for Credit Projects.

Project Developer: An entity proposing an action that will result in a debit.[12]

Program: The Montana Habitat Conservation Program.

Raw HQT Score: Final project score produced from Montana HQT Basemap Score after adding all project related Anthropogenic Variables for existing anthropogenic features on the landscape in GRSG habitat. The score reflects the total Functional Acres lost for the project or gained for a credit project.

Reclamation: Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.[13]

Restoration: The process of assisting the recovery of a resource (including its values, services, and/or functions) that has been degraded, damaged, or destroyed to the condition that would have existed if the resource had not been degraded, damaged, or destroyed.[14]

Restoration Habitat Management Area, BLM (RHMA): BLM-administered lands where maintaining populations is a priority, a balance between ongoing and future resource use so that enough quality habitat is maintained to allow some residual population in impacted areas to persist and that emphasizes the restoration of habitat to reestablish or restore sustainable populations.

Second Level Assessment: Level at which the HQT quantifies Functional Habitat to provide a benchmark of GRSG Habitat Functionality for a specific credit or development project. Computed using a geospatial platform (e.g., ArcGIS) using scores developed for selected Population and Habitat Variables associated with GRSG habitat selection and use.

Stakeholder Group: Included private, local, state, industry, and non-profit partners, as well as the Bureau of Land Management, the U.S. Forest Service, and the U.S. Fish and Wildlife Service.

The State: State of Montana.

Third Level Assessment: Site level validation of site condition. This assessment is used to verify credit site conditions as calculated by the HQT, and to validate development site conditions as calculated by the HQT. Results may be used to adjust the Raw HQT Score.

Total Anthropogenic Score: Calculated by multiplying all the Anthropogenic Scores specific to the Anthropogenic Variables.

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[11] Bureau of Land Management. 2016. Manual Section 1794: Mitigation.
[12] MCA § 76-22-103(11) (2017).
[13] See 40 CFR § 1508.20 definition of mitigation hierarchy (avoid, minimize, rectify, reduce, compensate).
[14] Bureau of Land Management. 2016. Manual Section 1794: Mitigation.

Total Habitat Score: Calculated by averaging all the Habitat Scores specific to the Population and Habitat Variables.

Upland Habitat: Upland is defined as high or hilly habitat, and is considered drier than a mesic area. These areas have unique plant species not generally found in mesic habitats.

Verification: An independent, expert check on the credit estimate, processes, services, or documents provided by a project developer or credit provider. The purpose of verification is to provide confidence to all program participants that credit calculations and project documentation are a faithful, true, and fair account – free of material misstatement and conforming to credit generation and accounting standards, state and federal laws, and policies.

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Appendix A. MONTANA HQT BASEMAP – GIS METHODS

This appendix provides details about the geospatial methods used to process the data layers and manipulate them for inclusion in the final calculation of the Montana HQT Basemap (Table A. 1).

Table A. 1. List of model parameters and associated data sources used to develop parameters.

Model Parameters	Data Source
Distance to Lek	DNRC[1]/MTFWP[2] Lek Points
Breeding Density	Doherty et al. (2010) Lek Density[3]
Distance to Upland	MSDI LULC[5]
Excluded Lands	MSDI LULC
Sagebrush Abundance	MRLC[6] Sagebrush Cover[7]
Sagebrush Percent Cover	MRLC Sagebrush Cover
Sagebrush Height Classes	MRLC Sagebrush Height[8]
Oil & Gas Well Density	DNRC Existing Disturbance, DNRC Submitted Project Disturbance
Distance to Tall Structure	DNRC Existing Disturbance, DNRC Submitted Project Disturbance
Distance to Transmission Lines	DNRC Existing Disturbance, DNRC Submitted Project Disturbance
Distance to Moderate Road, Pipeline, Fiber Optic Cable & Other Buried Utilities	DNRC Existing Disturbance, DNRC Submitted Project Disturbance
Agriculture, Mine & Land Conversion (%)	DNRC Existing Disturbance, DNRC Submitted Project Disturbance
Compressor Stations & Other Noise Sources	DNRC Existing Disturbance, DNRC Submitted Project Disturbance
Distance to Large Road	DNRC Existing Disturbance, DNRC Submitted Project Disturbance, MDT[9] Yearly Traffic Count data

[1] DNRC = Department of Natural Resource and Conservation.
[2] MTFWP = Montana Fish, Wildlife, and Parks.
[3] Data link: https://www.conservationgateway.org/ConservationByGeography/NorthAmerica/Pages/sagegrouse.aspx, Accessed on X.
[5] MSDI LULC = Montana Spatial Data Infrastructure Land Use/Land Cover, Data Link: http://geoinfo.msl.mt.gov/Home/msdi/land_use_land_cover, Accessed on X.
[6] MRLC = Multi-Resolution Land Characteristics Consortium, Data Link:
[7] Data Link: http://www.landfire.gov/bulk/downloadfile.php?TYPE=nlcdshrub&FNAME=Provisional_WYMT_Sagebrush_v2.zip, Accessed on 2/13/2018.
[8] Data Link: http://www.landfire.gov/bulk/downloadfile.php?TYPE=nlcdshrub&FNAME=Provisional_WYMT_Sagebrush_Height_v2.zip, Accessed on 2/13/2018.
[9] MDT = Montana Department of Transportation, Data Link: , Accessed on X.

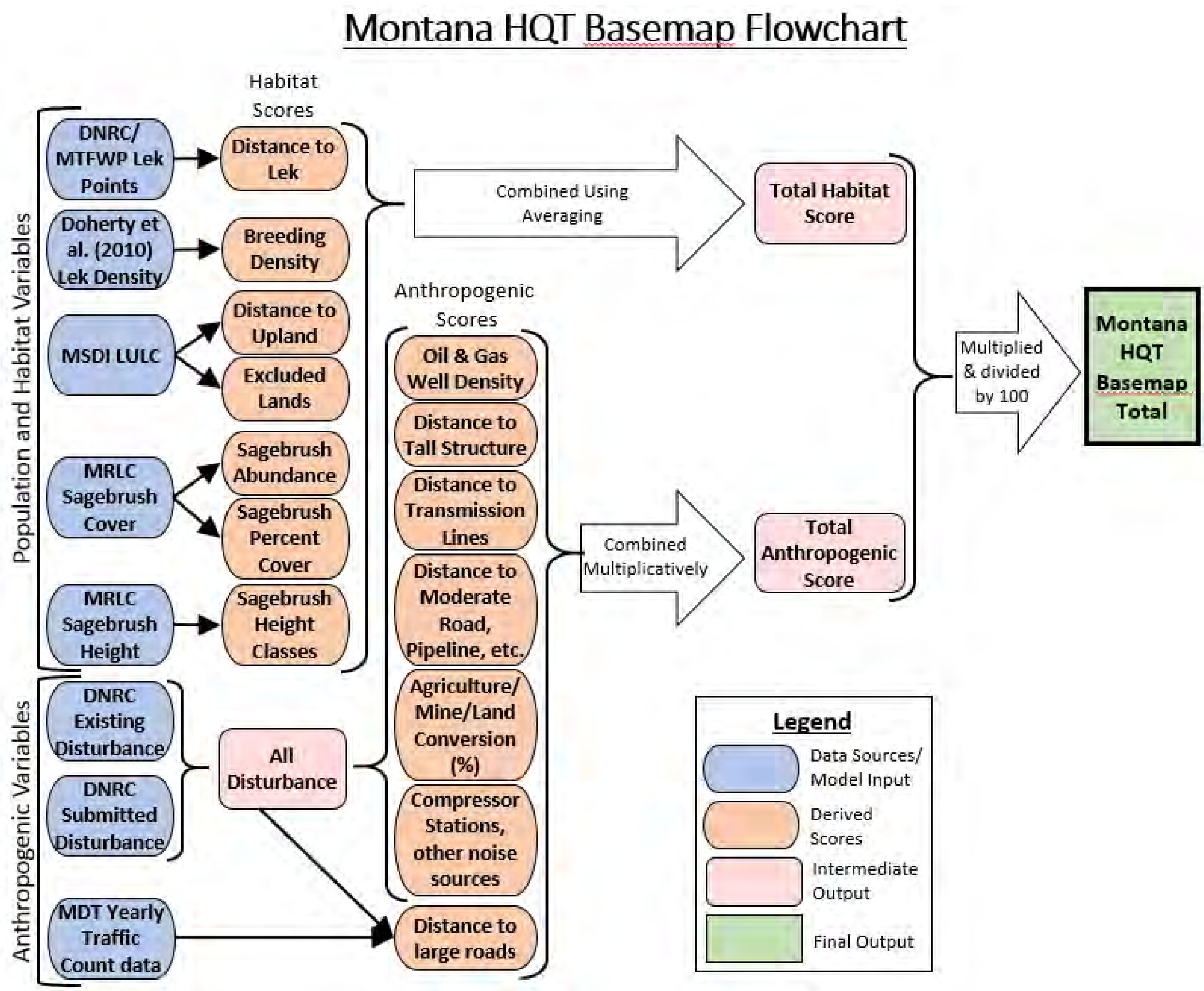

Figure A. 1. Flowchart showing the steps of data manipulations to develop the Final Montana HQT Basemap.

POPULATION AND HABITAT VARIABLES

1. Distance to Lek

Data Layers used in Habitat Score Creation: Montana Sage-grouse Lek Location Point Data.

Sage-grouse leks in the Montana statewide data layer are classified by their activity status as defined in
Table A. 2. Only active leks, those classified as Confirmed Active (CA), Confirmed Inactive (CI) or Unconfirmed (UC), are used in this metric. Leks classified as Confirmed Extirpated (CE) or Never Confirmed Active (NCA) are not included in the analysis because they are either permanently abandoned or there is not enough evidence to officially classify them as leks.

Table A. 2. Definitions for Lek Activity Status used in the Montana HQT Basemap data layers.

Lek Activity Status	Definition
Confirmed Active	Data supports existence of lek. Supporting data defined as 1 year with 2 or more males lekking on site followed by evidence of lekking (Birds - male, female or unclassified; -OR- Sign - vegetation trampling, feathers, or droppings) within 10 years of that observation.
Confirmed Inactive	Confirmed Active lek with no evidence of lekking (Birds - male, female or unclassified; -OR- Sign - vegetation trampling, feathers, or droppings) for the last 10 years. Requires a minimum of 3 survey years with no evidence of lekking during a 10-year period. Reinstating Confirmed Active status requires meeting the supporting data requirements.
Unconfirmed	Unconfirmed lek. Grouse activity documented. Data insufficient to classify as Confirmed Active status.
Confirmed Extirpated	Habitat changes have caused birds to permanently abandon a lek (e.g., plowing, urban development, overhead power line) as determined by the biologists monitoring the lek.
Never Confirmed Active	Unconfirmed lek that was never confirmed active. Requires 3 or more survey years with no evidence of lekking (Birds - male, female or unclassified; -OR- Sign - vegetation trampling, feathers, or droppings) over any period of time.

Available literature and datasets related to lek-to-nest distances in Montana were used to establish scores for this variable. Generally, most available literature and datasets for Montana indicate that the nesting activities in the state occur within 10.0-km of a lek. In southeastern Montana, Foster et al. (2014) found that an 8.0-km buffer around all leks was adequate to protect 100% of nests used by radio tagged hens in southeast Montana, respectively (Figure A. 2). Foster et al. (2014) found that this relationship remained relatively consistent when active and inactive leks or only active leks were included in the analysis. Similarly, in southeastern Montana and northeastern Wyoming, Doherty (2008) found that 95% of all nesting activity occurred within 10.0-km of a lek. *The Final Management Plan and Conservation Strategies for Sage-Grouse in Montana* (FWP 2005) describes similar lek-to-nest distance relationships. Based on these Montana-specific findings, detailed scoring for the distance to lek variable was completed for distances less than 10-km from leks in Montana (Figure A. 2). Scoring for distances further than 10-km was based on findings not specific to Montana, as discussed in subsequent paragraphs.

Montana-specific datasets and publications were used to establish scores for the distance to lek variable were developed within 10.0-km of a lek (Figure A. 2). Generally, distances less than 3.2-km of a lek were recognized as important nesting habitat across the state with decreased nest numbers with increased distance from a lek. Foster et al. (2014) found that a 3.2-km buffer was adequate to protect 84% of nests used by radio tagged hens in southeast Montana, respectively (Figure A. 2). The Foster et al. (2014) findings are consistent with Martin (1970, from FWP 2005) who found that greater than 80% of nests were located less than 3.2-km from leks in southwestern Montana. Data presented in Woodward (2006) indicate that populations in Golden Valley and Musselshell counties also follow this pattern with 66% and 80% of nests occurring within 3.0-km of a lek, respectively. The Musselshell County population used nesting habitats closer to leks than any other population documented in Montana with 98% and 100% of nests located within 4.0-km and 5.0-km of a lek, respectively. Similarly, Wallestad and Pyrah (1974, from FWP 2005) reported that 68% of all nests were located within 2.4-km of a lek in central Montana. In southern Phillips County, results presented by Moynahan (2004 unpublished presentation materials) differ slightly from results from other parts of Montana with less than 40% of nests occurring within 3.0-km of a lek and 60% of nests occurring within 5.0-km. While the Moynahan results differ slightly from the remainder of the state, they should be considered when developing scores for this variable, especially at distances greater than 3.0-km as they indicate that in some areas of the state, habitats farther from leks may still be important for nesting and breeding activities.

Montana-specific datasets related to lek-to-nest distances are very similar to those observed elsewhere across the range of the GRSG. While not specific to Montana, MTFWP (2005) reported that unpublished data from Idaho (Autenrieth 1976) found that 59%, 85%, and 96% of nests occurred within 3.2-km, 6.4-km, and 8.0-km of leks, respectively. Holloran and Anderson (2005) studied nesting GRSG at 30 leks in central and western Wyoming and determined that 45% and 64% of female GRSG nested within 3.2-km and 5.0-km, respectively, of the lek where the hen was radio-collared. Although it occurs infrequently, female GRSG do nest at greater distances from a lek. Holloran and Anderson (2005) reported approximately 10% of all nests occurring between 9.0-km and 15.0-km from a lek and approximately 3% of all nests occurring beyond 15.0-km. The farthest distance reported in Holloran and Anderson (2005) was 27.4-km. Coates et al. (2013) observed declining surface use beyond 9.6-km, and that the majority of utilization for breeding populations, including migratory populations, was contained within 15.0-km.

Based on available literature and the professional judgment of the stakeholder group, all habitats within 3.2-km of a lek were assigned a score of 100 for this variable (Figure A. 2). Scores for remaining distances out to 10.0-km were developed in 1.6-km (1 mile) distance bins. Scores for each distance bin were determined by standardizing the percent of nests beyond each distance value by 0.32 (the minimum value of percent of nests beyond the specific distance for the 0.0-km to 3.2-km distance bin). All remaining scores were developed by averaging the standardized values within each distance bin and rounding to the nearest tenth. The score for the 6.4-km to 8.0-km distance bin was increased to 20 to provide a more conservative score than would have been calculated by rounding to the nearest tenth. The score for the 10.0-km to 20.0-km bin were 50% of the score for the 8.0-km to 10.0-km bin (Table A. 3).

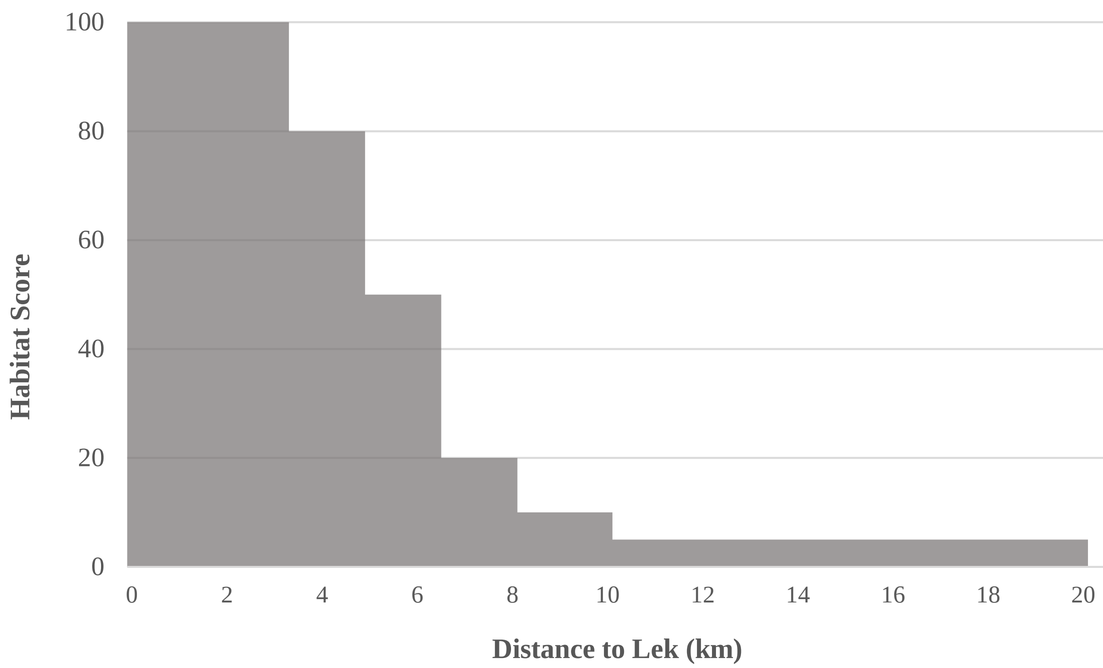

Figure A. 2. The Habitat Score for the distance to nearest lek Population and Habitat Variable.

GIS Steps for Habitat Score Creation:

1. Select active leks (CA, CI, UC) from Montana statewide lek dataset.
2. Create a Euclidean distance raster with a maximum distance of 20,000-m.
3. Reclassify raster with values corresponding to the Habitat Score (Table A. 33) based on an individual raster cells' distance from an active lek.

Table A. 3. Habitat Scores for each distance bin for the distance to lek Population and Habitat Variable.

Distance from Lek (km)	Habitat Score
0.0 – 3.2	100
>3.2 – 4.8	80
>4.8 – 6.4	50
>6.4 – 8.0	20
>8.0 – 10.0	10
>10.0 – 20.0	5
>20.0	0

2. Breeding Density

<u>Data Layers used in Habitat Score Creation</u>: *Range-wide breeding densities*, Doherty, et al. (2010; hereafter, Doherty model)

Leks are widely recognized as a focal point for occupancy and seasonal use, and lek counts provide a reasonable index to relative abundance of GRSG populations (Reese and Bowyer 2007). Studies show that during breeding seasons (lekking and nesting), GRSG select habitat near and surrounding leks (Holloran and Anderson 2005, Cagney et al. 2009, Doherty et al. 2011, and Fedy et al. 2012). Higher attendance leks likely influence GRSG populations more than lower attendance leks, and the birds using these leks may use habitats across broader spatial scales (Coates et al. 2013).

Breeding density models were used to identify areas with higher function for GRSG populations. Doherty et al. (2010a) developed a widely used spatial model of breeding density that can be used in the HQT. The Doherty et al. (2010a) model provides a spatially explicit, continuous variable that identifies breeding density across the range of the species. In their study, breeding density areas were modeled by assigning an abundance-weighted density (based on number of displaying males) to each lek, and then summed the number of displaying males, starting with the highest density until a given percent population threshold was met. This resulted in a defined percent of the population being identified in areas of the highest density of breeding sites across the range of the species. Doherty et al. (2010a) used known distributions of nesting hens around leks to delineate the outer boundaries of breeding areas. The model output is a grouping of nesting areas that represent the smallest areas necessary to contain 25, 50, 75, and 100 percent of the nesting GRSG populations. Area estimates are inclusive, in that the 25% population threshold is included within the boundary of the 50% population threshold. While this metric may correlate closely with the distance to lek variable, it was decided to retain both variables in the Montana HQT because the Stakeholder Group determined that for mitigation purposes, habitats closer to leks (greater numbers of nests) in areas with higher breeding densities (higher populations) should generate more credits if they are conserved.

The range-wide breeding density model (Doherty et al. 2010a) is classified into 25%, 50%, 75%, and 100% cumulative breeding thresholds quartiles with the highest relative breeding density in the 25% threshold quartile and the lowest breeding density in the 100% quartile (Figure A. 3). These thresholds were used to assign variable scores with the scores of 100 being assigned to the areas with the highest breeding density (25% quartile) with scores decreasing linearly to 25 for the 100% threshold quartile (Table A. 4). Areas outside of the breeding density model (modeled breeding density of 0) receive a score of 0. Scores for this variable will be updated as new breeding density data become available.

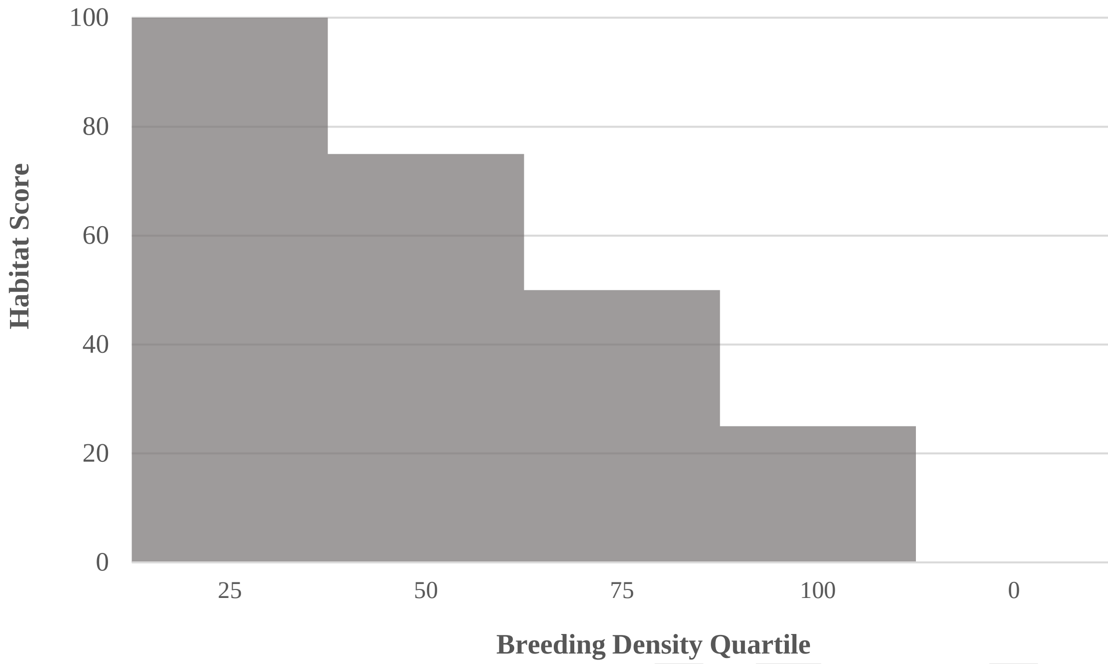

Figure A. 3. The Habitat Score for the breeding density Population and Habitat Variable.

GIS Steps for Habitat Score Creation:

1. Create raster that combines all vector outputs of Doherty model.
2. Reclassify Doherty model (Table A. 4) based on Table A. 3 above.

Table A. 4. Habitat Scores for each breeding density quartile bin for the breeding density Population and Habitat Variable.

Breeding Density (%)	Habitat Score
25	100
50	75
75	50
100	25
0 (outside model)	0

3. Unsuitable/Excluded Lands

The EO defines unsuitable habitat as "land within the historic range of sage grouse that did not, does not, or will not provide sage grouse habitat due to natural ecological conditions such as badlands or canyons" (EO No. 12-2015). Unsuitable habitat would include rock outcroppings, and open water or reservoirs of more than 10 acres in size. For the purposes of the HQT, excluded unsuitable lands would also include land cover classes that do not provide basic life requisites for GRSG, and may include urban areas, existing disturbance footprints, recent burns (<10 years) or areas of high elevation or forested habitats not suitable for sage grouse.

Data Layers used in Habitat Score Creation: MSDI 2016 Landcover

This metric “zeros” out all non-habitat land use types.

GIS Steps for Habitat Score Creation:

1. Reclassify the NHP land cover dataset so that all unsuitable/excluded land cover types are given a value of 0 while all other suitable land cover types are given a value of 100.
2. Use the table described in Appendix M for appropriate land cover values to remap.

4. Sagebrush Abundance

Data Layers used in Habitat Score Creation: MRLC Sagebrush Cover

This metric measures the proportion of sagebrush habitat available within a 1.0-km radius (3.14-km^2) moving window.

Walker et al. (2007) found that the proportion of habitat that was classified as sagebrush within 6.4-km of a given lek’s center location was a strong predictor of lek persistence in the Powder River Basin of Wyoming and Montana. Leks had a lower probability of persisting when areas within 6.4 km of the lek center had less than 30% sagebrush cover. Aldridge and Boyce (2007) used a moving window (1-km^2) to measure sagebrush cover and availability on the landscape. Their resource selection function found that GRSG selected nesting habitat that contained large patches (1-km^2) of sagebrush with moderate canopy cover and moderate sagebrush availability (i.e., heterogeneous distribution of sagebrush). Aldridge and Boyce (2007) found increasing probability of population persistence with increased availability of sagebrush on the landscape. Carpenter et al. (2010) found similar results. Their top resource selection functions included a quadratic function for sagebrush availability on the landscape, which indicates that areas of moderate sagebrush were selected more frequently than areas of low or homogenous sagebrush abundance. Doherty (2008) found that probability of GRSG use increased with increasing availability of sagebrush within 100.0m of a location. Wisdom et al. (2011) found that landscapes with less than 27% sagebrush availability were not different from landscapes from which GRSG have been extirpated. Similar to Aldridge and Boyce (2007), Wisdom et al. (2011) found that 50% sagebrush across a landscape was a good indicator of GRSG persistence.

Breakpoints for sagebrush cover in the model were determined from the above literature. The average probability of use of sagebrush by GRSG (odds or population persistence were also used, depending on study design) was calculated for projects occurring in Montana or in nearby states or Canadian provinces. Average values from Doherty (2008), Walker et al. (2007) and Aldridge and Boyce (2007), were calculated and standardized to a range of values between 0 and 100.

Using this approach, lands classified as sagebrush comprising 80% to 100% of a 3.14-km^2 window were characterized as having high habitat function and were assigned a score of 1.0 for this variable (Table A. 5; Figure A. 4). Lands classified as sagebrush comprising 40% to 80% of the window were determined to still have high habitat function and were assigned a score of between 75 and 90. Moderate functional scores (50 – 60) were assigned for areas having between 20% and 40% of lands classified as sagebrush in the assessment area. Areas with little sagebrush occurring in the assessment area received lower scores although areas having as little as 2% of the landscape classified as sagebrush still received a score of 15 due to use of silver sagebrush by GRSG.

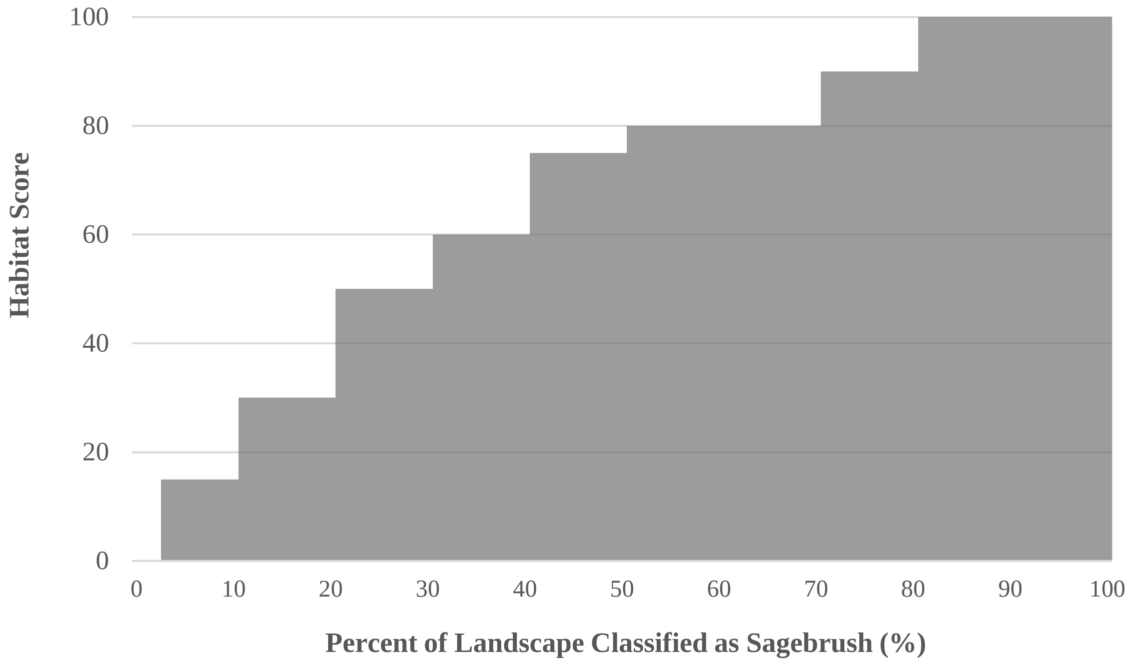

Figure A. 4. The Habitat Score for the proportion of land cover Population and Habitat Variable classified as sagebrush in a 3.14-km² moving assessment window.

<u>GIS Steps for Habitat Score Creation (for areas covered by NLCD data):</u>

1. Extract by mask and project the MRLC NLCD sagebrush cover dataset to sage grouse habitat.
2. Reclassify the MRLC NLCD sagebrush cover dataset so that all areas with > 2% sagebrush cover are given a value of 1 and all areas with ≤ 2% sagebrush cover are assigned a value of 0.
3. Use the “Focal Statistics” tool (1,000-m radius circle neighborhood, SUM statistics) to create a raster that represents the number of cells surrounding a particular cell that have been converted.
4. Convert the new raster to a float.
5. Divide the resulting raster by the maximum possible number of cells within a 1,000-m radius circle. This maximum value will be dependent on cell size used, so script in a variable equal to float (arcpy.GetRasterProperties_management(sagefloat, "MAXIMUM").getOutput(0)) to plug into the Division step.
6. Reclassify the resulting raster (Table A. 5).

Table A. 5. Range of values and Habitat Scores for the proportion of land cover classified as sagebrush in a 3.14-km² moving assessment window Population and Habitat Variable.

Sagebrush Abundance (%)	Habitat Score
0 – 2	0
>2 – 10	15
>10 – 20	30
>20 – 30	50
>30 – 40	60
>40 – 50	75
>50 – 70	80
>70 – 80	90
>80 – 100	100

5. Sagebrush Canopy Cover (%)

Data Layers used in Metric Creation: MRLC Sagebrush cover, MT sage grouse AOI

This metric measures the average sagebrush cover over the landscape. For most of the state, we can use the MRLC NLCD sagebrush cover dataset but it does not cover the western part of the state. For the areas not covered by the NLCD dataset, we calculate the sagebrush cover by extrapolating attributes from various vegetation transects in the area.

Sagebrush cover is an important attribute of nesting habitat because hens nest almost exclusively under sagebrush plants, with some limited exceptions documented in Montana. Connelly et al. (2000) cite 13 references to suitable sagebrush cover that range from 15% to 38% mean canopy cover surrounding the nest. Citations contained within Crawford et al. (2004) reported 12% to 20% cover, including 41% cover in nesting habitat though this percentage is likely rare in Montana. In their species assessment, Connelly et al. (2000) conclude that 15% to 25% canopy cover is the recommended range for productive GRSG nesting habitat. This is also the range identified in the *Sage-grouse Habitat Assessment Framework* (Stiver et al. 2015) as providing the highest function for GRSG based on a review of the available literature. Wallestad and Pyrah (1974) reported that successful nests were in stands where sagebrush cover approximated 27%. This cover range is used as a goal in some GRSG management guidelines (Bohne et al. 2007, BLM et al. 2000). Cagney et al. (2009) guidelines for grazing in GRSG habitat state that hens tend to select an average 23% live sagebrush canopy cover when selecting nesting sites. However, outside the optimal range, other studies (e.g., Perkins 2010) have found canopy cover >25% may still provide moderate suitability for nesting. For example, sagebrush canopy cover was higher on average around successful nests (33%) than unsuccessful nests (22%) in Wildcat Knoll, Utah (Perkins 2010).

In Montana, sagebrush cover used during nesting and breeding use periods are similar to those reported elsewhere across the range of GRSG. Doherty (2008) reported 20-30% cover surrounding nest locations in the Powder River Basin. Foster et al. (2014) found that habitat use by radio-collared GRSG during the breeding and nesting season was highest between 15-25% canopy cover. Tack (2009), Lane (2005), Woodward (2006), and Woodward et al. (2011) reported similar results with an average of approximately 15% canopy cover around nest locations. Overall, GRSG in Montana use a wide range of sagebrush canopy cover classes and use is based on availability and spatial variation across the GRSG habitats in Montana. The range of sagebrush canopy cover classes is critically important to provide a variety of cover and forage resources that change seasonally.

Sagebrush cover is also an important attribute of brood-rearing habitat. Connelly et al. (2000) found that productive brood-rearing habitat should include 10% to 25% cover of sagebrush. This is the range used as a goal in GRSG management guidelines in Oregon (Bohne et al. 2007, BLM et al. 2000). While sagebrush is a vital component of GRSG habitat, very thick shrub cover (e.g., >60%) may inhibit understory vegetation growth and reduce the birds' ability to detect predators (Wiebe and Martin 1998). In Montana, the range of canopy cover conditions reported for GRSG is largely consistent with reported values elsewhere in the range of the species. Klebenow (1969) reported that brood-rearing and summer use activities occurred in habitats having 15-35% cover. Martin (1970) reported brood and summer use activities in habitats having 10-35% cover. Foster et al. (2014) found that radio-collared GRSG in southeastern Montana used habitats having 10-35% cover with the majority of use occurring in areas having 15-25% cover. Woodward et al. (2011) and Lane (2005) reported brood/summer use in habitats having 10-15% cover.

Sagebrush is an essential component of winter habitat because GRSG winter diets are almost exclusively sagebrush leaves. Connelly et al. (2000) cite 10 references to sagebrush coverage in winter-use areas that range from 15% to 43% mean canopy cover [Crawford et al. (2004) also cites 2 of these references in their assessment]; however, they considered a canopy of 10-30% cover (above the snow) as a characteristic of sagebrush needed for productive GRSG winter habitat. This is the cover range used as a goal in GRSG management guidelines in Oregon (Bohne et al. 2007, BLM et al. 2000). However, conditions in Montana may not be consistent with these studies because of differences in winter conditions and snow depth. Eng and Schladweiler (1972), Foster et al. (2014), Wallestad and Pyrah (1974), and Woodward et al. (2011) provide Montana-specific values of sagebrush canopy cover in winter use areas. Eng and Schladweiler (1972) found that GRSG winter use in eastern Montana generally occurred in areas with greater than 20% sagebrush canopy cover. Foster et al. (2014) found that 78% of all use by radio-collared GRSG in southeastern Montana occurred in sagebrush habitats having 11-25% cover with an average of 11-13% cover in critical and important habitats. Only 7% of all GRSG use occurred in habitats greater than 25% cover with no use in habitat having greater than 31% cover.

Seasonal canopy cover values were standardized to a range of values between 0 and 100 for habitat variable scoring purposes. The maximum standardized seasonal use value across all three seasons was used as the basis for variable scoring (Table A. 6). Recognizing that optimal canopy cover conditions may vary slightly across seasons, the maximum standardized seasonal value was used rather than the average standardized value. This approach ensures that the HQT score for this habitat variable receives the maximum score possible for each sagebrush cover bin that was identified.

Across all seasons, the highest reported GRSG use in Montana occurred in habitats having 15-25% cover with the lowest use occurring in areas with sparse or extremely high sagebrush canopy cover. Sagebrush percent canopy cover of 15% to 30% was assumed to provide the highest function and was assigned a score of 100 (Table A. 6; Figure A. 5). Consistency in use of this range of sagebrush cover across all seasons supports this score. Areas with moderately more (30-40%) or less (10-15%) cover than the optimal range were determined to be highly functional and received scores of 70 and 90, respectively, using the maximum standardized seasonal values. Areas with substantially more (>45%) or less (<10%) cover than the optimal range were given lower scores. Areas with less than 3% canopy cover were given a score of 0.

Table A. 6. Standardized seasonal canopy cover values used to develop the Habitat Scores for the sagebrush canopy cover Population and Habitat Variable.

Canopy Cover (%)	Nesting/ Breeding	Brood/ Summer	Winter	Maximum Seasonal Value
0	10	0	0	10
5	40	40	0	40
10	60	90	50	90
15	100	100	100	100
20	100	100	100	100
25	100	100	100	100
30	70	70	50	70
35	60	70	50	70
40	50		50	50
45	40			40
50	40			40

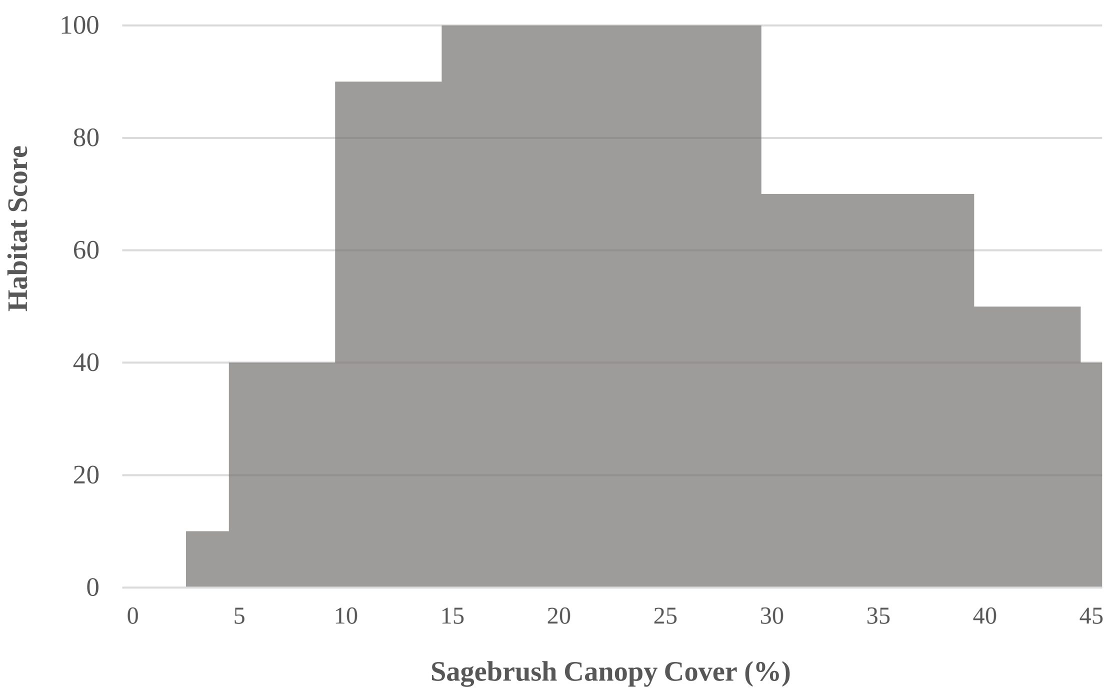

Figure A. 5. The Habitat Score for the sagebrush canopy cover Population and Habitat Variable.

<u>GIS Steps for Habitat Score Creation:</u>

1. Reclassify the MRLC NLCD sagebrush cover raster according to the table below.
2. Extract by mask the MRLC NLCD sagebrush cover using the MT sage grouse AOI.
3. Reclassify sagebrush cover percentage (Table A. 7):

Table A. 7. Range of values and Habitat Scores for the sagebrush canopy cover Population and Habitat Variable.

Sagebrush Cover (%)	Habitat Score
0 – <3	0
3 – <5	10
5 – <10	40
10 – <15	90
15 – <30	100
30 – <40	70
40 – <45	50
≥45	40

6. Sagebrush Height

Data Layers used in Habitat Score Creation: MRLC Sagebrush Height

Sagebrush canopy height is an important aspect of all GRSG seasonal habitats. However, literature recommendations for sagebrush height for GRSG habitat vary seasonally and regionally. Scores for this habitat variable were calculated by evaluating reported average seasonal sagebrush requirements for GRSG populations in Montana. Sagebrush height was characterized for winter, nesting/breeding, and brood/summer use periods, respectively.

Sagebrush height is an important attribute of GRSG nesting habitat. Connelly et al. (2000) reports that sagebrush heights ranging from 29.0-cm to 79.0-cm mean height are most commonly used during nesting. In their assessment, Connelly et al. (2000) conclude that sagebrush with a height of 30.0-cm to 80.0-cm is needed for productive GRSG nesting habitat in arid sites and 40.0-cm to 80.0-cm in mesic sites. These ranges are used by Stiver et al. (2015), who recommend a range of 30.0-cm to 80.0-cm at arid sites, and BLM et al. (2000), which state that optimum GRSG nesting habitat consists of sagebrush stands containing plants 40.0-cm to 80.0-cm tall. Heights of 40.0-cm to 80.0-cm are rarely reported in literatures specific to GRSG in Montana.

Because of the differences in reported Montana sagebrush height values and values reported elsewhere across the range of the species, Montana-specific data and literature were used to evaluate height requirements during the nesting season. In Montana, GRSG nesting was most commonly reported in habitats having sagebrush heights between 15.0-cm and 50.0-cm (Eng and Schladweiler 1972, Lane 2005, Wisinski 2007, Woodward et al. 2011, Foster et al. 2014). Lane (2005) reported the most variable range of conditions with nesting occurring in sagebrush with heights between 25.0-cm and 50.0-cm. In southeastern Montana, Foster et al. (2014) reported that radio-collared GRSG most commonly nested in habitats having heights between approximately 30.0-cm and 40.0-cm. Wisinski (2007) reported similar ranges of conditions in nesting habitats with highest use reported for sagebrush heights between 25.0-cm and 45.0-cm.

During the brood rearing season, GRSG may use habitats that are not dominated by sagebrush (Connelly et al. 2000). Schreiber et al. (2015) found that while sagebrush was necessary to support brood-rearing in most cases, visual obstruction provided by all vegetation types between 0.0-cm and 45.7-cm was the most influential variable in models predicting brood survival. Hansen et al. (2016) found a similar influence of visual obstruction for nesting sites although sagebrush cover and height greater than 20.0-cm were also influential in models of nest site selection. In Montana, sagebrush heights were reported for a number of studies and were used to evaluate Montana-specific requirements of sagebrush height during the brood-rearing and summer use periods. Sagebrush heights of 20.0-cm to 65.0-cm have been reported for brood and summer use habitats in Montana (Martin 1970, Lane 2005, Wisinski 2007, Woodward et al. 2011, Foster et al. 2014,). The most commonly reported range of sagebrush heights used in Montana falls between 20.0-cm and 45.0-cm (Lane 2005, Wisinski 2007, Foster et al. 2014).

Important structural components in winter habitat include medium to tall (25.0-cm to 80.0-cm) sagebrush stands (Crawford et al. 2004). Connelly et al. (2000) cite 10 references to sagebrush height in winter habitat that range from 20.0-cm to 46.0-cm above the snow. Two studies cited by Connelly et al. (2000) measured the entire plant height and provided a range from 41.0-cm to 56.0-cm. In their assessment, Connelly et al. (2000) conclude that characteristics of productive winter habitat include sagebrush that is 25.0-cm to 35.0-cm in height above the snow. This is the height range used as a goal in GRSG management guidelines in Oregon (Bohne et al. 2007, BLM et al. 2000).

Ranges for winter use developed across the range of the GRSG may not be representative of conditions in Montana because of differences in sagebrush communities as well as snowfall depths and winter conditions. For Montana GRSG, Eng and Schladweiler (1972) and Woodward et al. (2011) found that sagebrush height of 25.0-cm to 35.0-cm were most commonly used in winter months. In southeastern Montana, Foster et al. (2014) found that use by radio-collared GRSG occurred in habitats having sagebrush height between approximately 8.0-cm and 80.0-cm with mean sagebrush heights of 20.0-cm to 28.0-cm in important winter habitat areas.

Seasonal sagebrush height averages were standardized to a range of values between 0 and 100.0 for final scoring purposes. The maximum standardized seasonal value across all three seasons was used as the basis for the habitat variable scoring (Table A. 8). Recognizing that optimal sagebrush height conditions may vary slightly across seasons, the maximum standardized seasonal value was used rather than the average standardized value. This approach ensures that the HQT score for this variable receives the maximum score possible for each sagebrush height bin that was identified.

Across all seasons, the highest reported GRSG use in Montana occurred in habitats having sagebrush heights of 25.0-cm to 40.0-cm (Table A. 8; Figure A. 6). This range of values was assigned a score of 100.0 (Table A. 8) for the sagebrush height habitat variable as that range has the potential to provide high quality habitat conditions across all seasons (Table A. 8). Based on the maximum standardized seasonal height values, sagebrush having heights between 15.0-cm and 25.0-cm and those with heights between 45.0-cm and 70.0-cm were assigned moderate to high scores (60-90). As sagebrush canopy height decreases, the value of a sagebrush plant to provide cover for nesting females and their nests/broods or provide winter habitat is diminished. Sagebrush heights of less than 10.0-cm were assigned a score of 0.0 due to the lack of reported use in habitats with extremely low growing sagebrush.

Table A. 8. Standardized seasonal sagebrush height values used to develop the Habitat Scores for the sagebrush height Population and Habitat Variable.

Sagebrush Height (cm)	Nesting/ Breeding	Brood/ Summer	Winter	Maximum Seasonal Value
0	--	--	--	--
5	--	--	--	--
10	10	10	10	10
15	60	30	20	60
20	70	80	50	80
25	90	90	100	100
30	100	100	100	100
35	100	100	80	100
40	100	100	20	100
45	80	90	10	90
50	70	70	10	70
55	40	80	10	80
60	20	60	10	60
65	10	60	10	60

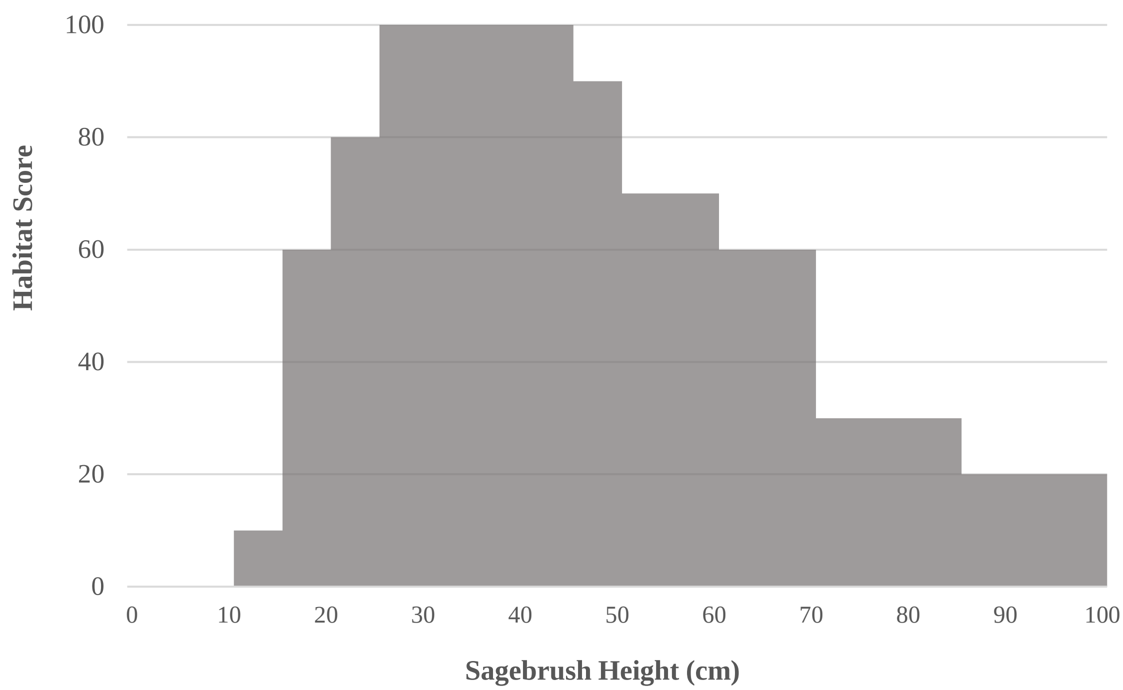

Figure A. 6. The Habitat Score for the sagebrush canopy height Population and Habitat Variable.

GIS Steps for Habitat Score Creation (for areas covered by the NLCD data):

1. Reclassify the MRLC NLCD sagebrush height raster (Table A. 9).
2. Extract by mask the MRLC NLCD sagebrush height to sage grouse habitat

Table A. 9. Range of values and Habitat Scores for the sagebrush canopy height Population and Habitat Variable.

Sagebrush Canopy Height (cm)	Habitat Score
0 – 10	0
>10 – 15	10
>15 – 20	60
>20 – 25	80
>25 – 45	100
>45 – 50	90
>50 – 60	70
>60 – 70	60
>70 – 85	30
>85	20

7. Distance to Suitable Upland Habitat

Data Layers used in Metric Creation: MSDI 2016 Landcover

This metric measures the distance to suitable upland/nesting habitat from all mesic/lowland habitats.

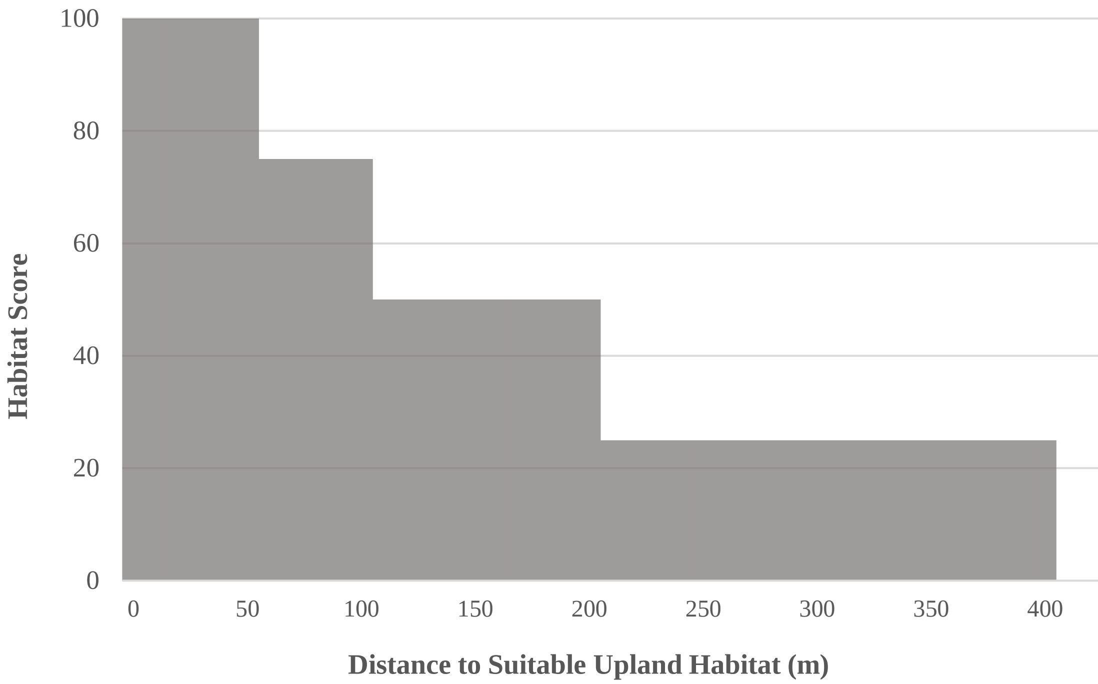

Figure A. 7. The Habitat Score for the distance to suitable upland Population and Habitat Variable.

<u>GIS Steps for Habitat Score Creation:</u>

1. Reclassify the NHP land cover dataset so that all suitable upland land cover types (shrub habitats) are given a value of 1 while all other land cover types are given a value of 0.
2. Extract by attribute only the suitable upland land cover types.
3. Run the Euclidean Distance tool to create a raster that represents the distance (in meters) to the closest suitable upland habitat.
4. Reclassify the distance raster (Table A. 10).

Table A. 10. Range of values and Habitat Scores for the distance to suitable upland Population and Habitat Variable.

Distance to Suitable Upland Habitat (m)	Habitat Score
0 – 50	100
>50 – 100	75
>100 – 200	50
>200 – 400	25
>400	0

8. Habitat Score Raster

Create a raster output that is the average of the seven outputs described in Part I:

$$\textbf{\textit{Habitat Score}} = ([Distance\ to\ Lek * Breeding\ Density * Excluded\ Lands * Sagebrush\ Abundance * Sagebrush\ Cover * Sagebrush\ Height * Distance\ to\ Upland]/7)$$

ANTHROPOGENIC VARIABLES

<u>GIS Steps for Preprocessing the input data sources:</u>

1. Merge DNRC Existing Disturbance and DNRC Submitted Disturbance data layers
2. Dissolve by 'Disturbance Type' attribute field
3. Create 'Dummy Mosaic' with value = 100 that covers all of Sage grouse habitat
4. Resulting data layer: DNRC Total Disturbance

1. Oil & Gas Well Density

<u>Data Layers used in Anthropogenic Score Creation</u>: DNRC Total Disturbance

This metric measures the density of oil and gas wells in an area to quantify their impact on nearby habitats.

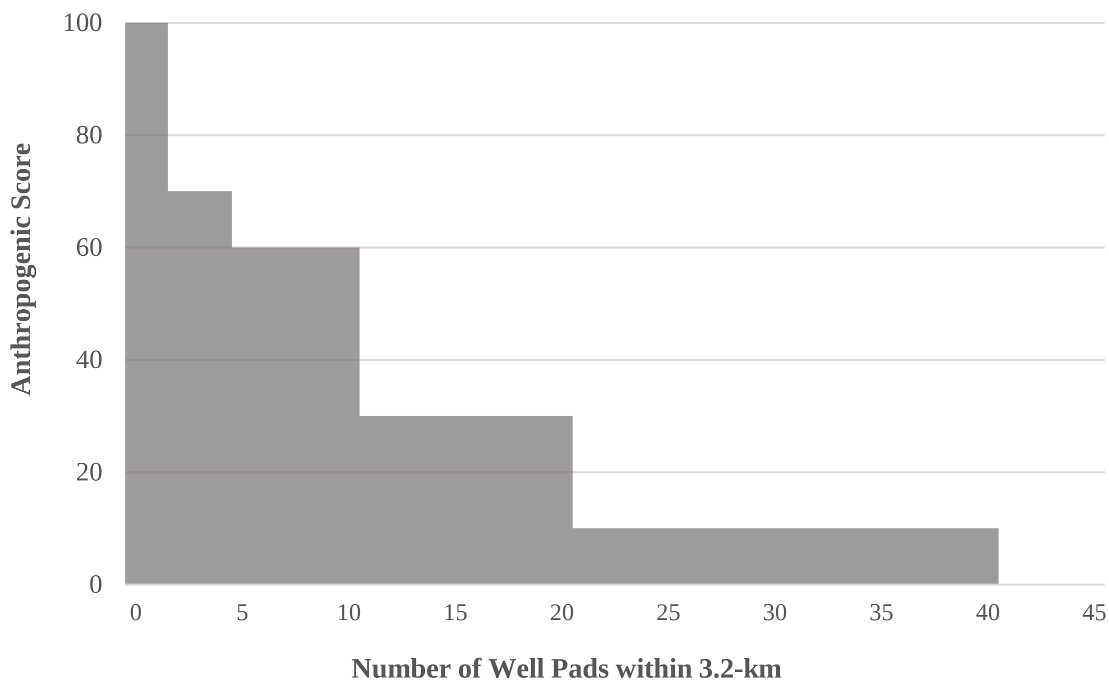

Figure A. 8. The Anthropogenic Score for the number of well pads Anthropogenic Variable.

GIS Steps for Anthropogenic Score Creation:

1. Query “well pads” out of DNRC Total Disturbance to create Well Pads layer.
2. Convert features in the Well Pads layer to points using centroid and point location.
3. Add a new field to the Well Pads layer called “count” and calculate the field = 1. This field will be used in the next step to run the point statistics tool.
4. Run the Point Statistics tool (1,000-m radius circle neighborhood, SUM statistics) on the “count” field in the Well Pads layer. The resulting raster layer represents the number of wells within 1.0-km of each cell.
5. Reclassify the point statistics raster (Table A. 11).
6. Combine the reclassified well density raster with the dummy raster that covers all sage grouse habitat using ‘Mosaic to New Raster’ making sure to use “MINIMUM” as the mosaic operator to create the Final Well Density raster.

Table A. 11. Range of values and Anthropogenic Scores for the number of well within a 1.0-km radius Anthropogenic Variable.

Number of Wells within 1.0-km	Anthropogenic Score
0 – 1	100
2 – 4	70
5 – 10	60
11 – 20	30
21 – 40	10
≥41	0

2. Distance to Tall Structure

Data Layers used in Anthropogenic Score Creation: DNRC Total Disturbance

Disturbances included in this metric are tall features such as Wind Turbines, Cell Towers, Transmission Line Towers, and Substations. This metric measures the distance to the nearest tall structure for each cell to quantify the impacts of tall structures on nearby habitats.

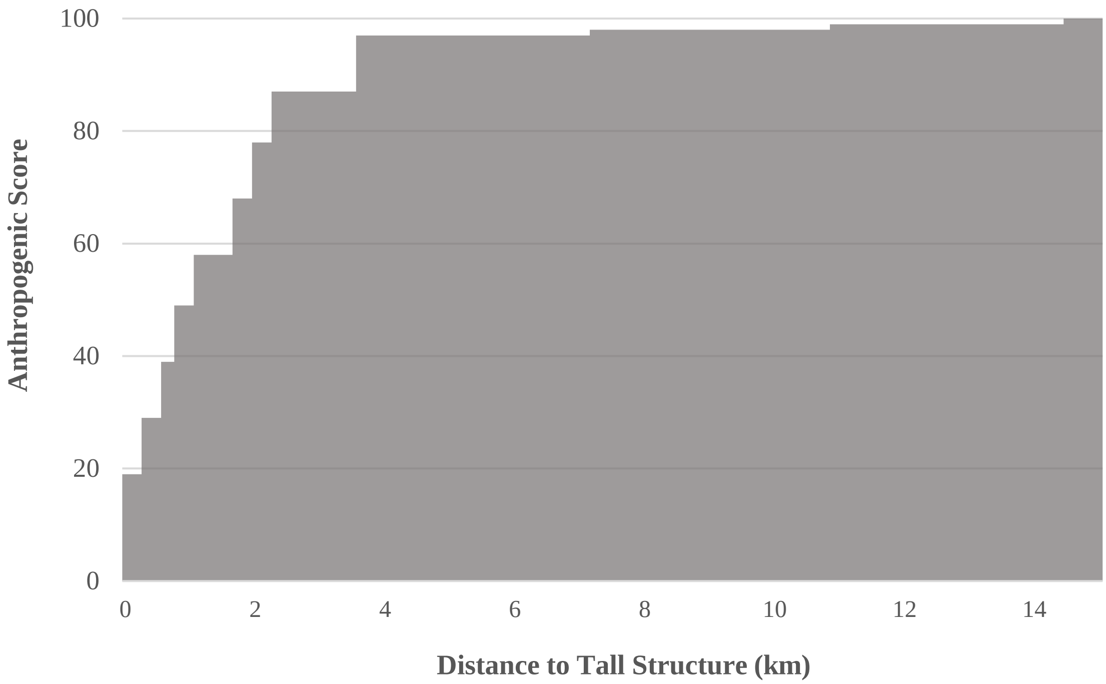

Figure A. 9. The Anthropogenic Score for the distance to tall structures Anthropogenic Variable.

<u>GIS Steps for Anthropogenic Score Creation:</u>

1. Query Tall Structures out of DNRC Total Disturbance to create Tall Structures layer.
2. Buffer the Tall Structures layer by 14,484-m to create an output extent layer.
3. Run Euclidean distance on Tall Structures layer with a maximum distance of 14,484-m, specifying the previous buffer as the extent in environments settings.
4. Reclassify this raster (Table A. 12).
5. Combine the reclassified Tall Structures raster with the dummy raster that covers all sage grouse habitat using ‘Mosaic to New Raster’ making sure to use “MINIMUM” as the mosaic operator to create the Final Tall Structures raster.

Table A. 12. Range of values and Anthropogenic Scores for the distance to tall structure Anthropogenic Variable.

Distance to Tall Structure (km)	Anthropogenic Score
0 – <0.3	19
0.3 – <0.6	29
0.6 – <0.8	39
0.8 – <1.1	49
1.1 – <1.7	58
1.7 – <2.0	68
2.0 – <2.3	78
2.3 – <3.6	87
3.6 – <7.2	97
7.2 – <10.9	98
10.9 – <14.5	99
≥14.5	100

3. Distance to Transmission Line

Data Layers used in Metric Creation: DNRC Total Disturbance

Disturbances included in this metric are above-ground linear features such as Transmission Lines and Power Lines. This metric measures the distance to the nearest "Transmission Line" for each cell to quantify the impacts on nearby habitats.

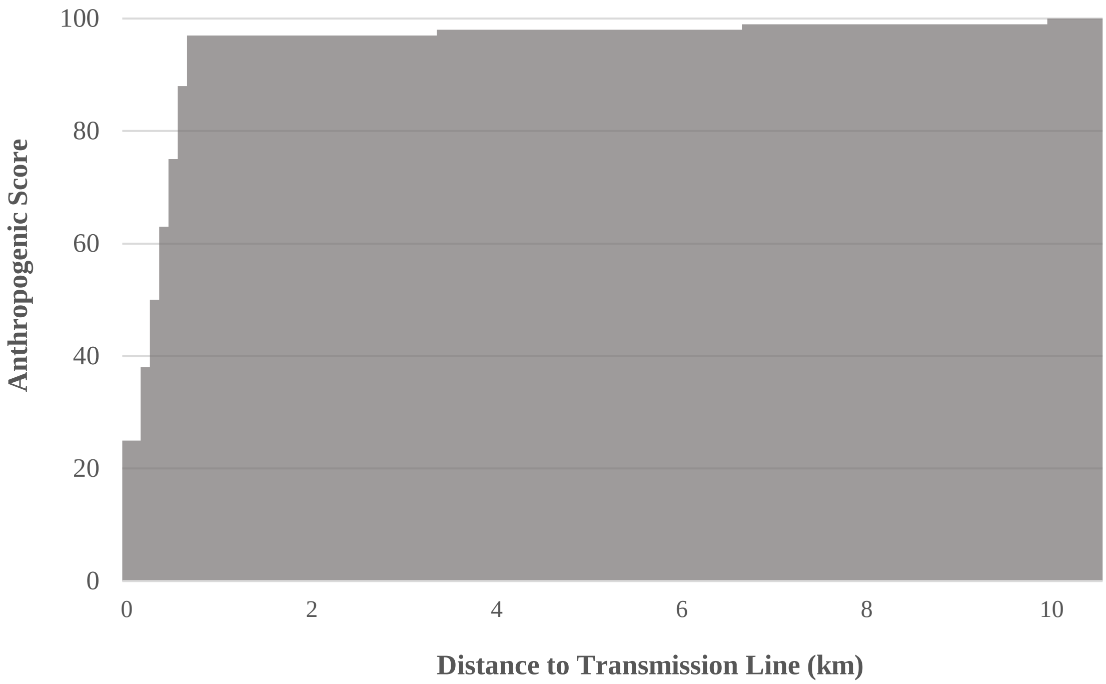

Figure A. 10. The Anthropogenic Score for the distance to transmission line Anthropogenic Variable.

<u>GIS Steps for Anthropogenic Score Creation:</u>

1. Query Transmission Lines out of DNRC Total Disturbance to create Transmission Lines layer.
2. Buffer the Transmission Lines layer by 10,000-m to create an output extent layer.
3. Run Euclidean distance on Transmission Lines layer with a maximum distance of 10,000-m, specifying the previous buffer as the extent in environments settings.
4. Reclassify this raster (Table A. 13).
5. Combine the reclassified Transmission Lines raster with the dummy raster that covers all sage grouse habitat using 'Mosaic to New Raster' making sure to use "MINIMUM" as the mosaic operator to create the Final Transmission Lines raster.

Table A. 13. Range of values and Anthropogenic Scores for the distance to transmission line Anthropogenic Variable.

Distance to Transmission Line (km)	Anthropogenic Score
0 – 0.1	25
>0.1 – 0.2	38
>0.2 – 0.3	50
>0.3 – 0.4	63
>0.4 – 0.5	75
>0.5 – 0.6	88
>0.6 – 3.333	97
>3.333 – 6.666	98
>6.666 – 10	99
≥10	100

4. Distance to Moderate Roads, Pipelines, Fiber Optic Cables, and Other Buried Utilities

Data Layers used in Anthropogenic Score Creation: DNRC Total Disturbance

This metric measures the distance to the nearest moderate road or buried utility for each cell to quantify the impacts on nearby habitats.

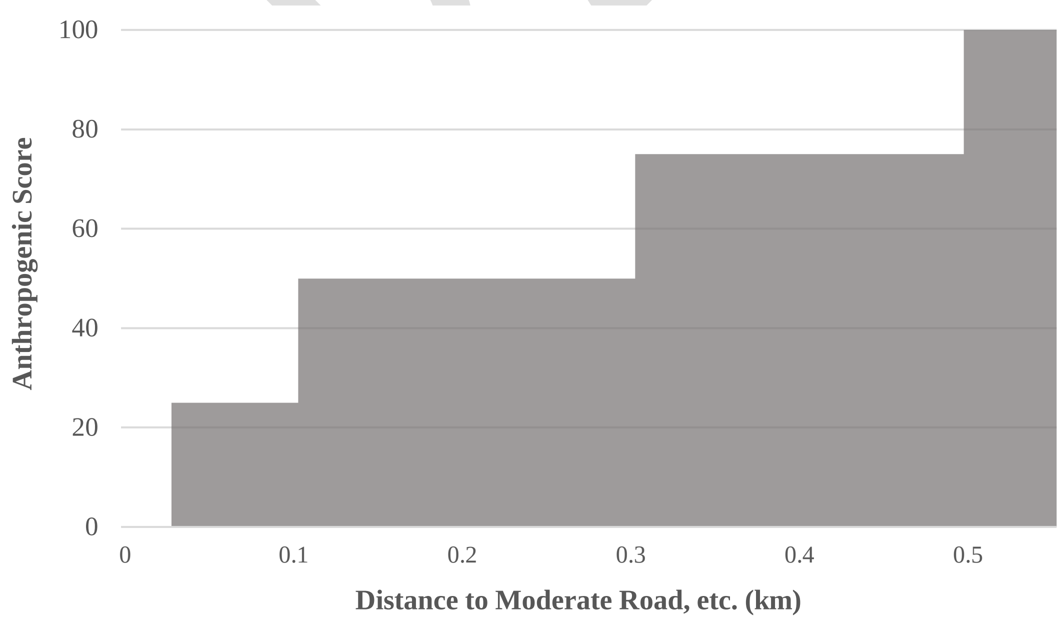

Figure A. 11. The Anthropogenic Score for the distance to moderate roads, pipelines, fiber optics, and other buried utilities Anthropogenic Variable.

GIS Steps for Anthropogenic Score Creation:

1. Query DNRC Total Disturbance to extract all impactful linear disturbances that are considered moderate roads or buried utilities to create Moderate Roads & Buried Utilities layer.
2. Buffer the Moderate Roads & Buried Utilities layer by 500-m to create an extent buffer layer.
3. Run Euclidean distance on the layer specifying 500-m as the maximum distance. Assign the 500-m extent buffer layer as the extent in environment settings.
4. Reclassify the resulting raster (Table A. 14).
5. Combine the reclassified Moderate Roads & Buried Utilities raster with the dummy raster that covers all sage grouse habitat using 'Mosaic to New Raster' making sure to use "MINIMUM" as the mosaic operator to create the Final Moderate Roads & Buried Utilities raster.

Table A. 14. Range of values and Anthropogenic Scores for the distance to Moderate Roads, Pipelines, Fiber Optic Cables, and Other Buried Utilities Anthropogenic Variable.

Distance to Moderate Road & Buried Utilities (km)	Anthropogenic Score
>0.5	100
>0.3 – 0.5	75
>0.1 – 0.3	50
>0.025 – 0.1	25
0.0 – 0.025	0

5. Agriculture, Mine, and Other Land Conversion Activities (%)

Data Layers used in Anthropogenic Score Creation: MSDI LULC and DNRC Total Disturbance

This metric measures the density of land conversion (due to agriculture, mining, etc.) in an area.

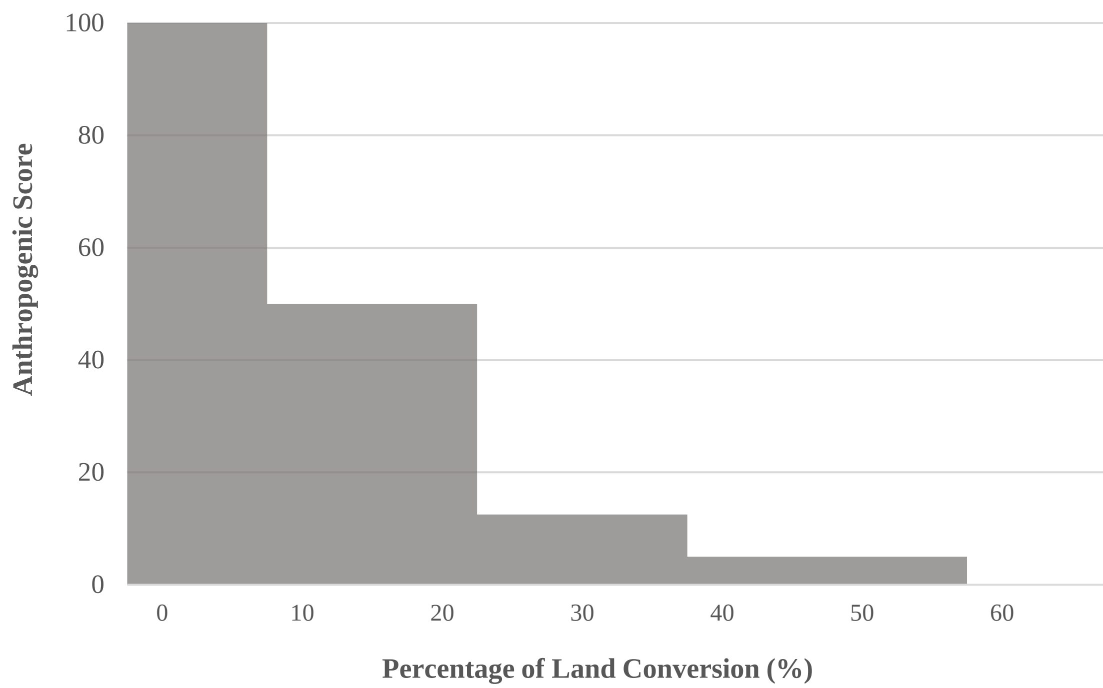

Figure A. 12. The Anthropogenic Score for the percentage of land classified as agriculture, mines, or other large conversion activities Anthropogenic Variable.

<u>GIS Steps for Anthropogenic Score Creation:</u>

1. Reclassify the MSDI LULC data layer so all land conversion land cover types (agriculture, mining, etc.) are given a value of 1 while all other land cover types are given a value of 0 to create an MSDI Land Conversion layer.
2. Create a feature layer of land conversion disturbances (agriculture, cropland, mining) from the DNRC Total Disturbance layer. Convert this feature class to a raster. Reclassify this raster so that all areas of land conversion are given a value of 1 to create a DNRC Land Conversion layer.
3. Merge the MSDI Land Conversion layer and DNRC Land Conversion layer using the "Mosaic to New Raster" tool (MAXIMUM Mosaic operator) to create a Land Conversion layer.
4. Use the "Focal Statistics" tool (3,200-m radius circle neighborhood, SUM statistics) to create a raster that represents the number of cells surrounding a particular cell that have been converted.
5. Convert the new raster to data type: float.
6. Divide the resulting raster by the maximum possible number of cells within a 3,200-m radius circle. This maximum value will be dependent on cell size used, so script in a variable equal to: "float(arcpy.GetRasterProperties_management(Agminefloat, "MAXIMUM").getOutput(0))" to plug into the Division step.
7. Reclassify the resulting raster (Table A. 15).
8. Combine the reclassified Land Conversion density raster with the dummy raster that covers all sage grouse habitat using 'Mosaic to New Raster' making sure to use "MINIMUM" as the mosaic operator to create the Final Land Conversion raster.

Table A. 15. Range of values and Anthropogenic Scores for the percentage of land classified as agriculture, mines, or other large conversion activities Anthropogenic Variable.

Percentage of Land Conversion (%)	Anthropogenic Score
0 – <10	100
10 – <25	50
25 – <40	12.5
40 – <60	5
≥60	0

6. Distance to Large Roads

Data Layers used in Anthropogenic Score Creation: DNRC Existing Disturbance, MDT Yearly Traffic Count data

This metric measures the distance to the nearest large road for each cell to quantify the impacts on nearby habitats.

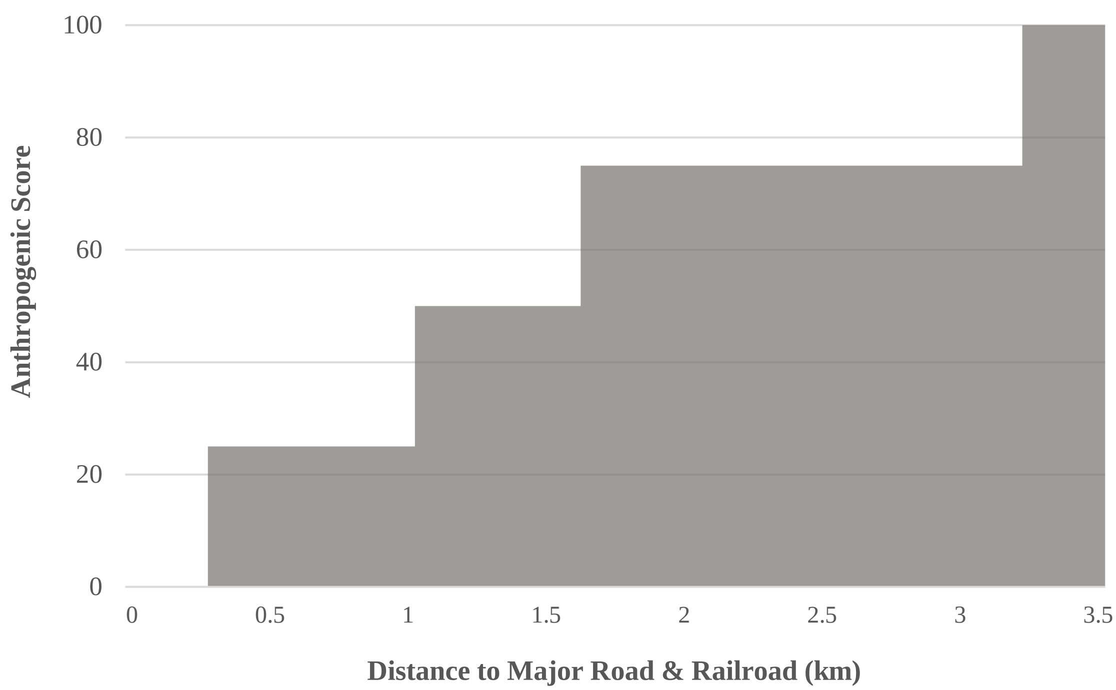

Figure A. 13. The Anthropogenic Score for the distance to major roads and railroads Anthropogenic Variable.

GIS Steps for Anthropogenic Score Creation:

1. Query high traffic roads from MDT Yearly Traffic Count data that intersect roads from DNRC Existing Disturbance and merge with queried railroads from DNRC Existing Disturbance to create Large Roads & Railroads layer.

2. Buffer the Large Roads & Railroads layer by 3,200-m to create an output extent layer.
3. Run Euclidean distance on Large Roads & Railroads layer with a maximum distance of 3,200-m, specifying the previous buffer as the extent in environments settings.
4. Reclassify this raster (Table A. 16).
5. Combine the reclassified Large Roads & Railroads raster with the dummy raster that covers all sage grouse habitat using 'Mosaic to New Raster' making sure to use "MINIMUM" as the mosaic operator to create the Final Large Roads & Railroads raster.

Table A. 16. Range of values and Anthropogenic Scores for the distance to major road and railroad Anthropogenic Variable.

Distance to Major Road & Railroad (km)	Anthropogenic Score
>3.2	100
>1.6 – 3.2	75
>1.0 – 1.6	50
>0.25 – 1.0	25
0.0 – 0.25	0

7. Compressor Stations & Other Noise Sources

<u>Data Layers used in Anthropogenic Score Creation</u>: DNRC Total Disturbance, and other sources to be determined.

DNRC will add information and GIS modifier functions for this metric at a later date. The metric will be referred to in the following as TBD Noise Sources raster.

8. All Other Disturbances

<u>Data Layers used in Anthropogenic Score Creation</u>: DNRC Total Disturbance

The All Other Disturbances metric includes disturbances not explicitly mentioned above.
For All Other Disturbances, the direct footprint of the disturbance will be converted to a pixel value of 0, but the disturbance will not be buffered to create an Indirect Impacts modifier for these types of disturbances.

9. Total Anthropogenic Score

<u>Data Layers used in Anthropogenic Score Creation</u>: Final Well Density raster, Final Tall Structures raster, Final Transmission Lines, Final Moderate Roads & Buried Utilities raster, Final Land Conversion raster, Final Large Roads & Railroads raster, TBD Noise Sources raster, and All Other Disturbances raster.

This metric combines all the anthropogenic Score into one overall anthropogenic habitat modifier layer.

<u>GIS Steps for Anthropogenic Score Creation:</u>

1. Divide each raster in the Data Layer list by 100 to convert them to decimal values between 0 – 1.
2. Multiply rasters together to get the Anthropogenic Modifier raster.

MONTANA HQT BASEMAP TOTAL: FINAL RASTER CREATION

<u>Data Layers used in Habitat and Anthropogenic Score Total Creation</u>: Habitat Score Total raster, Anthropogenic Score Total raster

This metric combines the Habitat Score raster and the Anthropogenic Score raster to create the Final Montana HQT Basemap raster.

<u>GIS Steps for Metric Creation:</u>

1. Multiply Habitat Score raster by the Anthropogenic Score raster and divide by 100.

$$\boldsymbol{Montana\ HQT\ Basemap\ Total} =$$

$$\left(\frac{[Total\ Habitat\ \ Score * Total\ Anthropogenic\ Score]}{100}\right)$$

Appendix B. ANTHROPOGENIC VARIABLE: OIL & GAS

When a new Oil and Gas project is proposed, all infrastructure for the proposal is overlain on the Montana HQT Basemap. Other infrastructure for the proposed project may include roads, transmission lines, etc. Specific Anthropogenic Scores are calculated to generate the Total Anthropogenic Score for the new Oil and Gas project (Figure B. 1). This project specific score is multiplied by the Montana HQT Basemap Total to produce a Project specific Raw HQT Score. (Section 3.2.3).

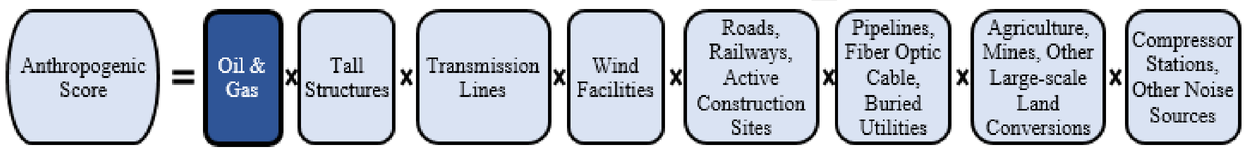

Figure B. 1. Equation for calculating the Anthropogenic Score for Oil & Gas projects and any additional infrastructure.

SUPPORTING LITERATURE

Numerous studies have shown that oil and gas well pads consistently have a deleterious effect on habitat selection by GRSG and on lek persistence and attendance, although the size of the effect varied by region, development type, and season. Research indicates that anthropogenic features, including oil and gas well pads, negatively affect GRSG habitat (including lek persistence and winter habitat use) at various spatial scales. Dinkins et al 2014 notes that sage grouse selected habitat with lower densities of oil and gas structures at all reproductive stages.

After controlling for habitat, Walker et al. (2007) found support for negative effects of coal bed natural gas (CBNG) development within 0.8-km and 3.2-km of the lek and for a time lag between CBNG development and lek disappearance, as indexed by male lek attendance and lek persistence. From 2001 to 2005, lek-count indices in CBNG fields declined by 82%, at a rate of 35% per year, whereas indices outside CBNG declined by 12%, at a rate of 3% per year. Among leks active in 1997 or later, fewer leks remained active by 2004–2005 in CBNG fields (38%) than outside CBNG fields (84%). Of 12 leks in CBNG fields monitored intensively enough to determine the year when they disappeared, 12 became inactive after or in the same year that development occurred. The average time between CBNG development and lek disappearance for these leks was 4.1 +/- 0.9 years. Walker's findings refute the idea that prohibiting surface infrastructure within 0.4 km of the lek is sufficient to protect breeding populations and indicate that increasing the size of no-development zones around leks would increase the probability of lek persistence. The buffer size required would depend on the amount of suitable habitat around the lek and the level of population impact deemed acceptable. Timing restrictions on construction and drilling during the breeding season do not prevent impacts of infrastructure (e.g., avoidance, collisions, raptor predation) at other times of the year, during the production phase (which may last a decade or more), or in other seasonal habitats that may be crucial for population persistence (e.g., winter).

Findings from Dinkins et al. (2014a) suggests that anthropogenic features influence GRSG habitat selection at a large spatial extent, and that a 3.0-km radius from a point count location represents the best spatial extent for density variables (including oil and gas structures, power lines, and major roads). In general, GRSG responded to most anthropogenic features by avoiding them, regardless of the bird's reproductive stage. Further, Dinkins notes that sage-grouse exhibit high individual (among seasons) and generational site fidelity (Fisher et al. 1993, Holloran and Anderson 2005, Thompson 2012), which likely limits their ability to move in response to changing distributions of avian predators. Site fidelity has been suggested to delay nonuse patterns of sage-grouse in response to developing oil and gas fields, with older birds displaying strong fidelity despite low productivity and yearling birds (first nesting season) avoiding new anthropogenic structures (Holloran et al. 2010, Naugle et al. 2011).

Johnson et al. (2011) found that, across the range of the species, trends on leks within 5.0-km of a producing oil or natural gas well were depressed. Trends were also lower on leks with more than 10 producing wells within 5.0-km or more than 160 wells within 18.0-km. Their results conservatively suggest that a density of more than one producing well/6.4 km^2 within 18 km of leks negatively influences lek count trends.

Research conducted by Holloran et al. (2015) investigated GRSG use of wintering habitats relative to distances to infrastructure, densities of infrastructure, and activity levels associated with infrastructure of a natural gas field over 5 years in southwestern Wyoming. This study investigated the total number of sage-grouse logged (Logs) and the total number of independent log events (Events) by data logger stations relative to distance to and density of natural gas field infrastructure on the Pinedale Mesa in Sublette County, Wyoming, 2005–2006 through 2009–2010 winters. Comparisons between density and distance models indicated that well pad density was a better predictor of both the total number of GRSG and the total number of log events occurring at data logger stations than distance to well pads. As the number of well pads within 2.8 km of a data logger station increased, the number of sage-grouse and the number of events decreased. For each additional conventional well pad within 2.8-km, the number of GRSG logged decreased by 1 and the number of events decreased by 2. For each additional Liquid Gathering System (LGS) well pad within 2.8-km, the number of GRSG logged decreased by four, and the number of events decreased by six. Holloran et al. (2015) concluded that GRSG avoided areas with high well pad densities during the winter regardless of differences in activity levels associated with well pads. They also note that GRSG visiting a given area spent in general less time near infrastructure with higher levels of activity (i.e., conventional well pads, drilling rigs, and plowed main haul roads), and more time in areas with taller sagebrush. This suggests that decreased human activity levels around important GRSG winter areas may reduce on-site effects of energy development. Holloran suggests that minimizing the densities of well pads, as well as reducing anthropogenic activity levels associated with energy development may reduce on-site impacts of energy development on wintering sage-grouse, and may reduce the temporal scale of indirect habitat loss.

Doherty et al. (2008) modeled winter habitat use by female greater GRSG in the Powder River Basin of Wyoming and Montana. They found that the number of CBNG wells within a 4.0-km^2 area was the best model to represent energy development. GRSG were 1.3 times more likely to occupy sagebrush habitats that lacked CBNG wells within a 4-km^2 area, compared to those that had the maximum density of 12.3-wells/4.0-km^2 allowed on federal lands, and that GRSG avoid CBNG development in otherwise suitable winter habitat. Doherty et al. (2008) also noted that timing stipulations that restrict CBNG development within 3.2-km of a lek during the breeding season (15 Mar–15 Jun) are insufficient because they do not prevent infrastructure from displacing GRSG in winter.

Doherty et al. (2008) used lek count data to test for differences in rates of lek inactivity and changes in bird abundance at various intensities of energy development within 32.2-km^2 (3.22-km or 2-mile radius) of a lek to identify thresholds of development compatible with conservation of GRSG in

Wyoming from 1997 – 2007. Doherty's study used a 3.2 km radius because it is a conservative estimate of the distance at which leks are impacted by oil and gas activities.

Doherty evaluated the percent increase in inactive leks, and grouped the results by a range in the number of wells within 3.2 km (1 – 12, 13 – 39, 40 – 100, and 101 – 199). Doherty also stratified the results into Management Zones I and II to reflect differences in average lek size and intensity of development per Connelly et al. (2004). Doherty notes that lek size is larger in Zone II than I, and intensity of development is greater in Zone I than Zone II. The Montana HQT incorporates the results for MZ I because this MZ covers most of the state and is most applicable.

Doherty's findings demonstrate that impacts from oil and gas development across the state are consistent with those documented in southwest (Holloran 2005) and northeast (Walker et al. 2007) Wyoming. A time-lag showed higher rates of lek inactivity and steeper declines in bird abundance 4 years after than immediately following development. Potential impacts were indiscernible at 1 – 12 wells within 32.2-km^2 of a lek (~1 well/1.0-mi^2), a threshold of development compatible with conservation. Above this threshold land managers can expect to see rate of lek inactivity double at 13-39 wells, and jumped to >5 times that outside of widespread development at 40-100 wells in northeast Wyoming (Management Zone 1).

How the Total Anthropogenic Score is Calculated

The Montana HQT Score Adjustment Factor for oil and gas well pad density captures two metrics consistent with the literature to capture winter use and nesting/breeding near a lek. The research findings by Holloran et al 2015 and Doherty et al 2008 both note a decline in habitat use with increasing well pad density during the winter, which is not a lek centric measure. Therefore, the metric evaluates well pad density across a large landscape measured as well pad density in all core habitat surrounding the development. The analysis would use a moving windows analysis to measure well pad density per section extending to the exterior boundary of the core habitat.

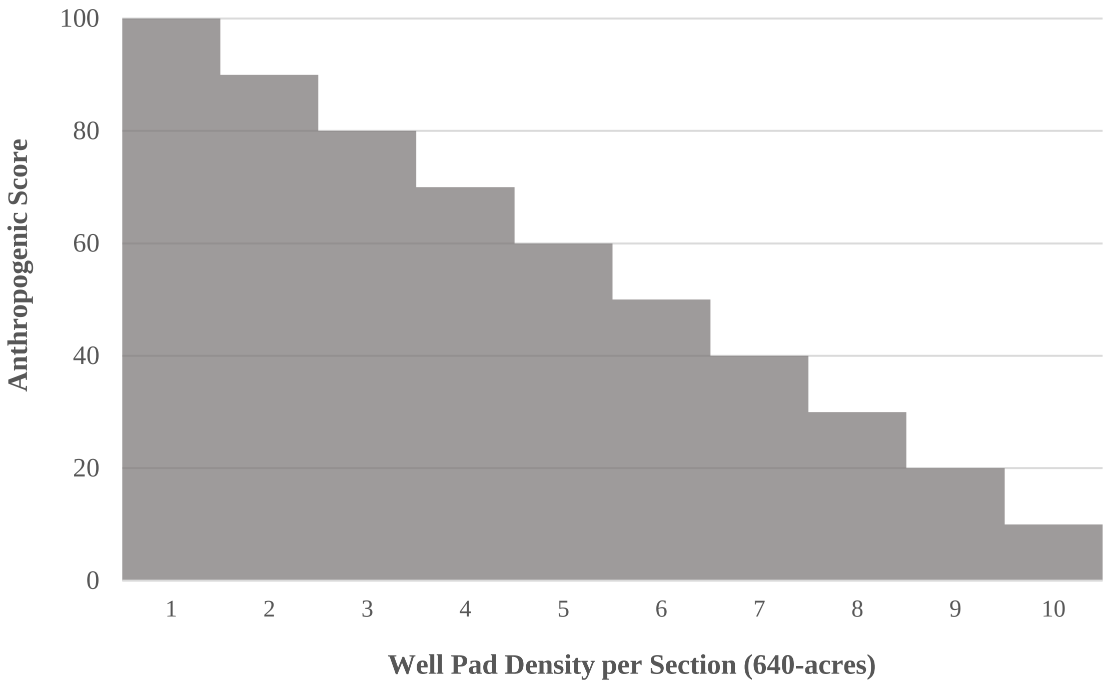

Figure B. 1. Well Pad Density per Section

As previously noted, multiple authors and research have documented a decline in lek attendance with increasing well pad density with a certain distance from a lek. The Montana HQT measures the number of wells within a 3.2 km (2 mile) radius consistent with Doherty 2008, because it is a conservative estimate of the distance at which leks are impacted by oil and gas activities.

Table B. 1 identifies the proportional increase in lek inactivity between control leks (0 wells / 32.2 km^2) and those inside four categories of increasing intensity of energy development in Wyoming from 1997-2007. Note only the results from Management Zone I are displayed.

Table B. 1. Increase in lek inactivity with increasing number of wells.

Number of wells	4-year time lag
1-12	1.06
13-39	2.00
40-100	5.07
101-199	5.74*

* sample size was less than 5 leks, statistical analysis was not preformed

The number of wells in the categories identified by Doherty et al (2008) was used to set the adjustment factor levels for the Montana HQT within a 3.2-km buffer surrounding a lek (Table B. 22).

Data Layers: Proposed Oil & Gas Project Spatial Data (submitted by proponent)

GIS Steps for Anthropogenic Variable and Score Creation:

1. Create the Project Assessment Area:
    a. Direct Footprint: this is the exact shape and area of the submitted Proposed Oil & Gas Project.
    b. Indirect Impact: Create the Indirect Impact area by buffering the Direct Footprint of the Proposed Oil & Gas Project by 3.2-km.
    c. Project Assessment Area (PAA): This is the Direct Footprint *and* the Indirect Impact area.
2. Convert the Oil and Gas PAA layer to a point shapefile, delineating the centroid(s) and point(s) location(s) of the new proposed oil and gas well pads within the Direct Footprint.
3. Add a new field to the Oil and Gas PAA point shapefile called "count" and calculate the field =1. This field will be used in the next step to run the point statistics tool.
4. Run the Point Statistics Tool (3.2-km radius circle neighborhood, "SUM" statistics) on the "count" field in the Oil and Gas PAA point shapefile. The resulting layer (Well Pad Count raster) represents the number of oil and gas well pads within 3.2-km of each cell.
5. Using the Mask Tool, remove the Direct Footprint area from the Well Pad Count raster to create the Well Pad Count Indirect raster.
6. Convert the Direct Footprint layer to a raster and reclassify values to 0 to create the Direct Well Density Anthropogenic Score raster.
7. Reclassify the pixel values in the Well Pad Count Indirect raster to the associated Anthropogenic Score in Table B.2 to create the Indirect Well Density Anthropogenic Score raster.
8. Merge (Mosaic to New Raster Tool) the Direct Well Density Anthropogenic Score raster with the Indirect Well Density Anthropogenic Score raster to create the Oil & Gas Well Density Anthropogenic Score raster.
9. If a given project contains additional disturbance types (e.g., roads, transmission lines), refer to the associated appendix for creation of additional Anthropogenic Score rasters.
10. Once all disturbance types for the proposed project have an Anthropogenic Score raster created, all Anthropogenic Score rasters are multiplied together to create the Total Anthropogenic Score for the Project Assessment Area for the proposed Oil & Gas project. See Section 5 for the complete calculation of the Raw HQT Score for Debit Projects.

Table B. 2. Anthropogenic Scores for well pads within a 3.2-km buffer of an active lek.

Number of wells	Anthropogenic Score	Doherty's findings
1-12	100	Potential impacts indiscernible at 1-12 wells within 32.2 km2 (< 1 well per 640 acres of land)
13-39	50	In MZ I, the rate of lek inactivity doubled at 13-39 wells.
40-100	20	In MZ 1, the rate of lek inactivity jumped to greater than 5 times that outside of widespread development.
> 101-199	0	Too few leks present in this category

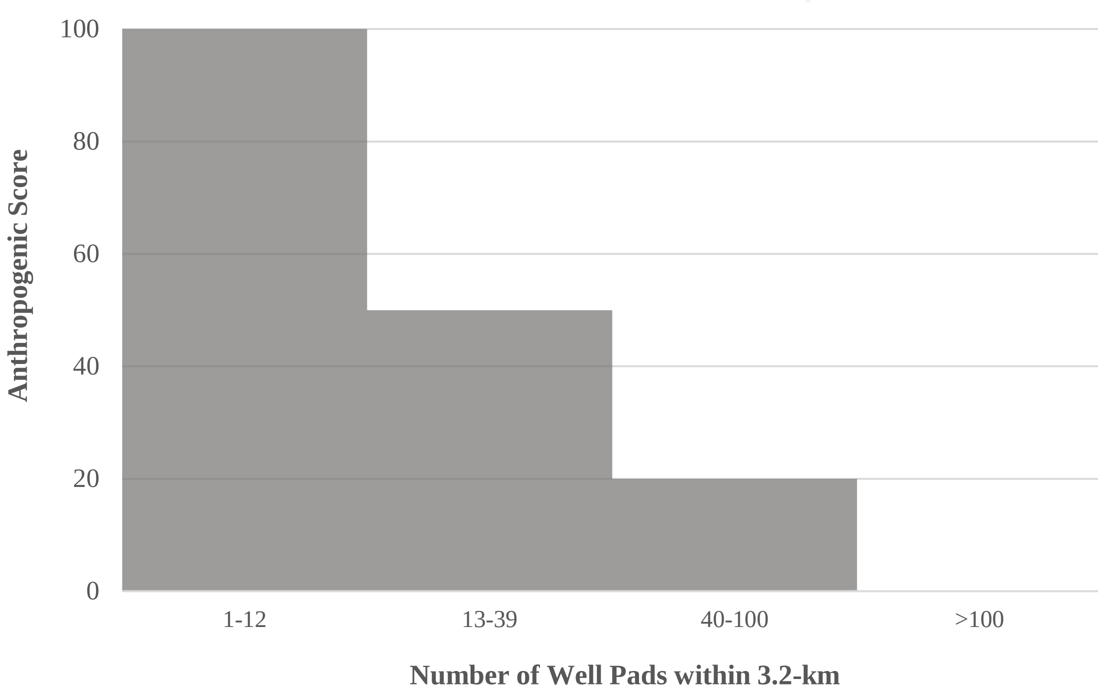

Figure B. 2. Adjustment of scores for number of well pads within a 3.2-km buffer.

OPTIONAL THIRD LEVEL ASSESSMENT

Debit projects may have the option of performing Third Level Assessment surveys to collect site-specific data to inform the final HQT scores. This assessment must follow the peer-reviewed standards set forth in this document to ensure all such assessments are comparable, complete, and collect data useable within the Montana HQT framework.

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Appendix C. ANTHROPOGENIC VARIABLE: TALL STRUCTURES (CELLULAR TOWERS, TRANSMISSION LINE TOWERS, WEATHER TOWERS)

When a new tall structure project is proposed, all infrastructure for the proposal is overlain on the Montana HQT Basemap. Other infrastructure for the proposed project may include roads, transmission lines, etc. Specific Anthropogenic Scores are calculated to generate the Total Anthropogenic Score for the new tall structure project (Figure C. 1). This project specific score is multiplied by the Montana HQT Basemap Total to produce a Project specific Raw HQT Score. (Section 3.2.3).

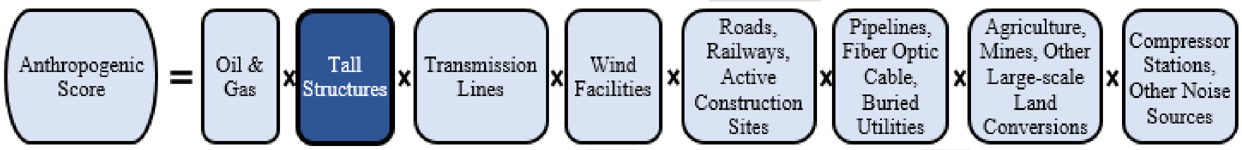

Figure C. 1. Equation for calculating the Anthropogenic Score for Tall Structure projects and any additional infrastructure.

SUPPORTING LITERATURE

While research is needed to fully assess the effects of tall structures (e.g., cellular towers, transmission line towers, substations), there is a growing body of evidence that tall structures impact GRSG, primarily by increasing predation risks and fragmenting habitat. Here, we consider impacts distinct to tall structures on the landscape that could provide avian perching or nesting subsidies.

Anthropogenic structures such as transmission towers, cooling towers, communication towers and weather stations provide perching and nesting subsidies for avian predators (Coates et al. 2014a, Dinkins et al. 2014a). Increased raven abundance has been detected near transmission facilities (Coates et al. 2014b, Gibson 2013, Steenhof et al. 1993). Raptors begin nesting on transmission towers within one year of construction and will return to the same area each year (Steenhof et al. 1993). Resident territorial ravens are responsible for the majority of GRSG nest predation (Bui 2010, Howe 2014a). Howe et al. (2014b) reported breeding raven foraging was greatest within 0.57 km (0.35 mi.) of their nests while Coates et al. (2014a) found concentrated raven foraging occurred out to 2.2 km (1.4 mi.).

Tall structures provide improved avian predator hunting efficiency in an otherwise relatively flat open landscape (Connelly 2004, Dinkins et al. 2014a). The probability of raven occurrence was detected out to 27.0 km (16.78 mi.) from transmission facilities (Coates et al. 2014b). Researchers have noted predator impacts were reduced where habitat was contiguous and provided canopy cover (Bloomberg and Sedinger 2009, Braun 1998, Coates et al. 2014b, Coates and Delehanty 2010, Kolada et al. 2009).

Negative lek trends were detected within 18.0 km (11.8 mi) of communication towers (Johnson et al. 2011). Knick et al. (2013) found leks were absent where communication towers exceeded 0.08 km/km^2. Wisdom et al. (2011) detected GRSG extirpated ranges within 12.0 km (7.5 mi) of communication towers. The authors suggest the strong correlation between distance to communication towers and extirpated range of GRSG may be due in part because these structures are typically near human development and major highways. GRSG select nest sites and brood rearing habitat further away from tall structures, partially based on a perceived risk of predation (Braun 1998, Dinkins et al. 2012, Dinkins et al. 2014).

HOW THE TOTAL ANTHROPOGENIC SCORE IS CALCULATED

Land cover, topography and cumulative human activity contribute to the level of impacts from tall structures. Avoidance is modeled as loss of habitat that decreases linearly from 0.0 to 2.2 km (1.4 mi.) to account for localized impacts from tall structures to GRSG. The average distance between the findings of Knick et al (2013), negative trends within 18.0 km and Wisdom et al. (2011), extirpated range within 12.0 km are applied to the model for population impacts. Population affects are modeled as loss of habitat functionality that decreases linearly from 0.0 to 15.0 km, from the structure (Table C. 1).

<u>Data Layers:</u> Proposed Tall Structure Project Spatial Data (submitted by proponent)

<u>GIS Steps for Anthropogenic Variable and Score Creation:</u>

1. Create the Project Assessment Area:
    a. Direct Footprint: this is the exact shape and area of the submitted Proposed Tall Structure Project.
    b. Indirect Impact: Create the Indirect Impact area by buffering the Direct Footprint of the Proposed Tall Structure Project by 14,484-m.
    c. Project Assessment Area (PAA): This is the Direct Footprint *and* the Indirect Impact areas.
2. Run the Euclidean Distance Tool on the PAA layer with a maximum distance of 14,484-m, specifying the previous buffer as the extent in the environments settings to create an output Euclidean Distance Tall Structure raster.
3. Reclassify the pixel values in the Euclidean Distance Tall Structure raster to the associated Anthropogenic Score in Table C. 1 to create the Distance to Tall Structure Anthropogenic Score raster.
4. If a given project contains additional disturbance types (e.g., roads, transmission lines), refer to the associated appendix for creation of additional Anthropogenic Score rasters.
5. Once all disturbance types for the proposed project have an Anthropogenic Score raster created, all Anthropogenic Score rasters are multiplied together to create the Total Anthropogenic Score for the Project Assessment Area for the proposed Tall Structure project. See Section 5 for the complete calculation of the Raw HQT Score for Debit Projects.

Table C. 1. Anthropogenic Scores for proximity to tall structures.

Distance (km)	Anthropogenic Score
0 – <0.3	19
0.3 – <0.6	29
0.6 – <0.8	39
0.8 – <1.1	49
1.1 – <1.4	58
1.4 – <1.7	68
1.7 – <2.0	78
2.0 – <2.3	87
2.3 – <3.6	87
3.6 – <7.2	97
7.2 – <10.9	98
10.9 – <14.5	99
≥14.5	100

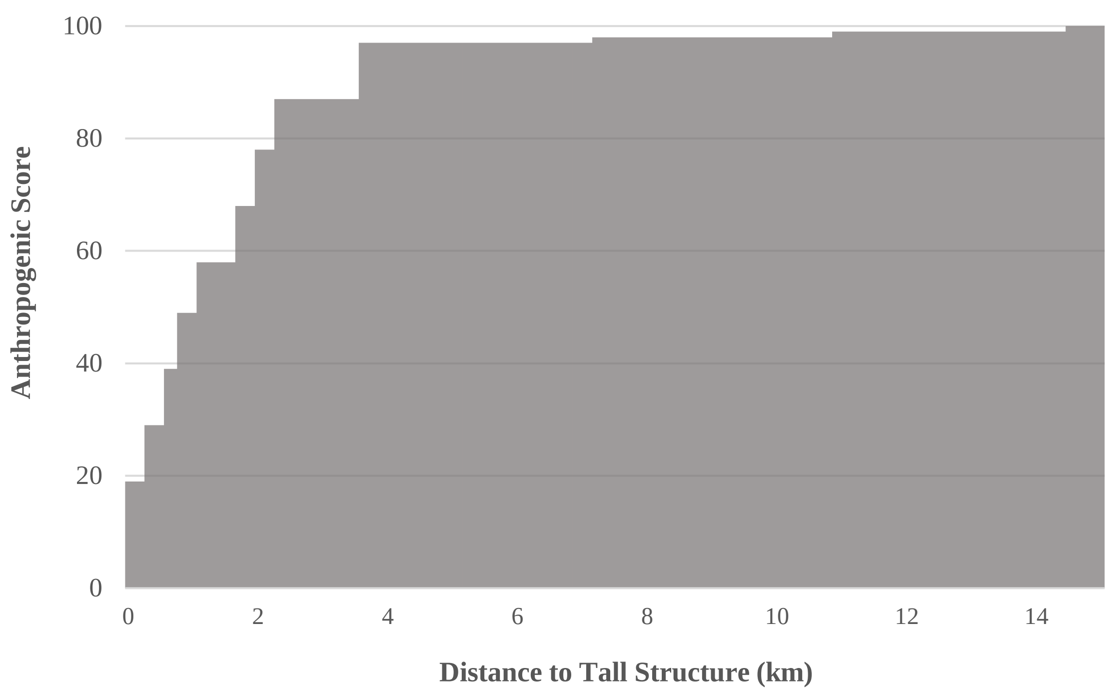

Figure C. 2. The Anthropogenic Score for the proximity to a tall structure Anthropogenic Variable.

OPTIONAL THIRD LEVEL ASSESSMENT

Debit projects may have the option of performing Third Level Assessment surveys to collect site-specific data to inform the final HQT scores. This assessment must follow the peer-reviewed standards set forth in this document to ensure all such assessments are comparable, complete, and collect data useable within the Montana HQT framework.

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Appendix D. ANTHROPOGENIC VARIABLE: TRANSMISSION LINES

When a new transmission line project is proposed, all infrastructure for the proposal is overlain on the Montana HQT Basemap. Other infrastructure for the proposed project may include roads, tall structures, etc. Specific Anthropogenic Scores are calculated to generate the Total Anthropogenic Score for the new transmission line project (Figure D. 1). This project specific score is multiplied by the Montana HQT Basemap Total to produce a Project specific Raw HQT Score. (Section 3.2.3).

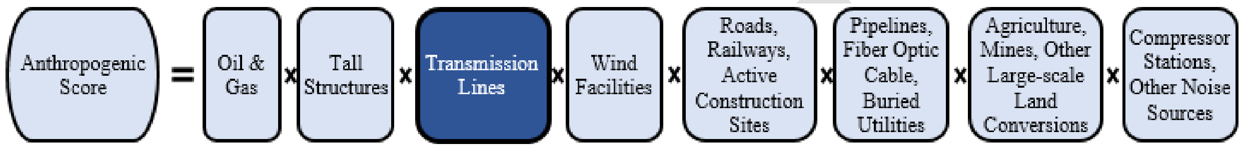

Figure D. 1. Equation for calculating the Anthropogenic Score for Transmission Line projects and any additional infrastructure.

SUPPORTING LITERATURE

The linear characteristics of transmission lines result in both Direct and Indirect Impacts to GRSG populations through habitat fragmentation and increased predation. The effects of transmission lines on GRSG have been considered in several recent studies of habitat use and lek attendance (e.g., Walker et al. 2007, Dinkins et al, 2014b; Knick et al. 2013; LeBeau 2012, Johnson et al. 2011; Hanser et al. 2011; Gillan et al. 2013; Shirk et al. 2015; Gibson et al. *In Review*). Most of these studies grouped larger transmission lines with smaller distribution lines and telephone lines.

A spatial analysis of GRSG telemetry data from west-central Idaho detected significantly fewer occurrences of GRSG within 600-m of lines than was predicted by the null model (Gillan et al. 2013); however, the change in the magnitude of use was not evaluated (J. Gillan, New Mexico State University, personal communication with A. Widmer, SWCA, 7/7/2015). Models of GRSG habitat use derived from the locations of GRSG scat (i.e., pellets) in the Wyoming Basin Ecoregional Assessment areas considered biotic, abiotic, and anthropogenic effects and identified distance to transmission line to be a significant predictor (Hanser et al. 2011). The results of the study indicate an avoidance effect that decreases with distance from the line. However, the size, number, location, and configuration of transmission lines evaluated were not described by Hanser et al. (2011). Expert opinion-based models of GRSG movement developed in Washington State predicted that transmission lines would significantly reduce GRSG movement to distances greater than 500 m; spatial patterns in gene flow and lek activity were consistent with model predictions (Washington Wildlife Habitat Connectivity Working Group [WHCWG] 2012; Shirk et al. 2015). These results provide evidence of transmission line impacts suggesting that avoidance behavior has the potential to result in a population-level effect.

Gibson et al. (*In Review*) quantified the effects of the Falcon-to-Gondor 345 kV Transmission Line in Nevada on two GRSG populations over 10 years of operation. This study provides strong evidence of transmission line effects to GRSG demographic parameters (female survival, nest site selection and success, and brood survival), largely in part because of the length of the study, the large number of data points collected (GRSG locations and habitat measurements), and the statistical analysis that isolated the effects of the transmission line from the effects of habitat quality and other covariates. The authors identified several demographic parameters that were affected by the transmission line, and variation in the magnitude of the effect was largely explained by raven abundance. The authors also took the analysis a step further to estimate the impact that transmission lines have on females, nests, and chicks at the population level. Using lek attendance as a surrogate for population size, the authors estimated that population growth was reduced by 3% directly below the transmission line and the effect decreased linearly with distance to 0% at 10 km from the Falcon-to-Gondor transmission line. Population growth was reduced by 8% directly below "all power lines" (transmission line and distribution lines grouped) and the effect decreased linearly with distance to 0% at 10 km.

Highly territorial, breeding ravens exploit anthropogenic features common to transmission corridors and are more likely to predate sage grouse nests (Bui et al. (2010) more often than migrant raven. Territorial breeding raven forage within an average of 570 to ±707.3 m of their nests (Howe et al. 2014). Burton and Mueller (2006) and Ratcliffe (1997) found raven nests up to 1 km apart. For the purposes of this document, transmission lines will be considered as co-located if they are within 1 km of each other.

Two Indirect Impact zones were defined for the transmission line habitat score modifier based on the literature:

- Avoidance (0-600 m [0.6 km])
- Decreased Population Growth (0 m to 10,000 m [10 km])

Avoidance is a behavioral response by GRSG that that has been documented in proximity to overhead transmission lines. It results in decreased use of habitat in areas within 600 meters of a transmission line. Avoidance effect would increase proportionally with the number of transmission lines, where the lines are sited less than 600 m apart.

Decreased population growth is not behavioral and instead is a result of changes in population demographics (e.g., nest success, brood survival, etc.) that lead to the population level impact described in Gibson et al. (*In Review*). Based on this study, decrease population affects the area 10 km to either side of an overhead transmission line. Raven abundance was the primary mechanism identified for decreased population growth in Gibson. However, overhead lines may also increase hunting efficiency for mammalian predators due to the edge effect created by removing sagebrush in the corridor. Where decreased population growth zones overlap or where one overlaps with an avoidance zone, the larger effect is modeled.

Avoidance and decreased population growth effects both occur across all seasons; apply to both sexes and all age groups; and occur for the operating lifetime of the project. The magnitude of the Indirect Impact is described for each zone below.

How the Total Anthropogenic Score is Calculated

Avoidance (0-600 m)

Reduced use (avoidance) near transmission line is greatest directly under the line, decreasing out to 600 m based on peer-reviewed literature. Avoidance is modeled as a loss in habitat functionality that decreases linearly from 75% loss immediately below the line to 0% loss 600 m from the line.[15] The score adjustment factor is calculated as [1-1.25(0.6 - x)], where 'x' is the distance from the transmission line in km (Figure D. 2).

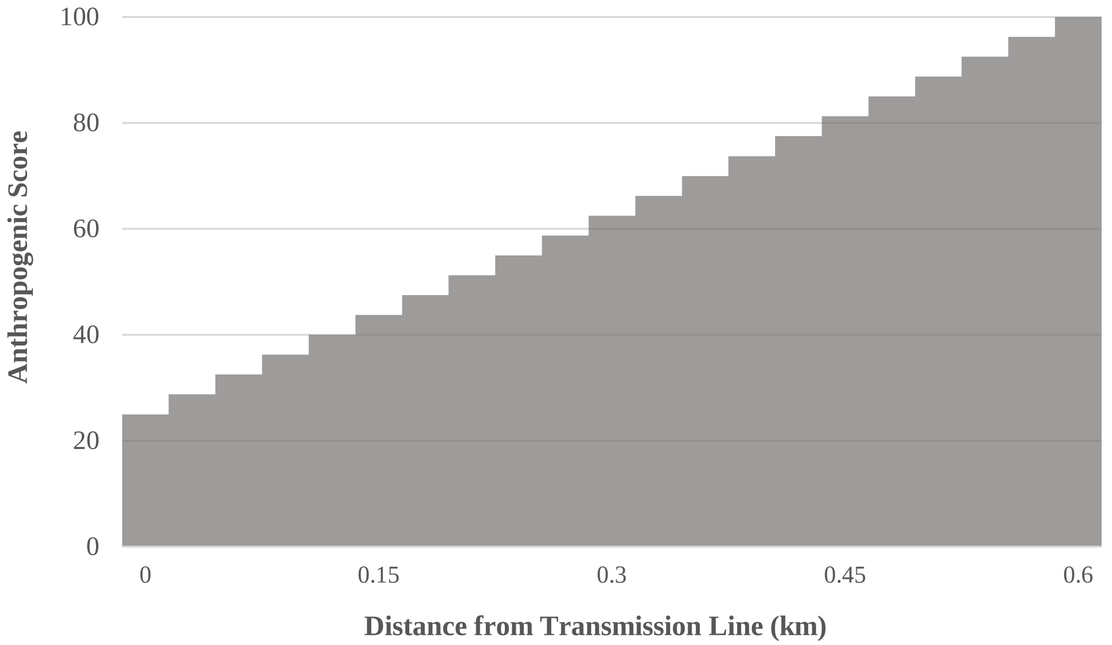

Figure D. 2. The Anthropogenic Score for the habitat avoidance with proximity to the transmission line Anthropogenic Variable.

Decreased Population Growth (0 m to 10,000 m)

Decreased population growth near transmission lines is modeled in all GRSG habitat, regardless of raw habitat score. Decreased population growth is modeled as a loss of habitat functionality that decreases linearly from 3%[16] directly below the line to 0% loss 10,000 m (10 km) from the line[17]. The score adjustment factor is calculated as [1-0.003(10-x)], where 'x' is the distance from the line in km (Figure D. 3). This approach is consistent with recommendations made by Gibson et al. (*In Review*) for the Falcon-to-Gondor Transmission Line.

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[15] Professional judgment was used to develop the 75% reduction in use immediately below the line with the likelihood of use increasing with increasing distance from the transmission line.

[16] This value is provisional until Gibson et al. (In Review) is published, because it has the potential to change during the peer review process.

[17] The effects of transmission lines is being modeled, not the effects of "all power lines". Distribution line data is not available for the entire analysis area. Without accurate and complete distribution line data, the baseline condition with existing power lines could not be accurately characterized and the baseline habitat scores would be inaccurate.

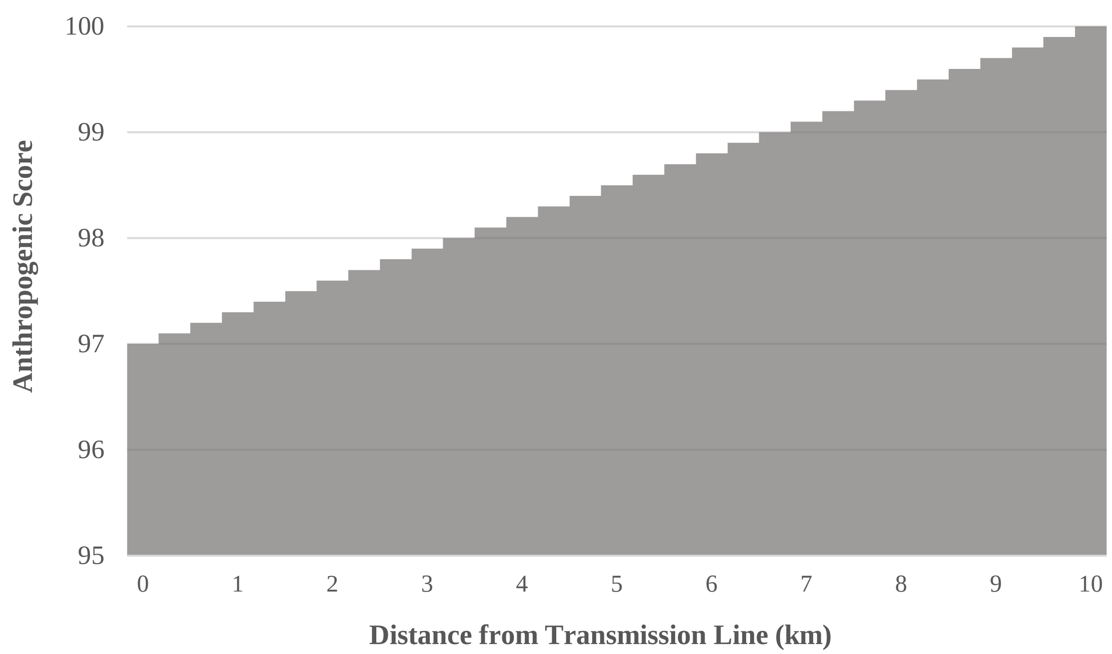

Figure D. 3. The Anthropogenic Score for decreased population growth with proximity to the transmission line Anthropogenic Variable.

<u>Data Layers:</u> Proposed Transmission Line Project Spatial Data (submitted by proponent)

<u>GIS Steps for Anthropogenic Variable and Score Creation:</u>

1. Create the Project Assessment Area:
    a. Direct Footprint: this is the exact shape and area of the submitted Proposed Transmission Line Project.
    b. Indirect Impact: Create the Indirect Impact area by buffering the Direct Footprint of the Proposed Transmission Line Project by 10,000-m.
    c. Project Assessment Area (PAA): This is the Direct Footprint *and* the Indirect Impact areas.
2. Run the Euclidean Distance Tool on the PAA layer with a maximum distance of 10,000-m, specifying the previous buffer as the extent in the Environment Settings to create an output "Euclidean Distance Transmission Line" raster.
3. Reclassify the pixel values in the Euclidean Distance Transmission Line raster to the associated Anthropogenic Score in Table A. 13 to create the "Distance to Transmission Line Anthropogenic Score" raster.
4. If a given project contains additional disturbance types (e.g., roads, tall structures), refer to the associated appendix for creation of additional Anthropogenic Score rasters.
5. Once all disturbance types for the proposed project have an Anthropogenic Score raster created, all Anthropogenic Score rasters are multiplied together to create the Total Anthropogenic Score for the Project Assessment Area for the proposed Transmission Line project. See Section 5 for the complete calculation of the Raw HQT Score for Debit Projects.

OPTIONAL THIRD LEVEL ASSESSMENT

Debit projects may have the option of performing Third Level Assessment surveys to collect site-specific data to inform the final HQT scores. This assessment must follow the peer-reviewed standards set forth in this document to ensure all such assessments are comparable, complete, and collect data useable within the Montana HQT framework.

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Appendix E. ANTHROPOGENIC VARIABLE: WIND FACILITIES

When a new wind facility project is proposed, all infrastructure for the proposal is overlain on the Montana HQT Basemap. Other infrastructure for the proposed project may include roads, tall structures, etc. Specific Anthropogenic Scores are calculated to generate the Total Anthropogenic Score for the new wind facility project (Figure E. 1). This project specific score is multiplied by the Montana HQT Basemap Total to produce a Project specific Raw HQT Score. (Section 3.2.3).

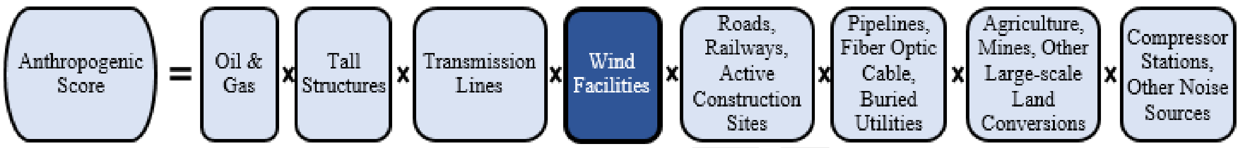

Figure E. 1. Equation for calculating the Anthropogenic Score for Wind Facility projects and any additional infrastructure.

SUPPORTING LITERATURE

LeBeau (2012) detected no decrease in habitat use with proximity to turbines by hens in the nesting, brood rearing, or summer seasons in southern Wyoming. While there was no effect to hen survival, LeBeau (2012) detected a decreased probability of nest and brood survival with proximity to turbine out to approximately 5 km, and speculated that the effect may be attributed to increased predation due to the presence of human development and edge effects. In the same study area, LeBeau et al. (2017) determined that the percent area disturbed by wind facility infrastructure is a stronger predictor of impacts to GRSG than distance to turbine. This pattern suggests that use in some seasons occurs around the edge of the facility and in less densely developed areas, but less so within the facility. The relative probability of GRSG selecting brood-rearing and summer habitats decreased as percentage of surface disturbance associated with the facility infrastructure increased out to approximately 1.2 km, and this relationship strengthened after a 3-year lag time. Wind facility disturbance in the study area ranged 0 to 2.7%; a 2% disturbance resulted in a 60% reduction in the probability of habitat use. The percentage of surface disturbed did not affect selection of nest sites, or survival of hens, nests, or brood (LeBeau et al. 2017).

HOW THE TOTAL ANTHROPOGENIC SCORE IS CALCULATED

Because of the limited scientific research on the effects of wind energy, a conservative approach was used to develop scores for this habitat modifier variable. The percentage of the surface area disturbed by wind energy facilities within 1.5 km will be used to determine scores (Table E. 1) following the results described in LeBeau et al. (2017). A 60% reduction in habitat function (score = 0.4) will be applied when wind energy infrastructure disturbs 2-3% of the area in a 1.5 km moving window (LeBeau et al. 2017). Remaining scores were determined by fitting a logarithmic curve centered on the 60% reduction value at 2% (Table E. 1; Figure E. 2).

Table E. 1. Anthropogenic Scores for area covered by wind energy facilities.

Percent Disturbance from Wind Energy Infrastructure within 1.5-km moving window	Anthropogenic Score
0 – <10	100
10 – <25	50
25 – <40	12.5
40 – <60	5
≥60	0

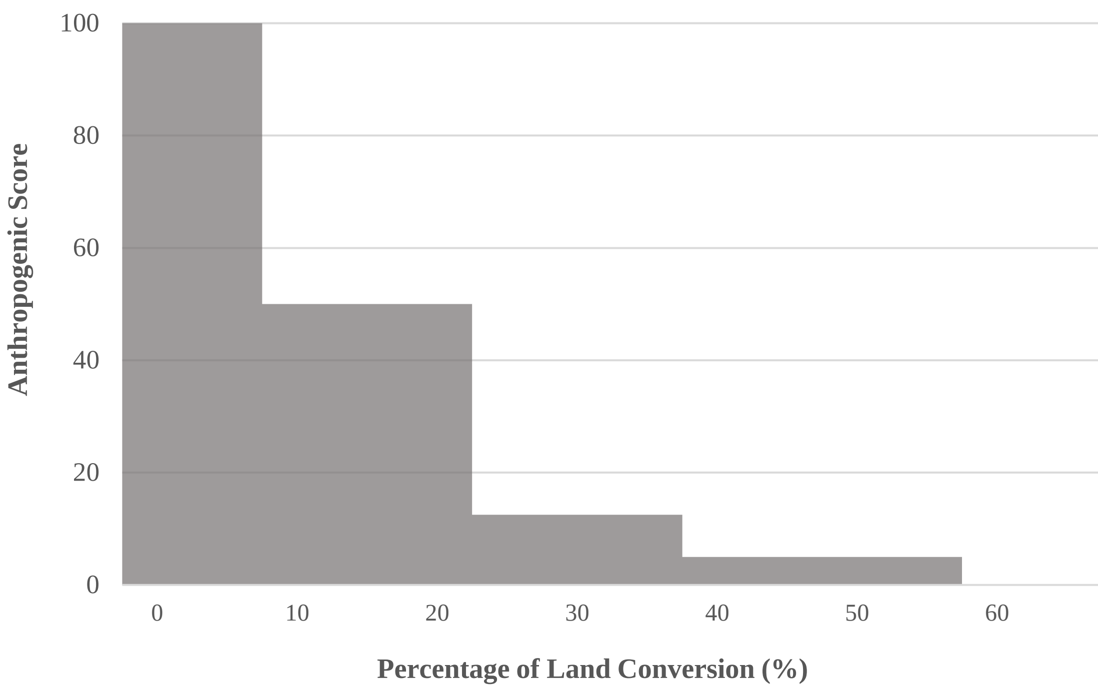

Figure E. 2. The Anthropogenic Score for the area covered by wind energy facilities Anthropogenic Variable. Line is logarithmic curve used to develop scores for this habitat adjustment factor.

Data Layers: Proposed Wind Facility Project Spatial Data (submitted by proponent)

GIS Steps for Anthropogenic Variable and Score Creation:

1. Create the Project Assessment Area:
    a. Direct Footprint: this is the exact shape and area of the submitted Proposed Wind Facility Project.
    b. Indirect Impact: Create the Indirect Impact area by buffering the Direct Footprint of the Proposed Wind Facility Project by 1.5-km.
    c. Project Assessment Area (PAA): This is the Direct Footprint *and* the Indirect Impact area.

2. Convert the Wind Facility PAA layer to a raster, giving all cells within the Direct Footprint boundary a value of “1” to create the “Wind Facility Project” raster.
3. Use the Focal Statistics Tool with a 1.5-km radius circle neighborhood (e.g., moving window) and select “SUM statistics” option to create a “Wind Facility Sum” raster that represents the number of cells surrounding a particular cell that are categorized as a Wind Facility Project (pixel value = 1).
4. Convert the new raster to data type “float” to allow for decimal places for calculation of percentages.
5. Divide the resulting raster by the maximum possible number of cells within a 1.5-km radius circle to create the “Wind Facility Percent Disturbance” raster. This maximum value will be dependent on cell size used, so script in a variable equal to: “float(arcpy.GetRasterProperties_management(windfacilityfloat, "MAXIMUM").getOutput(0))” to plug into the Division step.
6. Using the Mask Tool, remove the Direct Footprint area from the Wind Facility Percent Disturbance raster to create the Wind Facility Percent Disturbance Indirect raster.
7. Convert the Direct Footprint layer to a raster and reclassify values to 0 to create the Direct Wind Facility Anthropogenic Score raster.
8. Reclassify the pixel values in the Wind Facility Percent Disturbance Indirect raster to the associated Anthropogenic Score in Table E.1 to create the Indirect Wind Facility Percent Anthropogenic Score raster.
9. Merge (Mosaic to New Raster Tool) the Direct Wind Facility Anthropogenic Score raster with the Indirect Wind Facility Percent Anthropogenic Score raster to create the Wind Facility Percent Anthropogenic Score raster.
10. If a given project contains additional disturbance types (e.g., roads, transmission lines), refer to the associated appendix for creation of additional Anthropogenic Score rasters.
11. Once all disturbance types for the proposed project have an Anthropogenic Score raster created, all Anthropogenic Score rasters are multiplied together to create the Total Anthropogenic Score for the Project Assessment Area for the proposed Wind Facility project. See Section 5 for the complete calculation of the Raw HQT Score for Debit Projects.

Optional Third Level Assessment

Debit projects may have the option of performing Third Level Assessment surveys to collect site-specific data to inform the final HQT scores. This assessment must follow the peer-reviewed standards set forth in this document to ensure all such assessments are comparable, complete, and collect data useable within the Montana HQT framework.

Literature Cited

LeBeau, C.W. 2012. Evaluation of greater sage-grouse reproductive habitat and response to wind energy development in south-central Wyoming. Thesis, University of Wyoming, Laramie, Wyoming, USA.

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Appendix F. ANTHROPOGENIC VARIABLE: ROADS, RAILWAYS AND ACTIVE CONSTRUCTION SITES

When a new road, railway or active construction project is proposed, all infrastructure for the proposal is overlain on the Montana HQT Basemap. Other infrastructure for the proposed project may include transmission lines, tall structures, etc. Specific Anthropogenic Scores are calculated to generate the Total Anthropogenic Score for the new road, railway or active construction project (Figure F. 1. Equation for calculating the Anthropogenic Score for Roads, Railroads and active construction projects and any additional infrastructure.). This project specific score is multiplied by the Montana HQT Basemap Total to produce a Project specific Raw HQT Score. (Section 3.2.3).

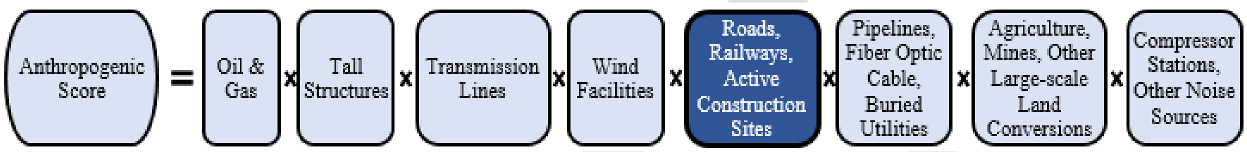

Figure F. 1. Equation for calculating the Anthropogenic Score for Roads, Railroads and active construction projects and any additional infrastructure.

SUPPORTING LITERATURE

Research on the effects of roads on GRSG indicates that there are variable levels of disturbance based on distance to roads, size of roads, traffic frequency, and associated noise. For instance, in Colorado, Rogers (1964) mapped 120 leks regarding distance from roads and found that 42% of leks were over 1.6 kilometers (km) from the nearest improved road, but that 26% of leks were within about 90 meters (m) of a county or state highway, and two leks were on a small dirt road. Connelly et al. (2004) also note the use of roads for lek sites. LeBeau (2012) found evidence for avoidance of roads by hens in the nesting and brood rearing seasons at one study site, but not the other; avoidance by hens was documented at both sites during the summer season only. Similarly, Pruett et al. (2009) found that lesser prairie-chickens (*Tympanuchus pallidicinctus*) avoided one of the two highways in the study by 100-m; however, some prairie-chickens crossed roads and had home ranges that overlapped the highways, thus roads did not completely exclude them from neighboring habitat.

In contrast, Craighead Beringia South (2008) reported results from a 2007 to 2009 study of GRSG seasonal habitat use in Wyoming. Results indicate that GRSG avoid areas within approximately 100-m of paved roads. Similarly, Knick et al. (2013) found that high value lek habitats had <1.0-km/km^2 of secondary roads, <0.05-km/km^2 of highways, and <0.01-km/km^2 of interstate highways. Research by Holloran (2005) found that traffic occurring on roads within 1.3-km of a lek during early morning strutting activity was related to significant declines in male attendance. Johnson et al. (2011) examined the correlation between trends in lek attendance and the environmental and anthropogenic features within 5- and 18-km buffers around leks. They found that lek attendance declined over time with length of interstate highway within 5-km, although the authors note that this trend was based on relatively few data points and no pre-highway data were available for comparison. Interstate highways >5-km away and smaller state and federal highways had little or no effect on trends in lek attendance.

Seasonal and daily timing of traffic and its associated noise is an important aspect of managing disturbance of GRSG because animal behaviors such as attracting mates, or males competing on leks, often occur in the morning or evening, the same time as rush hour traffic. The frequency of the sound waves produced by traffic on roads can mask these important behavioral communications, which occur at the same or similar frequencies (Blickley and Patricelli 2012). This masking effect can also interfere with hens' communication with their chicks throughout their seasonal habitats located away from leks, and can occur throughout the day (Lyon and Anderson 2003). Widespread noise may contribute to decreases in abundance of many species near roads (Forman and Deblinger 2000).

A related source of disturbance is intermittent traffic on smaller roads. This type of activity and noise may be more difficult for species to habituate to due to its unpredictable nature (Blickley et al. 2012). Blickley and her team played sounds mimicking noise disturbances found in energy production areas, resulting in a reduction in lek attendance of 73% for road noise, and 29% for drilling noise. Research by Lyon and Anderson (2003) found that even light vehicular traffic (1 to 12 vehicles/day) increased the distance of nests from lek sites and substantially reduced nest initiation rates.

How the Total Anthropogenic Score is Calculated

Based on these studies and professional judgement based on effects of similar disturbance types, buffer estimates were made for GRSG avoidance of roads, railways and active construction sites. Buffers account for Indirect Impacts from a project, in this instance noise and human activity, which can extend far beyond the project area itself (Blickley and Patricelli 2010). Habitats located within 250-m of a high-traffic road (>6,000 AADT [annual average daily traffic][18]), such as an interstate highway or high-traffic federal or state highway or a mainline railway, are considered to provide no functional habitat to GRSG due to traffic and associated noise/human disturbance (Table F. 1; Figure F. 2).

Likewise, habitats within 25-m of a moderate-traffic road (a low-traffic highway) or spur railway are considered to provide no functional habitat (Table F. 1; Figure F. 3). Habitats within these buffers are adjusted by a factor of 0.0 for a final functional habitat score of 0.0. Those habitats located farther than 3,200-m (high-traffic road) and 500-m (moderate-traffic road) were considered to be outside the range of disturbance to GRSG and were assigned a score adjustment factor of 1.0.

New construction or new activities on two-track roads, ranch roads, resource roads, or other roads receiving light traffic will be assessed on a case-by-case basis. Adjustments to distance buffers, consideration of using a road density approach, or further refinement of road volume categories will be explored as research in these areas becomes available.

The Montana HQT places a larger adjustment on habitats that are bisected by all types of large roadways and mainline railways. Adjustments are higher for projects that typically have higher traffic levels and risk to greater GRSG (e.g., mortality from collision, noise disturbance) than less-utilized project types that generally have less traffic and implied risk.

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[18] This cutoff was determined by examining the AADT of roads and identifying natural break points occurring between Interstate highways, major U.S. and State Highways, and other road types.

A moderate-traffic road score adjustment factor will also be applied around project footprints for the duration of active construction of other project types to account for increased traffic, disturbance, and human presence of the landscape.

Data Layers: Proposed Road, Railway, or Active Construction Site Project Spatial Data (submitted by proponent)

GIS Steps for Anthropogenic Variable and Score Creation:

1. Create the Project Assessment Area:
   a. Direct Footprint: this is the exact shape and area of the submitted Proposed Road, Railway, or Active Construction Site Project.
   b. Indirect Impact: Create the Indirect Impact area by buffering the Direct Footprint of the Proposed Road, Railway, or Active Construction Site Project by 3,500-m for large roadways and mainline railways or by 500-m for moderate-traffic roads and active construction sites.
   c. Project Assessment Area (PAA): This is the Direct Footprint *and* the Indirect Impact areas.
2. Run the Euclidean Distance Tool on the PAA layer with a maximum distance of 3,500-m for large roadways and mainline railways or by 500-m for moderate-traffic roads and active construction sites. Specify the previous buffer, respectively, as the extent in the Environment Settings to create an output "Euclidean Distance Road, Railway, or Active Construction Site" raster.
3. Reclassify the pixel values in the Euclidean Distance Road, Railway, or Active Construction Site raster to the associated Anthropogenic Score in Table F.1 to create the "Distance to Road, Railway, or Active Construction Site Anthropogenic Score" raster.
4. If a given project contains additional disturbance types (e.g., oil & gas well pads, tall structures), refer to the associated Anthropogenic Variable appendix for creation of additional Anthropogenic Score rasters.
5. Once all disturbance types for the proposed project have an Anthropogenic Score raster created, all Anthropogenic Score rasters are multiplied together to create the Total Anthropogenic Score for the Project Assessment Area for the proposed Road, Railway, or Active Construction Site project. See Section 5 for the complete calculation of the Raw HQT Score for Debit Projects.

Table F. 1. Anthropogenic Scores for proximity to roads, railways, and active construction sites.

Disturbance Categories	Anthropogenic Score				
	100	75	50	25	0
Distance to high-traffic road (>6,000 AADT), mainline railway, active construction sites (km)	≥3.2	1.6 – <3.2	1.0 – <1.6	0.25 – <1.0	<0.25
Distance to moderate-traffic road (i.e. county roads, low traffic highways, etc.), spur rail, or active construction site (km). Does not include two-tracks.	≥0.50	0.30 – <0.50	0.10 – <0.30	0.025 – <0.10	<0.025

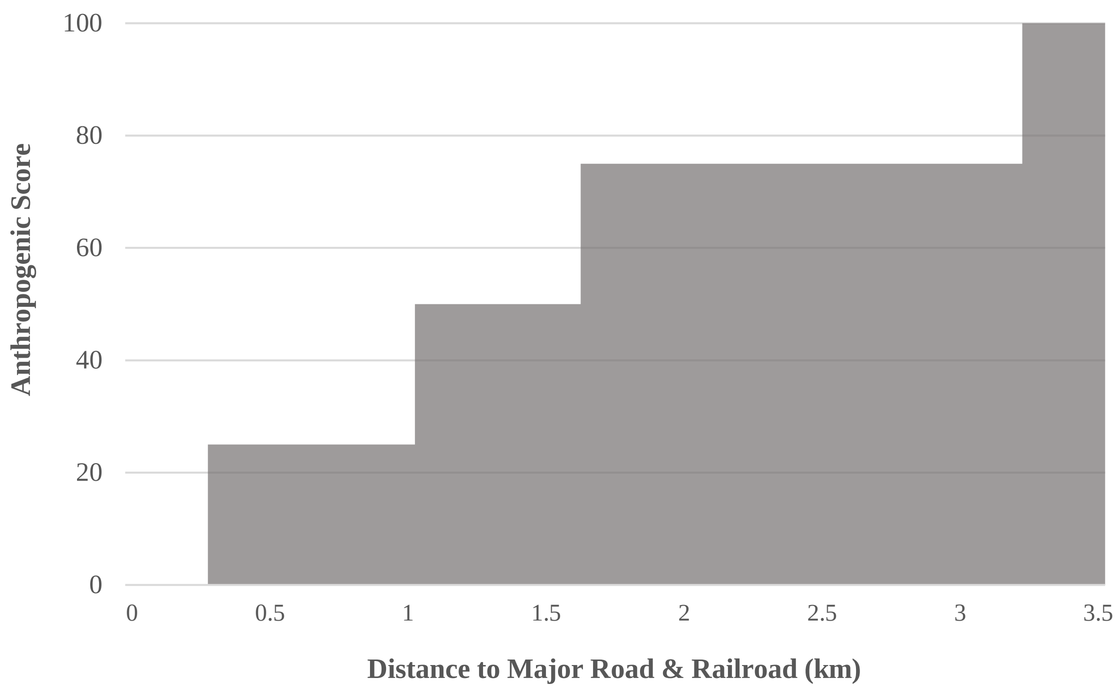

Figure F. 2. The Anthropogenic Score for the proximity to a high-traffic road or mainline rail Anthropogenic Variable.

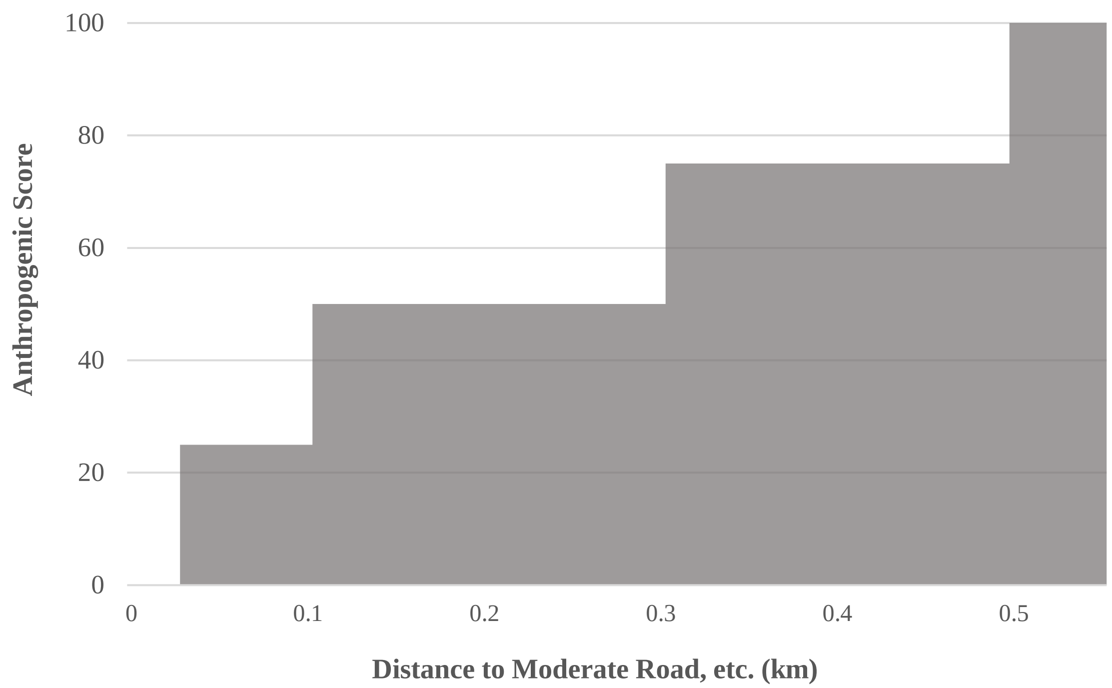

Figure F. 3. The Anthropogenic Score for the proximity to a moderate-traffic road or spur rail Anthropogenic Variable.

Optional Third Level Assessment

Debit projects may have the option of performing Third Level Assessment surveys to collect site-specific data to inform the final HQT scores. This assessment must follow the peer-reviewed standards set forth in this document to ensure all such assessments are comparable, complete, and collect data useable within the Montana HQT framework.

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Appendix G. ANTHROPOGENIC VARIABLE: PIPELINES, FIBER OPTIC CABLE, AND BURIED UTILITIES

When a new pipeline, fiber optic, or buried utility project is proposed, all infrastructure for the proposal is overlain on the Montana HQT Basemap. Other infrastructure for the proposed project may include roads, tall structures, etc. Specific Anthropogenic Scores are calculated to generate the Total Anthropogenic Score for the new pipeline, fiber optic, or buried utility project (Figure G. 1. Equation for calculating the Anthropogenic Score for Pipelines, Fiber Optics, and Buried Lines projects and any additional infrastructure.). This project specific score is multiplied by the Montana HQT Basemap Total to produce a Project specific Raw HQT Score. (Section 3.2.3).

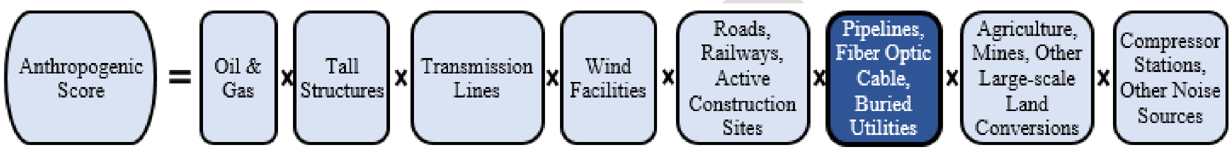

Figure G. 1. Equation for calculating the Anthropogenic Score for Pipelines, Fiber Optics, and Buried Lines projects and any additional infrastructure.

SUPPORTING LITERATURE

Major or minor pipelines, buried fiber optic cable, and other types of buried utilities projects have in common a high level of surface disturbance and human activity during the construction phase, followed by a relatively short time frame for reclamation to vegetated habitat. The operations phase is different from most project types in that, although the lifetime of the project would be considered permanent (longer than 25 years), it creates no lasting surface disturbance and therefore does not impact GRSG or their habitat after the construction phase and relatively brief reclamation phases are complete.

It is important for the Montana HQT to accurately quantify the initial disturbance, however, and then estimate the timeframe for the reestablishment of native vegetation. Depending on the type of project, surface disturbance could be a corridor of several hundred feet using backhoes and tracked equipment for a major gas pipeline and associated activities, or minimal disturbance for fiber optic cable or other utilities using a single cable plow or micro-trenching machine. After the construction phase, the primary concern for GRSG habitat conservation is controlling for invasive weeds or erosion within the disturbance area.

Relatively few studies have been conducted on the Indirect Impacts of pipelines on GRSG distribution. We are not aware of any studies specifically addressing effects of buried utilities, but the common characteristic is the duration of the construction and reclamation phases. Where the effects of pipelines have been considered, the results are inconclusive because the pipelines are included as one factor among several potential explanatory variables, many of which have confounding effects since they are often co-located with other infrastructure (Knick et al. 2013; Johnson et al. 2011).

HOW THE TOTAL ANTHROPOGENIC SCORE IS CALCULATED

Since the construction phase of this disturbance activity disturbance is similar to that of a moderate-traffic road, these projects can be modeled using the same Indirect Impacts buffer (Table G. 1; Figure G. 2).

Data Layers: Proposed Pipeline, Fiber Optic Cable, or other buried Utilities Project Spatial Data (submitted by proponent)

GIS Steps for Anthropogenic Variable and Score Creation:

1. Create the Project Assessment Area:
    a. Direct Footprint: this is the exact shape and area of the submitted Proposed Pipeline, Fiber Optic Cable, or other buried Utilities Project.
    b. Indirect Impact: Create the Indirect Impact area by buffering the Direct Footprint of the Proposed Pipeline, Fiber Optic Cable, or other buried Utilities Project by 500-m.
    c. Project Assessment Area (PAA): This is the Direct Footprint *and* the Indirect Impact areas.
2. Run the Euclidean Distance Tool on the PAA layer with a maximum distance of 500-m. Specify the previous buffer as the extent in the Environment Settings to create an output "Euclidean Distance Pipeline, Fiber Optic Cable, or other buried Utilities" raster.
3. Reclassify the pixel values in the Euclidean Distance Pipeline, Fiber Optic Cable, or other buried Utilities raster to the associated Anthropogenic Score in Table G.1 to create the "Distance to Pipeline, Fiber Optic Cable, or other buried Utilities Anthropogenic Score" raster.
4. If a given project contains additional disturbance types (e.g., oil & gas well pads, tall structures), refer to the associated Anthropogenic Variable appendix for creation of additional Anthropogenic Score rasters.
5. Once all disturbance types for the proposed project have an Anthropogenic Score raster created, all Anthropogenic Score rasters are multiplied together to create the Total Anthropogenic Score for the Project Assessment Area for the proposed Pipeline, Fiber Optic Cable, or other buried Utilities project. See Section 5 for the complete calculation of the Raw HQT Score for Debit Projects.

Table G. 1. Anthropogenic Scores for proximity to pipelines, fiber optic cable, or other buried utilities during construction phase.

Disturbance Categories	Anthropogenic Score				
	100	75	50	25	0
Distance to disturbance during year(s) of construction (km)	≥0.5	0.3 – <0.5	0.1 – <0.3	0.025 – <0.1	<0.025

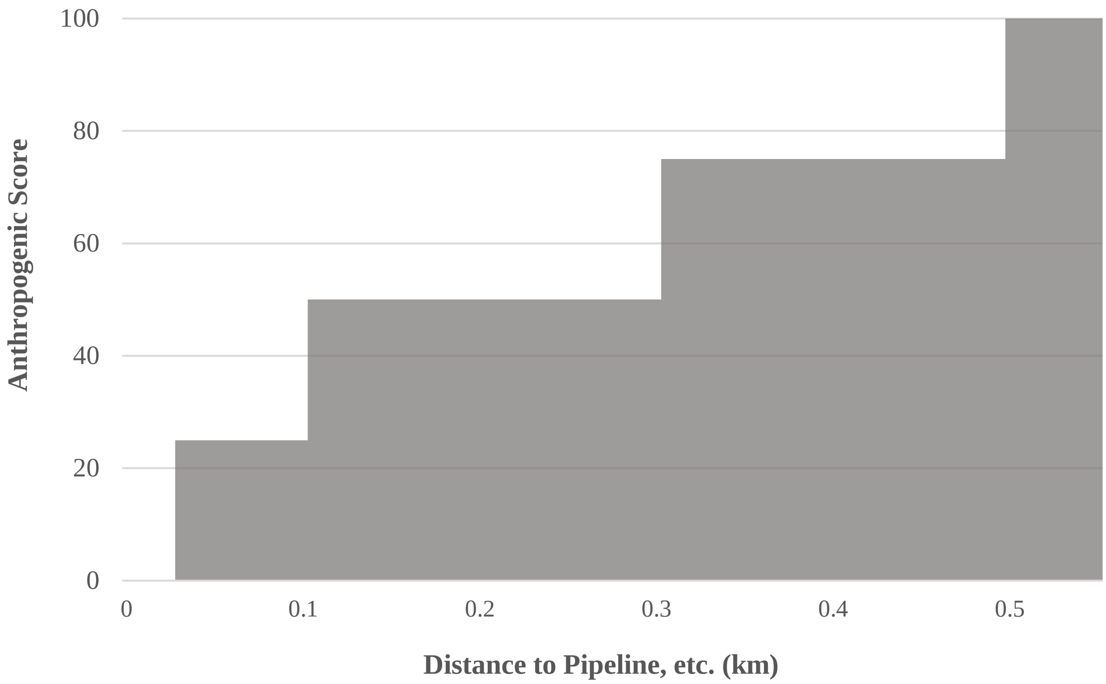

Figure G. 2. The Anthropogenic Score for the proximity to a pipeline, fiber optic cable, or other buried utilities during construction Anthropogenic Variable.

Optional Third Level Assessment

Debit projects may have the option of performing Third Level Assessment surveys to collect site-specific data to inform the final HQT scores. This assessment must follow the peer-reviewed standards set forth in this document to ensure all such assessments are comparable, complete, and collect data useable within the Montana HQT framework.

Literature Cited

Johnson, D.H., J.J. Holloran, J.W. Connelly, S.E. Hanser, C.L. Amundson, and S.T. Knick. 2011. Influences of environmental and anthropogenic features on greater sage-grouse populations, 1997–2007. In Greater Sage-Grouse: Ecology and Conservation of a Landscape Species and its Habitats, Studies in Avian Biology, Vol. 38, S.T. Knick and J.W. Connelly (eds), pp.407–450, University of Californian Press, Berkeley, CA, USA.

Knick, S.T., S.E. Hanser, and K.L. Preston. 2013. Modeling ecological minimum requirements for distribution of greater sage-grouse leks: implications for population connectivity across their western range, USA. Ecology and Evolution 3:1539–1551.

Appendix H. ANTHROPOGENIC VARIABLE: AGRICULTURE, MINES, AND OTHER LARGE-SCALE LAND CONVERSION PROCESSES

When a new agriculture, mine, or other large-scale land conversion project is proposed, all infrastructure for the proposal is overlain on the Montana HQT Basemap. Other infrastructure for the proposed project may include roads, tall structures, etc. Specific Anthropogenic Scores are calculated to generate the Total Anthropogenic Score for the new agriculture, mine, or other large-scale land conversion project (Figure H. 1). This project specific score is multiplied by the Montana HQT Basemap Total to produce a Project specific Raw HQT Score. (Section 3.2.3).

Figure H. 1. Equation for calculating the Anthropogenic Score for Agriculture, Mines, and Other Large-scale Land Conversion projects and any additional infrastructure.

SUPPORTING LITERATURE

Conversion of GRSG habitat to agricultural lands is another source of habitat loss and degradation of habitat value at the landscape scale (e.g., Knick et al. 2013; Smith et al. 2016, and Aldridge et al. 2008). This same conversion process may also be present for other moderate to large-scale land uses, including mining. The effects of mines on GRSG have not been specifically studied and are likely to vary widely based on the type of mine (e.g., surface or below ground) and infrastructure. Removal of vegetation during surface mining would likely make the area unsuitable for GRSG and may be similar to the conversion of sagebrush to agriculture.

In their survey of lek locations throughout the western half of the species range, Knick et al. (2013) found that the percent agriculture varied widely across individual lek locations, but <2% of the leks were in areas surrounded by >25% agriculture within a 5.0-km radius, and 93% by <10% agriculture. Smith et al. (2016) found that cropland effects manifest at a spatial scale of 32.2-km^2 in eastern Montana, northeastern Wyoming, and North and South Dakota, and that a 10-percentage point increase in cropland is associated with a 51% reduction in lek density. Aldridge et al. (2008) estimated that GRSG were extirpated from areas of their range when more than 25% of current habitat was in cultivated cropland. These findings suggest that approximately 25% cropland constitutes an upper threshold for GRSG breeding habitat.

HOW THE TOTAL ANTHROPOGENIC SCORE IS CALCULATED

Based upon the findings noted above, the HQT score evaluates percent agriculture within a 3.2-km buffer (as documented by Smith et al. 2016), and the score is reduced as the proportion of the surrounding landscape that is converted to other land uses increases. Habitats surrounded by <10% agriculture, mining, or other land conversion types within 3.2-km have no reduction in value in the model, consistent with the finding by Knick et al. (2013). The HQT score is reduced by 50% for habitats with 10–25% agriculture (or other land conversion) consistent with Smith et al. (2016). As only 2% of leks were found with >25% agriculture and extirpation is likely, the HQT score goes to zero at 25% land conversion (Table H. 1).

Table H. 1. Anthropogenic Scores for percent agriculture within a 3.2-km radius.

Percent agriculture within a 3.2-km radius	Anthropogenic Score
0 – <10	100.0
10 – <25	50.0
25 – <40	12.5
40 – <60	5.0
≥60	0.0

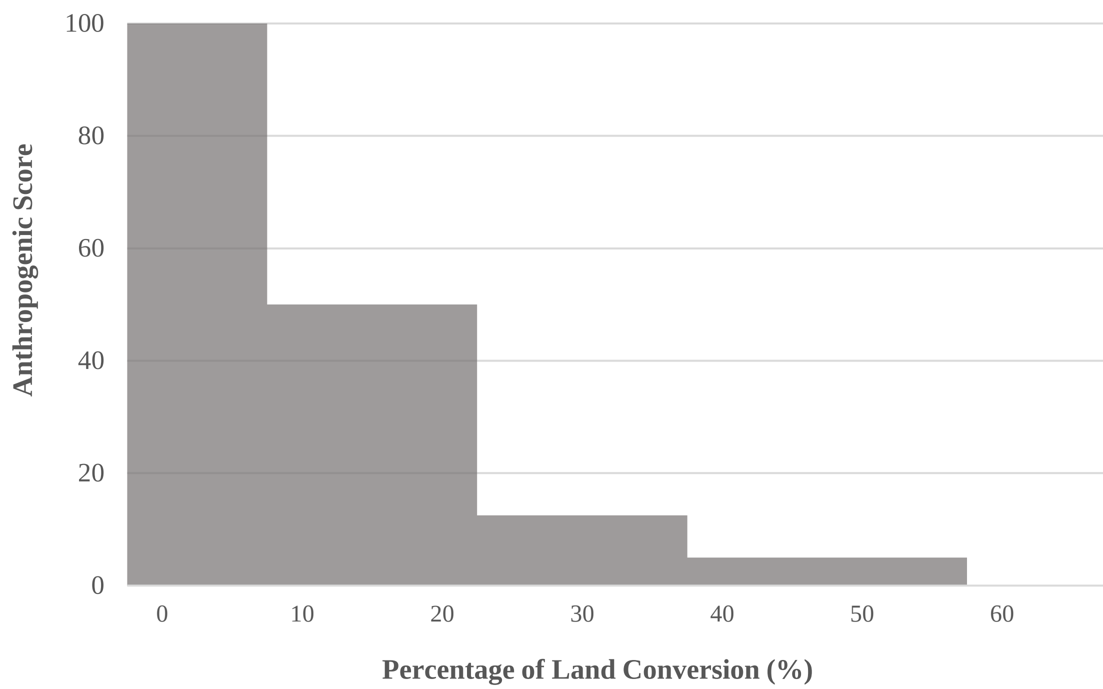

Figure H. 2. The Anthropogenic Score for the Agriculture, Mining, and Other Large-scale Land Conversion Processes Anthropogenic Variable within a 3.2-km radius.

<u>Data Layers:</u> Proposed Agriculture, Mine, and/or other Large-scale Land Conversion Project Spatial Data (submitted by proponent)

<u>GIS Steps for Anthropogenic Variable and Score Creation:</u>

1. Create the Project Assessment Area:
   a. Direct Footprint: this is the exact shape and area of the submitted Proposed Agriculture, Mine, and/or other Large-scale Land Conversion Project.

b. Indirect Impact: Create the Indirect Impact area by buffering the Direct Footprint of the Proposed Agriculture, Mine, and/or other Large-scale Land Conversion Project by 3.2-km.

c. Project Assessment Area (PAA): This is the Direct Footprint *and* the Indirect Impact area.

2. Convert the Agriculture, Mine, and/or other Large-scale Land Conversion PAA layer to a raster, giving all cells within the Direct Footprint boundary a value of "1" to create the "Agriculture, Mine, and/or other Large-scale Land Conversion Project" raster.

3. Use the Focal Statistics Tool with a 3.2-km radius circle neighborhood (e.g., moving window) and select "SUM statistics" option to create a "Agriculture, Mine, and/or other Large-scale Land Conversion SUM" raster that represents the number of cells surrounding a particular cell that are categorized as Agriculture, Mine, and/or other Large-scale Land Conversion Project (pixel value = 1).

4. Convert the new raster to data type "float" to allow for decimal places for calculation of percentages.

5. Divide the resulting raster by the maximum possible number of cells within a 3.2-km radius circle to create the "Agriculture, Mine, and/or other Large-scale Land Conversion Percent Disturbance" raster. This maximum value will be dependent on cell size used, so script in a variable equal to: "float(arcpy.GetRasterProperties_management(agminefloat, "MAXIMUM").getOutput(0))" to plug into the Division step.

6. Using the Mask Tool, remove the Direct Footprint area from the Agriculture, Mine, and/or other Large-scale Land Conversion Percent Disturbance raster to create the Agriculture, Mine, and/or other Large-scale Land Conversion Percent Disturbance Indirect raster.

7. Convert the Direct Footprint layer to a raster and reclassify values to 0 to create the Direct Agriculture, Mine, and/or other Large-scale Land Conversion Anthropogenic Score raster.

8. Reclassify the pixel values in the Agriculture, Mine, and/or other Large-scale Land Conversion Percent Disturbance Indirect raster to the associated Anthropogenic Score in Table H.1 to create the Indirect Agriculture, Mine, and/or other Large-scale Land Conversion Percent Anthropogenic Score raster.

9. Merge (Mosaic to New Raster Tool) the Direct Agriculture, Mine, and/or other Large-scale Land Conversion Anthropogenic Score raster with the Indirect Agriculture, Mine, and/or other Large-scale Land Conversion Percent Anthropogenic Score raster to create the Agriculture, Mine, and/or other Large-scale Land Conversion Percent Anthropogenic Score raster.

10. If a given project contains additional disturbance types (e.g., roads, transmission lines), refer to the associated appendix for creation of additional Anthropogenic Score rasters.

11. Once all disturbance types for the proposed project have an Anthropogenic Score raster created, all Anthropogenic Score rasters are multiplied together to create the Total Anthropogenic Score for the Project Assessment Area for the proposed Agriculture, Mine, and/or other Large-scale Land Conversion project. See Section 5 for the complete calculation of the Raw HQT Score for Debit Projects.

OPTIONAL THIRD LEVEL ASSESSMENT

Debit projects may have the option of performing Third Level Assessment surveys to collect site-specific data to inform the final HQT scores. This assessment must follow the peer-reviewed standards set forth in this document to ensure all such assessments are comparable, complete, and collect data useable within the Montana HQT framework.

LITERATURE CITED

Aldridge, C.L., S.E. Nielsen, H.L. Beyer, M.S. Boyce, J.W. Connelly, S.T. Knick, and M.A. Schroeder. 2008. Range-wide patterns of greater sage-grouse persistence. Diversity and Distributions 14:983–994.

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Smith, J.T., J.S. Evans, B.H. Martin, S. Baruch-Mordo, J.M. Kiesecker, and D.E. Naugle. 2016. Reducing cultivation risk for at-risk species: predicting outcomes of conservation easements for sage-grouse. Biological Conservation 201:10–19.

Appendix I. ANTHROPOGENIC VARIABLE: COMPRESSOR STATIONS & OTHER NOISE PRODUCING SOURCES

When a new compressor station or other noise producing project is proposed, all infrastructure for the proposal is overlain on the Montana HQT Basemap. Other infrastructure for the proposed project may include roads, tall structures, etc. Specific Anthropogenic Scores are calculated to generate the Total Anthropogenic Score for the new compressor station or other noise producing project (Figure I. 1). This project specific score is multiplied by the Montana HQT Basemap Total to produce a Project specific Raw HQT Score. (Section 3.2.3).

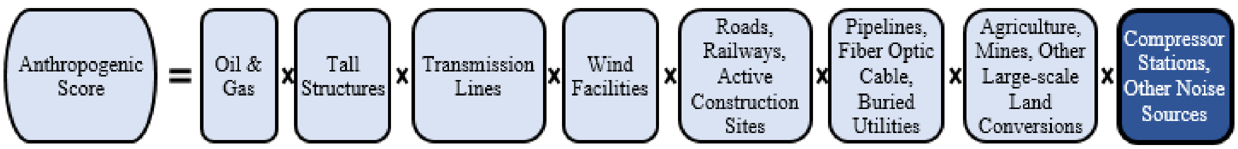

Figure I. 1. Equation for calculating the Anthropogenic Score for Compressor Stations and Other Noise Producing projects and any additional infrastructure.

SUPPORTING LITERATURE

Noise disturbance has been documented in literature to have deleterious effects on greater sage-grouse (*Centrocercus urophasianus*; hereafter GRSG) activities. Recent research has demonstrated that noise from natural gas development negatively affects GRSG abundance, stress levels, and behaviors. Other types of anthropogenic noise sources are similar to gas-development noise and, thus, the response by GRSG is likely to be similar. The results of research suggest that effective management of the natural soundscape is critical to the conservation and protection of GRSG (Patricelli et al. 2013). Acoustic communication is very important in the reproductive behaviors of GRSG, and energy exploration and development activities generate substantial noise (Blickley and Patricelli 2012). Female GRSG use male vocalizations to find males on the lek (Gibson 1989), and, during courtship, females assess male vocalizations and other aspects of male display when choosing a mate (Wiley 1973, Gibson and Bradbury 1985, Gibson 1996, Patricelli and Krakauer 2010). Noise produced from natural gas development primarily is due to drilling rigs, compressors, generators, and traffic on access roads. These noise sources are loudest in frequencies (i.e., pitch) <2.0-kHz (Blickley and Patricelli 2012). Male GRSG produce acoustic signals in a similar frequency range, between 0.2 – 2.0-kHz, so the potential exists for industrial noises to mask GRSG communication. Such a disruption in GRSG communication may interfere with the ability of females to find and choose mates and ultimately negatively affect mating success (Blickley and Patricelli 2012).

For a prey species, such as GRSG, noise may also increase predation risk by masking the sounds of approaching predators (e.g., coyote, badger), and contribute to behavioral disruptions such as elevated heart rate, interrupted rest, and increased stress levels, all of which may affect health and reproduction or cause avoidance of noisy areas (Patricelli et al. 2013).

The MT EO 12-2015 threshold for noise states: New project noise levels, either individual or cumulative, should not exceed 10-dBA (as measured by L50) above baseline noise at the perimeter of an active lek from 6:00 p.m. to 8:00 a.m. during the breeding season (March 1 - July 15). Patricelli et al. (2013) notes that 10-dB is a significant increase in the amount of noise. For an animal vocalizing to communicate with potential mates or offspring, a 10-dB increase in noise levels corresponds to a 10-fold decrease in the active space of the vocalization. This same increase in noise will lead to up to a 3-fold decrease in the detection distance between 2 receivers (Barber et al. 2009). This means that, in a noisy environment, the receiver must be 3 times closer to hear a vocalization than in quiet conditions, and perhaps more critically, a predator would be able to approach 3 times closer in noisy conditions before it was detected by a GRSG (Patricelli et al. 2013).

Blickley et al. (2012) found a 29% decrease in lek attendance due to continuous natural gas drilling rigs (<2.0-kHz) up to 400-m away over the course of three breeding seasons. The effect of the noise was immediate and sustained, having the potential to affect the size and persistence of the local population. The declines in male attendance observed on the Blickley noise-playback study were immediate and sustained throughout the 3-year experiment (Blickley et al. 2012a), and elevated stress hormones were observed in both the second and third years of noise playback (Blickley et al. 2012b), indicating that GRSG do not adapt to increased noise levels over time (Patricelli et al. 2013).

Holloran (2005) found observational evidence that noise may be at least partly responsible for impacts from natural gas development on GRSG populations in the Pinedale Anticline Project Area, Wyoming. Juvenile males avoided leks located near natural-gas drilling sites, even if the leks previously had high attendance by males (Holloran et al. 2010). These effects were more pronounced downwind of the drilling sites where noise levels were higher, suggesting that noise contributed substantially to these declines (Holloran 2005 in Patricelli et al. 2013).

HOW THE TOTAL ANTHROPOGENIC SCORE IS CALCULATED

The Montana HQT model assumes that effects from noise at stationary sources such as drill rigs, compressors, and substations are greatest near the source, and attenuate with distance, which corresponds to effects measured by Blickley et al. (2012) for drilling rigs on lek attendance (Table I. 1). There is no habitat value within 0 to 50-m of the noise source (Score Adjustment Factor = 0). Within 50 to 100-m of the noise source, 50% of habitat value is lost (i.e., Score Adjustment Factor = 50), and within 100 to 400-m, 30% of the habitat value is lost (i.e., Score Adjustment Factor = 70). This value returns over a distance of 400-m; beyond 400-m, there is no further decrease in habitat value (i.e., Score Adjustment Factor = 100). The effects of noise production (and, conversely, noise mitigation techniques) have the potential to vary greatly by source, type, and location. This variable may be changed to better represent this variability in the future as required to maintain consistency with the best available science.

<u>Data Layers:</u> Proposed Compressor Station and/or other Noise Producing Source Project Spatial Data (submitted by proponent)

<u>GIS Steps for Anthropogenic Variable and Score Creation:</u>

1. Create the Project Assessment Area:
    a. Direct Footprint: this is the exact shape and area of the submitted Proposed Compressor Station and/or other Noise Producing Source Project.
    b. Indirect Impact: Create the Indirect Impact area by buffering the Direct Footprint of the Proposed Compressor Station and/or other Noise Producing Source Project by 400-m.

c. Project Assessment Area (PAA): This is the Direct Footprint *and* the Indirect Impact areas.

2. Run the Euclidean Distance Tool on the PAA layer with a maximum distance of 400-m. Specify the previous buffer as the extent in the Environment Settings to create an output "Euclidean Distance Compressor Station and/or other Noise Producing Source" raster.
3. Reclassify the pixel values in the Euclidean Distance Compressor Station and/or other Noise Producing Source raster to the associated Anthropogenic Score in Table I.1 to create the "Distance to Compressor Station and/or other Noise Producing Source Anthropogenic Score" raster.
4. If a given project contains additional disturbance types (e.g., oil & gas well pads, tall structures), refer to the associated Anthropogenic Variable appendix for creation of additional Anthropogenic Score rasters.
5. Once all disturbance types for the proposed project have an Anthropogenic Score raster created, all Anthropogenic Score rasters are multiplied together to create the Total Anthropogenic Score for the Project Assessment Area for the proposed Compressor Station and/or other Noise Producing Source project. See Section 5 for the complete calculation of the Raw HQT Score for Debit Projects.

Table I. 1. Anthropogenic Scores for proximity to compressor stations and substations.

Distance (km)	**Anthropogenic Score**
0 – 0.05	0
>0.05 – 0.10	50
>0.10 – 0.40	70
>0.40	100

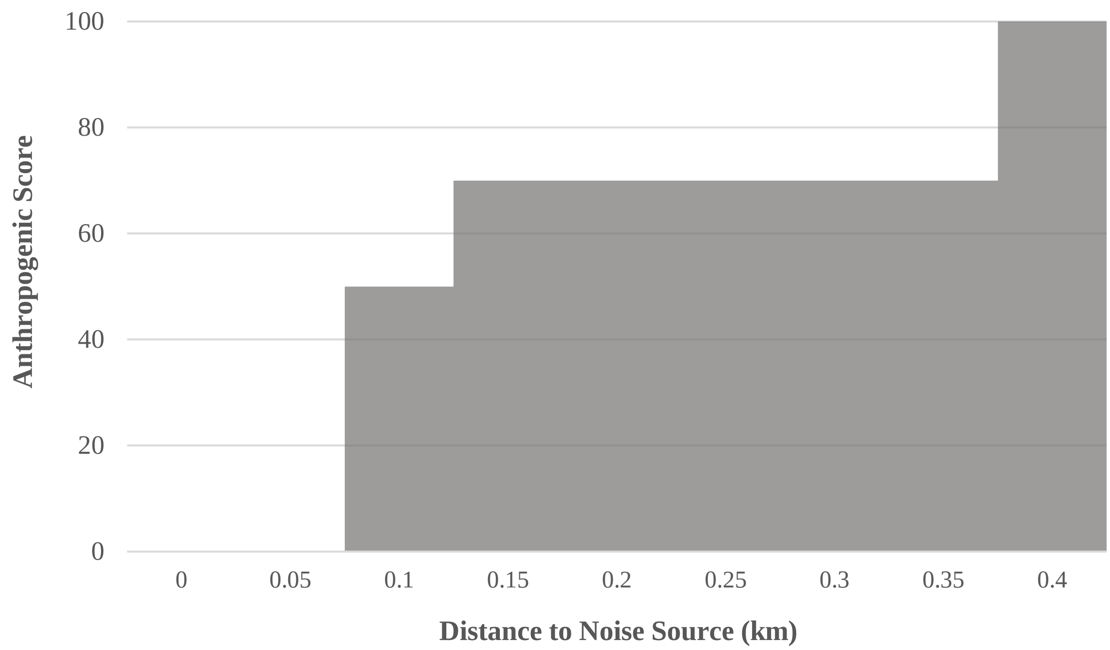

Figure I. 2. The Anthropogenic Score for the proximity to a given Noise Disturbance Source (e.g., compressor station, road traffic, etc.) Anthropogenic Variable.

Optional Third Level Assessment

Debit projects may have the option of performing Third Level Assessment surveys to collect site-specific data to inform the final HQT scores. This assessment must follow the peer-reviewed standards set forth in this document to ensure all such assessments are comparable, complete, and collect data useable within the Montana HQT framework.

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Appendix J. CREDIT PROJECT HABITAT IMPROVEMENT THROUGH PRESERVATION, RESTORATION, AND ENHANCEMENT

An important aspect of the GRSG habitat conservation strategy is the 1) preservation of existing habitat, 2) restoration of degraded habitats, and 3) enhancement of lower quality habitats to provide better quality habitat or to increase seasonal habitat capacity. Of these three approaches, only preservation does not incorporate the element of time in the Raw HQT Score because the landscape is not expected to be altered.

Preservation efforts, such as perpetual conservation easements or term leases, seek to conserve the remaining large blocks of intact habitat. Montana still has large tracts of intact sagebrush habitats that provide year-round habitat for GRSG. Sagebrush ecosystems are difficult to restore to suitable conditions for GRSG, and the cost and human effort needed to do so is increasing over time (Fuhlendorf, et al. 2017; Arkle et al. 2014). These intact areas can be preserved through conservation easements or term lease agreements [MCA § 76-22-112 (2017)], which, typically eliminate anthropogenic causes of habitat loss and fragmentation, such as cultivation and subdivision.

Enhancement requires an increase or improvement in quality, value, or extent of sage grouse habitat that has been degraded, or could be managed to increase the value of that habitat over its current value (BLM 2016). For credit projects, this approach can be used to increase existing credits by improving the habitat quality or function to GRSG

See Appendix L for a hypothetical credit project scenario.

Restoration can be defined as the process of assisting the recovery of a resource (including its values, services, and/or functions) that has been degraded, damaged, or destroyed to the condition that would have existed if the resource had not been degraded, damaged, or destroyed (BLM 2016). Restored lands are eligible to receive grants from the Stewardship Fund [MCA § 76-22-110 (2017)]. Examples include the re-establishment of suitable GRSG habitat on abandoned mining claims, abandoned industrial sites, heavily impacted livestock areas, removal of conifers, eradication of invasive plant species, removal of abandoned transmission lines and towers, or restoration of wet meadows that are currently not functioning properly.

Restoration can recover areas degraded or lost to a variety of disturbances and return them to suitable GRSG habitat (Pyke 2011). These areas can be important links for connectivity, provide important mesic habitat for late summer brood rearing, or provide other seasonal habitat components, thereby increasing the value of surrounding, intact sagebrush lands. Restoration can be achieved by treating vegetation at a site-specific scale, although effects of coordinated projects at a regional scale are less understood (Stiver et al., 2015). Two types of vegetation treatments that have resulted in successful habitat restoration for GRSG are conifer removal and reductions of shrub overstory cover to restore native perennial grasses and forbs. Vegetation treatment may also be used to create fuel brake networks to protect sensitive sagebrush habitats from wildfire (Stiver et al., 2015).

Conifer removal can quickly restore lost or degraded sagebrush habitat. GRSG avoid areas of relatively low-density conifer encroachment because conifers can provide roosting and nesting structure for avian predators (Fuhlendorf et al., 2002; Doherty et al., 2010; Knick et al., 2013;

Prochazka et al. 2017; Severson et al. 2017a). Research has shown that removal of encroaching conifers in sagebrush habitats can provide almost immediate gain in GRSG use of the treated habitat (Miller et al., 2017; Severson et al., 2017b), and improvement in snow persistence, water retention, and vegetation growth (Kormos et al., 2017).

Effective restoration of GRSG habitat can be challenging and difficult to achieve. The timeframe and success of a restoration project should be informed by local successful restoration projects or plant growth research data if possible. Restoration of sagebrush is a difficult and slow process due to abiotic variation, long-term weather patterns, short-lived seedbanks, and the long generation time of sagebrush. Disturbed soils and vegetation can increase the difficulty in restoring sagebrush depending on local conditions (Monsen 2005).

GRSG are sagebrush obligate species, and as such are more sensitive to habitat fragmentation, degradation, and alteration than are generalist species (Saab and Rich, 1997; Julliard et al., 2003; Colles et al., 2009). This makes preservation, restoration, and enhancement projects important management tools in maintaining and increasing GRSG populations and habitat in Montana. Research provides a good understanding of GRSG habitat selection on an annual basis to inform these projects. Walker et al. (2016) mapped seasonal habitats for GRSG and found that areas selected in all seasons had a mix of habitats with a sagebrush component, less rugged topography, and less non-sagebrush habitat. The grouse in the study selected sagebrush and sagebrush-grassland at intermediate elevations during breeding and winter, and more diverse sagebrush habitats at higher elevations in summer and fall.

Knick et al. (2013) modeled annual GRSG habitat with human use influences across their range. The model indicated that GRSG required sagebrush-dominated landscapes containing minimal levels of human land use. GRSG used relatively arid regions characterized by shallow slopes, even terrain, and low amounts of forest, grassland, and agriculture in the surrounding landscape. Baxter et al. (2017) had similar results when analyzing resource selection in mechanically-altered habitats (to increase sagebrush-grass-forb habitats), finding that GRSG selected areas that were distant from trees, paved roads, and powerlines, and on more gentle slopes. Continued research in this area will help inform effective management options to improve GRSG habitat in strategic and effective locations in or near Core Areas in Montana.

For restoration or enhancement projects, sagebrush seeding or planting may be desirable. The timeframes necessary for full recovery of sagebrush varies widely in the literature. Bunting et al. (2002) stated that recovery times of sagebrush communities vary, and may be as short as 15 years for mountain big sagebrush or as long as 50 to 75 years for Wyoming big sagebrush. Cooper et al. (2007) looked at post-fire recovery of sagebrush shrub-steppe communities in central and southeast Montana and found that full recovery of Wyoming big sagebrush took over 100 years and that recovery of mountain big sagebrush cover took slightly more than 30 years. They found that the mean recovery rate for Wyoming big sagebrush canopy cover was 0.16% per year in the study area, and the fastest recovery rate was 0.72% per year (Cooper et al. 2007). Wambolt et al. (2001) reported 72% recovery of Wyoming big sagebrush after 32 years at one site in southwestern Montana, and 96% recovery after only 9 years at another site. Baker (2006) found that recovery times for mountain big sagebrush ranged from 35 to 100 years, and that recovery times for Wyoming big sagebrush ranged from 50 to 120 years. The success of conservation actions carried out by a Credit Provider are likely site-specific, highly dependent on the existing quality of the vegetation and level of prior degradation received from anthropogenic or natural disturbances.

THE HQT CALCULATION PROCESS FOR PRESERVATION, RESTORATION, AND ENHANCEMENT PROJECTS

Regardless of the type of credit site project (preservation, restoration, or enhancement), accurately measuring and documenting changes in the Raw HQT Score at different project milestones and phases will be an important aspect for all credit projects. Verification of baseline site conditions are instrumental for credit projects. The initial verification of site conditions will be used to adjust the Project HQT Basemap. By comparing the adjusted Project HQT Basemap to the theoretical maximum HQT Score, the maximum amount of uplift that can be expected for a given site is calculated. Mutually agreed upon standards must be used to evaluate habitat changes over time.

PRESERVATION

Preservation projects can include conservation easements or term leases where the terms are based on managing future development on the property to preserve high quality GRSG habitat. For preservation credit projects, the Project Assessment Area is the property boundary or the conservation easement or term lease boundary. The Project HQT Basemap is extracted from the Montana HQT Basemap based on the Project Assessment Area footprint (Figure J. 1). The pixel values within the Project HQT Basemap are then averaged and the result is multiplied by the total area (acres) of the Project Assessment Area. The result is then multiplied by the number of years defined for the easement (perpetual conservation easements: 100 years; term lease easements: number of years of the lease). For credit projects, a Third Level Assessment will be required. The Raw HQT Score can be adjusted up or down, based on the results. The result is the Final Raw HQT Score, which represents the Functional Acres gained as the Predicted Uplift for the life of the project. See Figure J. 1.

Montana HQT – Flowchart for Preservation Projects

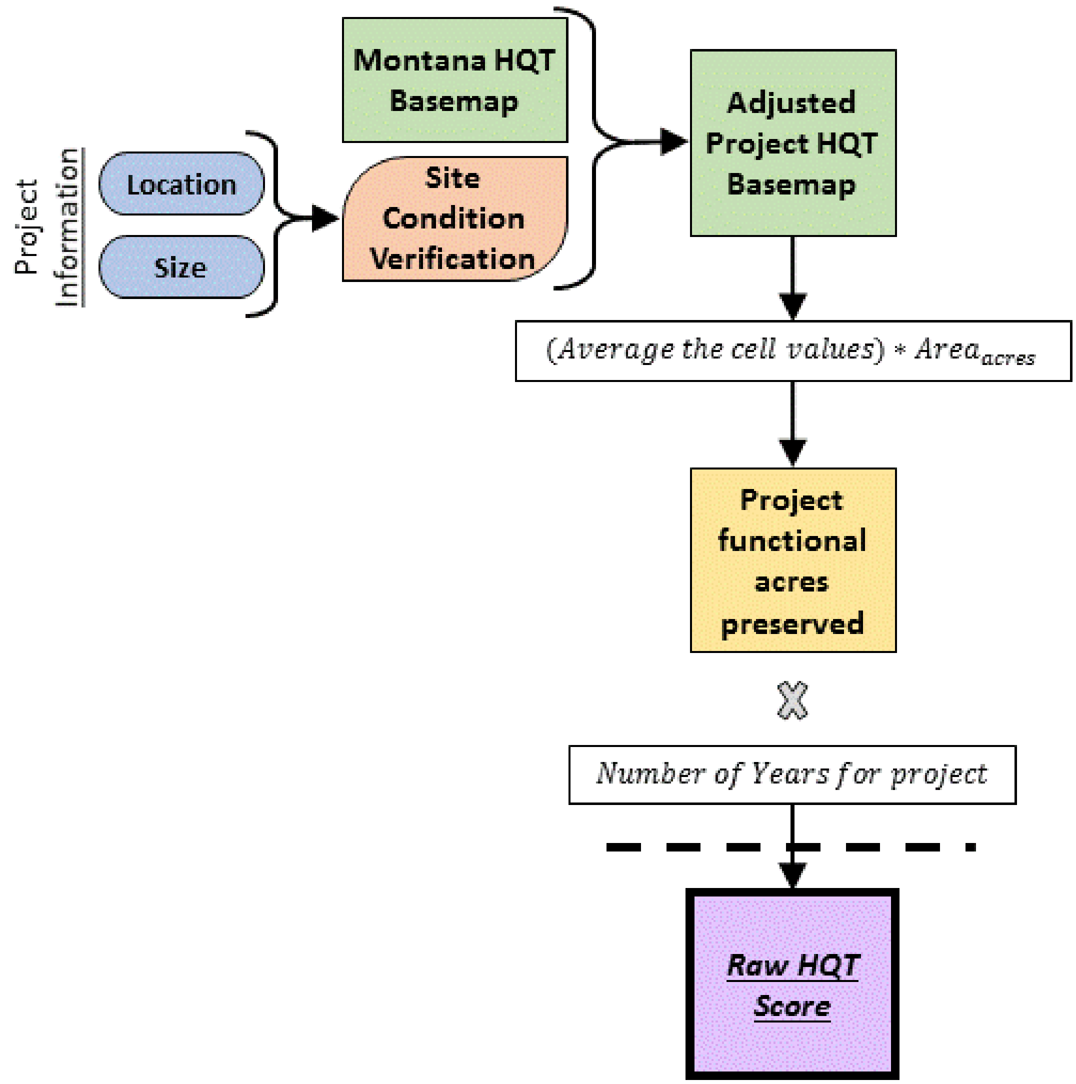

Figure J. 1. Flowchart for the development of the Raw HQT Score for Preservation Projects.

RESTORATION AND ENHANCEMENT

Each restoration credit project will develop a Project Management Plan that outlines the location and project-specific objectives, timeframe, conservation actions, and monitoring plans. Additional content for Project Management Plans may include a detailed species list for reseeding of native grasses, forbs, and sagebrush, and a planting schedule, a weed control plan, and standards for measuring successful restoration (see Section 2.4.1 in the *Policy Guidance Document* for specifics on Site Performance Standards). The Project Assessment Area for restoration and enhancement projects is the property boundary. The Project Assessment Area for restoration and enhancement projects is the property boundary. Because the spatial resolution of the input data used to develop the Montana HQT Basemap is too coarse to delineate some of the features (e.g., individual conifer trees, invasive species) a Third Level Assessment is required for all a Credit Provider may be interested in removing from the landscape, Credit Providers should contemplate local knowledge of the credit project sites.

The Third Level Assessment will verify on the ground conditions and adjust the Project HQT Basemap. The Adjusted Project HQT Basemap will serve as the benchmark for which subsequent restoration success will be compared (Figure J. 2). From the Adjusted Project HQT Basemap, a theoretical maximum Raw HQT Score will be predicted by adjusting the sagebrush habitat variables to their maximum value (i.e., 100). The difference calculated between the theoretical maximum Raw HQT Score and Adjusted Project HQT Basemap will quantify the Predicted Uplift that can be expected for a given site.

The Predicted Uplift, derived from the Final Raw HQT Score will then be divided by the total number of years for the restoration or enhancement project to provide the predicted Raw HQT Score (Functional Acres gained) at each milestone year. The milestone years will coincide with the phases in the credit release schedule defined in the *Policy Guidance Document*. The Raw HQT Scores for the milestone years will be compared with site verification reports to determine the degree of success based on the project's Site Performance Standards.

For restoration and preservation projects, credit releases occur when a Performance Standard defined in the Project Management Plan is achieved and coincide with the phases defined in the Credit Release Schedule, which is informed by the predicted Raw HQT Scores for the milestone years.

Montana HQT – Flowchart for Restoration & Enhancement Projects

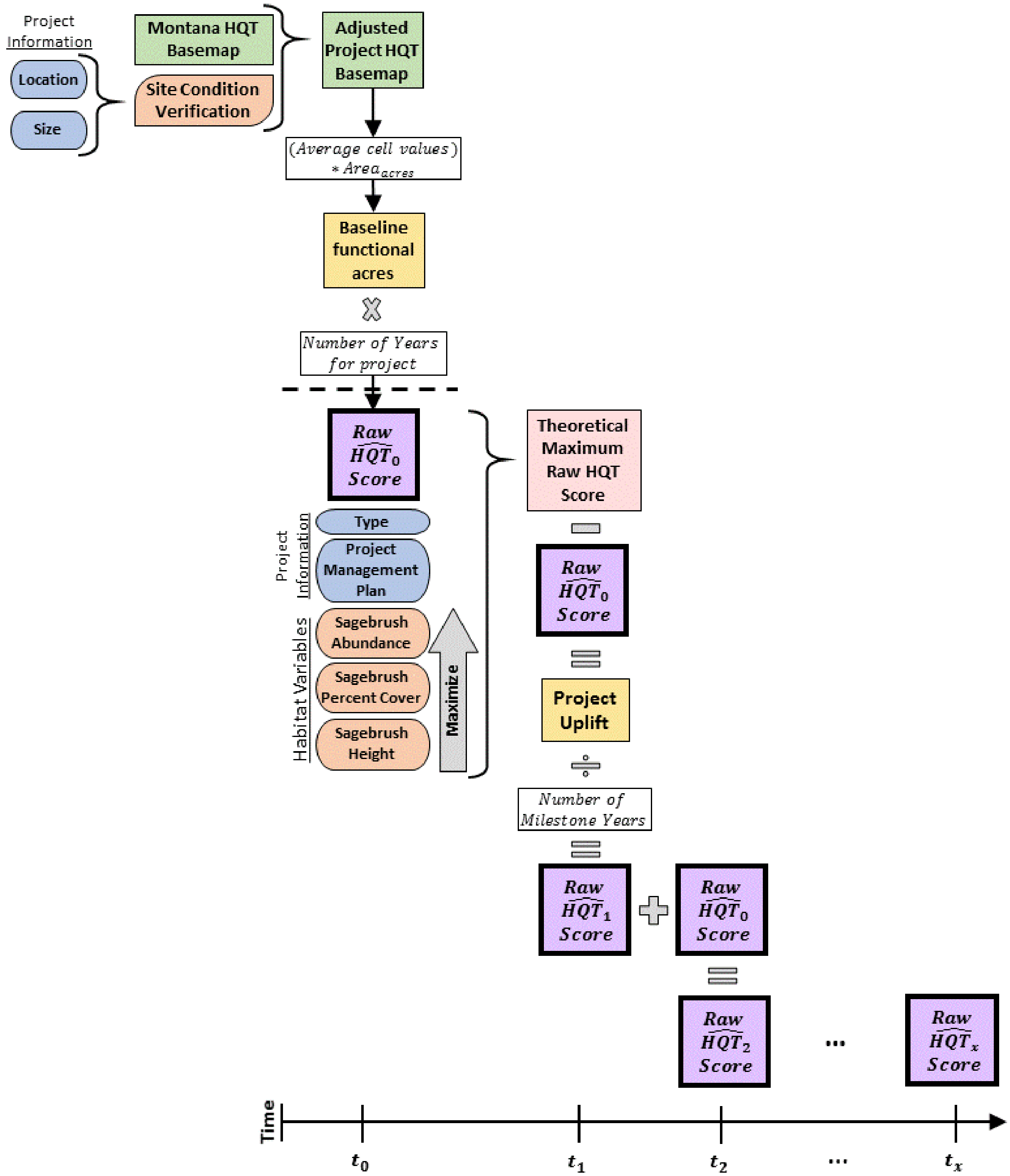

Figure J. 2. Flowchart for the development of the Raw HQT Scores for Restoration and Enhancement Projects.

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Appendix K. DEBIT PROJECT HABITAT RECOVERY THROUGH RECLAMATION

Reclamation is the habitat recovery approach available for project developers to bring development sites back to pre-project conditions. Reclamation is addressed in the EO 12-2015 for Core Area and General Habitat, stating that "reclamation should re-establish native grasses, forbs, and shrubs during interim and final reclamation to achieve cover, species composition, and life form diversity commensurate with the surrounding plant community or desired ecological condition to benefit [GRSG] and replace or enhance [GRSG] habitat" to the degree that environmental conditions allow. Control for noxious and invasive plant species is required during reclamation.

GRSG are sagebrush obligate species, and as such are more sensitive to habitat fragmentation, degradation, and alteration than are generalist species (Saab and Rich, 1997; Julliard et al., 2003; Colles et al., 2009). This makes reclamation an important management tools in maintaining and increasing GRSG populations and habitat in Montana. Research provides a good understanding of GRSG habitat selection on an annual basis to inform these projects. Walker et al. (2016) mapped seasonal habitats for GRSG and found that areas selected in all seasons had a mix of habitats with a sagebrush component, less rugged topography, and less non-sagebrush habitat. The grouse in the study selected sagebrush and sagebrush-grassland at intermediate elevations during breeding and winter, and more diverse sagebrush habitats at higher elevations in summer and fall.

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The timeframes necessary for full recovery of sagebrush varies widely in the literature. Bunting et al. (2002) stated that recovery times of sagebrush communities vary, and may be as short as 15 years for mountain big sagebrush or as long as 50 to 75 years for Wyoming big sagebrush. Cooper et al. (2007) looked at post-fire recovery of sagebrush shrub-steppe communities in central and southeast Montana and found that full recovery of Wyoming big sagebrush took over 100 years and that recovery of mountain big sagebrush cover took slightly more than 30 years. They found that the mean recovery rate for Wyoming big sagebrush canopy cover was 0.16% per year in the study area, and the fastest recovery rate was 0.72% per year (Cooper et al. 2007). Wambolt et al. (2001) reported 72% recovery of Wyoming big sagebrush after 32 years at one site in southwestern Montana, and 96% recovery after only 9 years at another site. Baker (2006) found that recovery times for mountain big sagebrush ranged from 35 to 100 years, and that recovery times for Wyoming big sagebrush ranged from 50 to 120 years. Assuming the practices of mowing and crushing vegetation have less negative impacts on vegetation recovery, mowed and crushed vegetation are expected to recover more quickly than cleared habitat.

HOW THE HQT CALCULATES FUNCTIONAL ACRES LOST DURING THE RECLAMATION PHASE

Reclamation is an important consideration for debit projects when determining the return of Habitat Function over the life of the project. As vegetation reclamation takes hold, Habitat Function increases. Accounting for reclamation activities over time requires consideration of the expected restoration success and timeframe for each vegetation community. It also must consider the type of impact (cleared, mowed, crushed) to the vegetation. Crushed vegetation generally recovers sooner than mowed and cleared vegetation. Cleared vegetation generally requires the longest recovery time. To account for the differences in the vegetation recovery rates, restoration recovery timeframes have been developed for each of these scenarios (Table K. 1). As necessary, these recovery timeframes will be updated as additional data become available.

To calculate functional acres lost during this phase, the Montana HQT uses the LANDFIRE data layer (USGS 2010 which is a component of the Montana HQT Basemap. The Montana HQT Basemap is combined with the Project Assessment Area to define vegetation data that is specific to the project area. The process removes any vegetation types not present in the project area, and therefore the resulting timeframe estimate is more accurate.

The recovery timeframes for cleared vegetation were estimated as the average time to obtain Class A and Class B seral stages among the specific vegetation types within the aggregate score. Seral stages used in LANDFIRE are described by the overall structural component and successional progression to a climax plant community (potential vegetation type). In this data set Class A is low cover, low height; and Class B is high cover, low height.

Development projects may have the option of performing Third Level Assessment surveys to collect site-specific data to inform the final HQT scores. This assessment must follow the peer-reviewed standards set forth in this document to ensure all such assessments are comparable, complete, and collect data useable within the Montana HQT framework. For example, these surveys could inform the model on conifer encroachment, invasive annual grasses, or native forbs or mesic areas. The Program reserves the right to require a Third Level Assessment for development projects.

THE HQT CALCULATION PROCESS FOR PRESERVATION, RESTORATION, AND ENHANCEMENT PROJECTS

The Project HQT Basemap will be compared to the Raw HQT Scores that will be re-run over time as restored or enhanced habitats develop and become established. For debit projects, the reclamation component of the Raw HQT Score will calculate the vegetation growth rate over time after the infrastructure is completely removed from the project footprint (i.e., direct project assessment area) and vegetation recovery begins. Mutually agreed upon standards must be used to evaluate habitat changes over time.

HOW THE HQT CALCULATES RECOVERY TIMEFRAMES

Reclamation is an important consideration when determining the return of Habitat Function over the life of a project. As vegetation reclamation takes hold, Habitat Function increases (Table K. 1).

Accounting for reclamation activities over time requires consideration of the expected reclamation success and timeframe for each vegetation community. It also must consider the type of impact to the vegetation as bladed and cleared habitat recovers at a different rate than mowed habitat and mowed habitat recovers at a different rate than crushed habitat. To account for these differences, reclamation recovery timeframes have been developed for each of these scenarios (Table K. 1). As necessary, these recovery timeframes will be updated in the Montana HQT as new scientific literature become available.

Recovery timeframes for cleared vegetation were estimated as the average time to obtain Class A and Class B seral stages among the specific vegetation types within the aggregate in LANDFIRE Rapid Assessment Modeling and Mapping Zones: Northern and Central Rockies, Great Basin, and Northwest (U.S. Geological Survey). Seral stages used in LANDFIRE are described by the overall structural component and successional progression to a climax plant community (potential vegetation type [PVT]): class A is low cover, low height; and class B is high cover, low height.

The times necessary for full recovery of sagebrush varies widely in the literature. Bunting et al. (2002) stated that recovery times of sagebrush communities vary, and may be as short as 15 years for mountain big sagebrush or up to 50 to 75 years for Wyoming big sagebrush. Cooper et al. (2007) looked at post-fire recovery of sagebrush shrub-steppe communities in central and southeast Montana and found that full recovery of Wyoming big sagebrush took over 100 years and that recovery of mountain big sagebrush cover took slightly more than 30 years. They found that the mean recovery rate for Wyoming big sagebrush canopy cover was 0.16% per year in the study area, and the fastest recovery rate was 0.72% per year (Cooper et al. 2007). Wambolt et al. (2001) reported 72% recovery of Wyoming big sagebrush after 32 years at one site in southwestern Montana, and 96% recovery after only 9 years at another site. Baker (2006) found that recovery times for mountain big sagebrush ranged from 35 to 100 years, and that recovery times for Wyoming big sagebrush ranged from 50 to 120 years. Assuming the practices of mowing and crushing vegetation have less negative impacts on vegetation recovery, mowed and crushed vegetation are expected to recover more quickly than cleared habitat.

Debit may have the option of performing Third Level Assessment surveys to collect site-specific data to inform the final HQT scores. This assessment must follow the peer-reviewed standards set forth in this document to ensure all such assessments are comparable, complete, and collect data useable within the Montana HQT framework. For example, these surveys could inform the model on conifer encroachment, invasive annual grasses, or native forbs or mesic areas.

Table K. 1. Percent of baseline Functional Habitat score present in each year of reclamation by habitat and disturbance type.

Years After Implementation of Reclamation (Reclamation Milestone)	Cleared Habitat	Mowed Habitat	Drive and Crush Habitat
0 (Year of Implementation)	• 0% of all vegetation communities	• 0% of agriculture, developed, badland/break, grassland, and riparian/wetland • 0% of remaining classes	• 0% of ag, developed, badland/break, grassland, and riparian/wetland • 0% of remaining classes
1 year	• 100% of agricultural and wetland • 20% of grassland and riparian • 5% shrub • 1% of low and big sagebrush	• 100% of agricultural, wetland, grassland, and riparian • 10% shrub and low sagebrush • 2% of big sagebrush	• 100% of agricultural, wetland, grassland, and riparian • 20% shrub and low sagebrush • 7% of big sagebrush
5 years	• 100% of agricultural, wetland, grassland, and riparian • 25% shrub • 5% of low and big sagebrush	• 100% of agricultural, wetland, grassland, and riparian • 50% shrub and low sagebrush • 10% of big sagebrush	• 100% of agricultural, wetland, grassland, and riparian, shrub and low sagebrush • 33% of big sagebrush
10 years	• 100% of agricultural, wetland, grassland, riparian, and shrub • 10% of low and big sagebrush	• 100% of agricultural, wetland, grassland, and riparian, shrub and low sagebrush • 20% of big sagebrush	• 100% of agricultural, wetland, grassland, and riparian, shrub and low sagebrush • 67% of big sagebrush
15 years	• 100% of agricultural, wetland, grassland, riparian, and shrub • 15% of low and big sagebrush	• 100% of agricultural, wetland, grassland, and riparian, shrub and low sagebrush • 30% of big sagebrush	• 100% of agricultural, wetland, grassland, and riparian, shrub and low sagebrush, big sagebrush
25 years	• 100% of agricultural, wetland, grassland, riparian, and shrub • 20% of low and big sagebrush	• 100% of agricultural, wetland, grassland, and riparian, shrub and low sagebrush • 40% of big sagebrush	• 100% of agricultural, wetland, grassland, and riparian, shrub and low sagebrush, big sagebrush
50 years	• 100% of agricultural, wetland, grassland, riparian, and shrub • 50% of low and big sagebrush	• 100% of agricultural, wetland, grassland, and riparian, shrub and low sagebrush, big sagebrush	• 100% of agricultural, wetland, grassland, and riparian, shrub and low sagebrush, big sagebrush
75 years after Reclamation	• 100% of agricultural, wetland, grassland, and riparian, shrub and low sagebrush, big sagebrush	• 100% of agricultural, wetland, grassland, and riparian, shrub and low sagebrush, big sagebrush	• 100% of agricultural, wetland, grassland, and riparian, shrub and low sagebrush, big sagebrush

INCORPORATING RECLAMATION IN THE MONTANAN HQT FOR DEBIT PROJECTS: PROCESSES AND TIMELINE

The Montana HQT incorporates a reclamation portion for Debit Projects and utilizes the 2016 Montana Landcover dataset to determine the regeneration timeline of vegetation located in the footprint of submitted projects.

For Debit Projects, the Montana HQT assumes that once a project reaches its end of operations, it is removed from the landscape. At this stage in the model, the Landcover dataset is extracted to the direct footprint of the removed project. The resulting Landcover Extract layer is then reclassified according to the coded value of its pixels, which correspond to a specific land cover type. Depending on land cover type, a percentage of the recovery coefficient value is selected according to a predetermined reclassification table (Table K. 2 and Table K. 3). This is done at each milestone recovery year (MRY; i.e., 1, 5, 10, 15, 25, 50, 75). Once this coefficient is assigned, the extracted and reclassified Landcover dataset is multiplied by the original baseline HQT pixel score of the direct project footprint.

HYPOTHETICAL RECOVERY TIMELINE FOR A SAGEBRUSH PIXEL

- For example, a project encompassed a pixel of Landcover Type 133 (Big Sagebrush Steppe) that, because of other disturbance factors, had a HQT score of 50.
- The recovery coefficient timeline for Landcover Type 133 goes as follows:

Table K. 2. Milestone Recovery Year and the percent of pixel recovered.

Milestone Recovery Year	Year 1	Year 5	Year 10	Year 15	Year 25	Year 50	Year 75
Percent of Pixel Recovered	1%	5%	10%	15%	20%	50%	100%

- So, the original HQT pixel score of 50, which was devalued to a score of 0.0 during construction and operations because it was in the direct footprint of the project, would have the following recovery timeline:

Table K. 3. Milestone Recovery Year, Percent Recovery, HQT Recovery Equation, and the New HQT Score.

MRY	Year 1	Year 5	Year 10	Year 15	Year 25	Year 50	Year 75
Percent Recovery	1%	5%	10%	15%	20%	50%	100%
HQT Recovery Equation	0.01 x 50 = 0.5	0.05 x 50 = 2.5	0.1 x 50 = 5.0	0.15 x 50 = 7.5	0.2 x 50 = 10	0.5 x 50 = 25	1.0 x 50 = 50
New HQT Score	0.5	2.5	5.0	7.5	10	25	50

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Appendix L. HYPOTHETICAL MONTANA HQT CREDIT AND DEBIT PROJECT SCENARIOS

Six hypothetical projects were created to illustrate important concepts in applying the Montana HQT and generating Raw HQT Scores. Policy decisions are then applied to the Raw HQT Scores as described in the companion *Policy Guidance Document*. The credit projects include: 1) 18,000-acre perpetual conservation easement credit project, and 2) a 30-year term lease agreement credit project. The four debit projects include: 1) a five-acre gravel pit, 2) a 1000-acre solar farm, 3) a 30-mile major pipeline, and 4) a 30-mile 345 kV transmission line.

To illustrate the differences in habitat impacts based on location at the landscape level, each hypothetical project is placed in a Core Area location and a General Habitat location. Other than location, the projects are identical in all other respects such as type, size and duration.

This comparison shows the differences in Raw HQT Scores between the two management areas: Core Area and General Habitat. Core Areas are the best of the best habitat, and therefore debit project Raw HQT Scores are higher when in Core Areas (habitat in the map is redder in color; Figure L.1). An identical project in General Habitat is located in lower quality habitat, which results in lower Raw HQT Scores (habitat in the map is bluer in color). Compare the differences in Raw HQT Scores between Core Area and General Habitat for each hypothetical project.

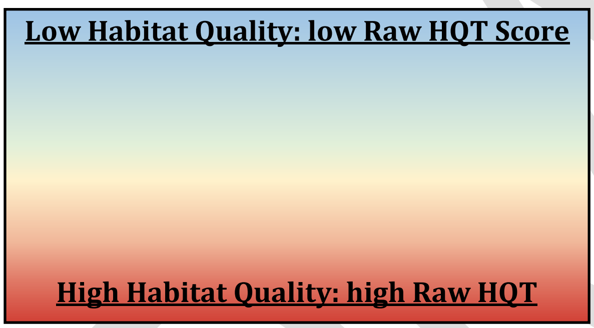

Figure L. 1. Color scheme to depict Raw HQT Scores for credit and debit projects. Blue represents low quality habitat and therefore low Raw HQT Scores. Red represents high quality habitat and therefore high Raw HQT Scores. The Raw HQT Score map colors will show the gradual change in colors between the two extremes.

Another concept to keep in mind when looking at the examples is that there can be significant differences in Raw HQT Scores depending on the project type and duration (Table L.1). Some project types have a greater impact on sage grouse, as do projects that are present on the landscape over a longer period.

The following hypothetical projects apply the Montana HQT Basemap to characterize realistic potential projects and their Raw HQT Scores (Table L.1). In the examples below, the Raw HQT Scores are shown for several types of projects. This result is then used for: 1) credit projects to determine number of credits as described in the *Policy Guidance Document* in Section 2; and 2) debit projects to determine mitigation obligation using policy and market valuation described in the *Policy Guidance Document* in Section 3.

Everyone with a credit or debit project in Montana will use the Montana HQT process. As you look at the following hypothetical projects, keep in mind that the Raw HQT Score is based on:

1) the underlying habitat quality at the location (HQT Basemap);
2) project location (Core Area versus General Habitat);
3) project type;
4) project size; and
5) project duration (this component of the score could be shortened with reclamation actions).

Table L. 1. Project information and Raw HQT Scores compared for the hypothetical projects when they are located in Core Area compared to General Habitat.

Project Type	Project Description	Project Duration	Raw HQT Score: Life of the Project	
			CORE AREA	GENERAL HABITAT
Hypothetical Credit Sites				
Conservation Easement	18,000 physical acres	Perpetuity – assume 100 years	773,049 Functional Acres gained	247,573 Functional Acres gained
30-Year Lease	18,000 physical acres	Fixed Term – 30 years	231,915 Functional Acres gained	74,272 Functional Acres gained
Hypothetical Development (Debit) Sites				
Transmission Line	824 physical acres 32 miles long 200-foot construction buffer Above ground	100 years construction & operation; Total maximum of 175 years until restored to pre-construction condition	384,667 Functional Acres lost	73,032 Functional Acres lost
Major Pipeline	824 physical acres 32 miles long 200-foot construction buffer Buried	1 year of construction; Total maximum of 76 years until restored to pre-construction condition	14,929 Functional Acres lost	2,646 Functional Acres lost
Solar Farm	1000 physical acres	50 years construction & operation; Total maximum of 125 years until restored to pre-construction condition	66,921 Functional Acres lost	3,300 Functional Acres lost
Mining: Gravel Pit	5 physical acres	10 years construction & operation; Total maximum of 85 years until restored to pre-construction condition	869 Functional Acres lost	161 Functional Acres lost

CREDIT PROVIDER PROJECT SCENARIOS

For credit projects, the higher the quality of the habitat, the higher the Raw HQT Score (**Error! Reference source not found.**). Therefore, the Raw HQT Scores for credit projects can provide guidance for identifying properties that have the highest quality habitats with the lowest anthropogenic impacts. These properties will generate the most credits. Once the project information is received by the Program, the Raw HQT Score will be computed following the steps outlined for Credit Providers in Section 4.0. The Raw HQT Score is then used to determine mitigation obligation using policy and market valuation described in the *Policy Guidance Document* in Section 2.0.

1. Hypothetical Credit Project: Perpetual Conservation Easement

The following example shows general project information (e.g., location, type, size, duration) for a perpetual conservation easement, which is a preservation type of credit project (Figure L.2). To highlight the differences in habitat quality based on location, the project is in a Core Area in Figure L.2 (left), or in General Habitat in Figure L.2 (right).

Once the project information is received by the Program, the Raw HQT Score will be computed following the steps outlined for preservation projects in Section 4 . Since the number of Functional Acres depends on habitat quality, higher quality habitat will create more Functional Acre credits (portrayed by the Raw HQT Score) per physical acre. Compare the differences in Raw HQT Scores between Core Area and General Habitat for the project.

When the easement is in a Core Area, the Raw HQT Score is 773,049, (Figure L.3, left). This equates to 43 Functional Acres per physical acre. When the easement is in General Habitat, the Raw HQT Score of 247,573 (Figure L.3, right). This equates to 14 Functional Acres per physical acre.

This illustrates the concept that Credit Providers can maximize the number of Functional Acres by selecting locations within Core Areas having low anthropogenic disturbance effects (e.g., roads, transmission lines).

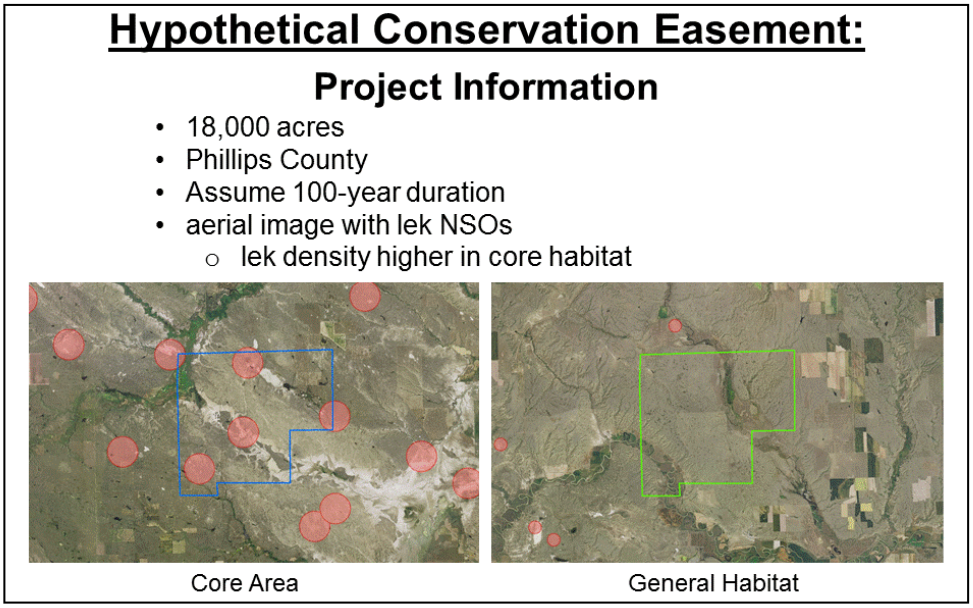

Figure L. 2. Project information for a hypothetical perpetual conservation easement project. The Core Area project location (left) has more active leks compared to General Habitat (right). Therefore, Core Area is higher quality habitat than the General Habitat location.

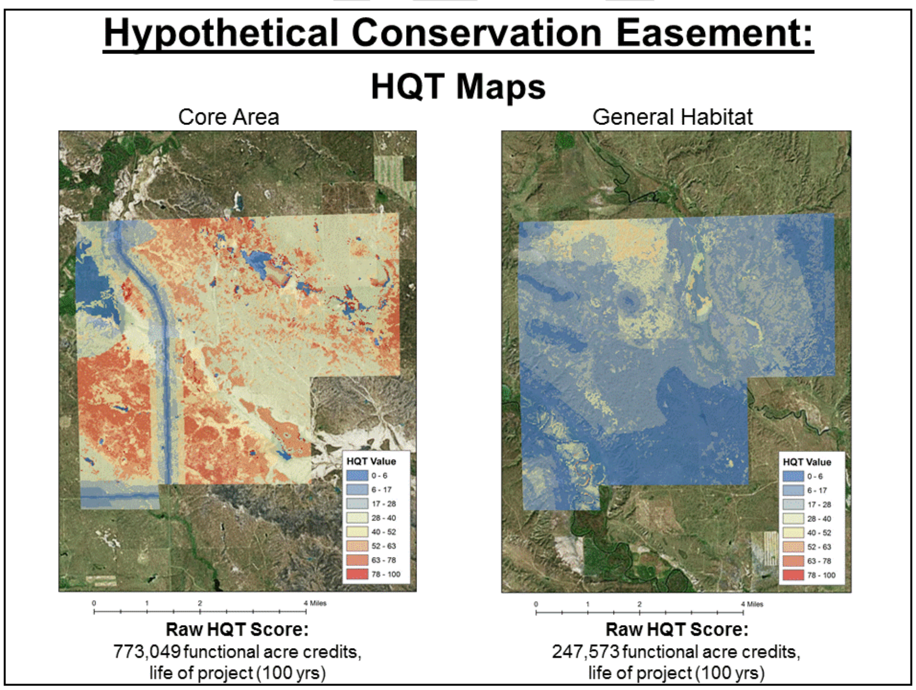

Figure L. 3. The Raw HQT Scores are shown for the same hypothetical perpetual conservation easement project. The Core Area location (left) has a Raw HQT Score of 773,049 Functional Acres. The General Habitat location (right) has a Raw HQT Score of 247,573 Functional Acres. The differences between the scores is shown in the maps by the change in color from red (higher quality habitat) to blue (lower quality habitat).

2. Hypothetical Credit Project: Term Lease Agreement

The following example shows general project information (e.g., location, type, size, duration) for a term lease agreement, which is a preservation type of credit project (Figure L.4). To highlight the differences in habitat quality based on location, the project is in a Core Area (Figure L.4, left), or in General Habitat (Figure L.4, right).

Once the project information is received by the Program, the Raw HQT Score will be computed following the steps outlined for preservation projects in Section 4 (Figure L.5). Since the number of Functional Acres depends on habitat quality, higher quality habitat will create more Functional Acre credits (portrayed by the Raw HQT Score) per physical acre. Compare the differences in Raw HQT Scores between Core Area and General Habitat for the project.

When the agreement property is in a Core Area, the Raw HQT Score is 231,915 (Figure L. 5, left). This equates to 13 Functional Acres per physical acre. When the agreement property is in General Habitat, the Raw HQT Score is 74,272 (Figure L. 5, right). This equates to 4 Functional Acres per physical acre.

This illustrates the concept that Credit Providers can maximize the number of Functional Acres by selecting locations within Core Areas having low anthropogenic disturbance effects (e.g., roads, transmission lines).

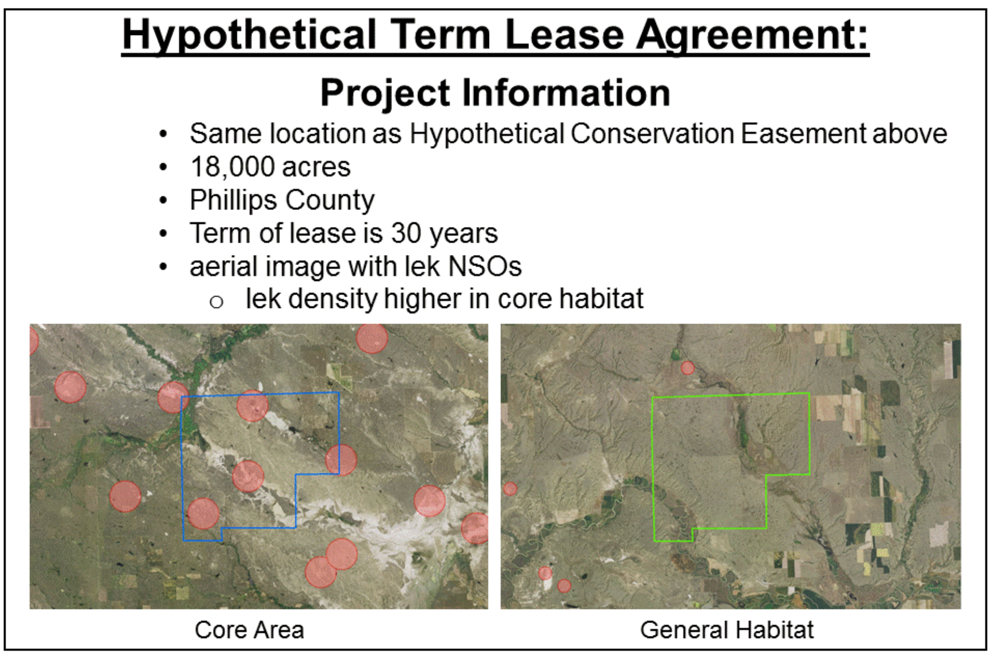

Figure L. 4. Project information for a hypothetical term lease agreement project. The Core Area project location (left) has more active leks compared to General Habitat (right). Therefore, Core Area is higher quality habitat than the General Habitat location.

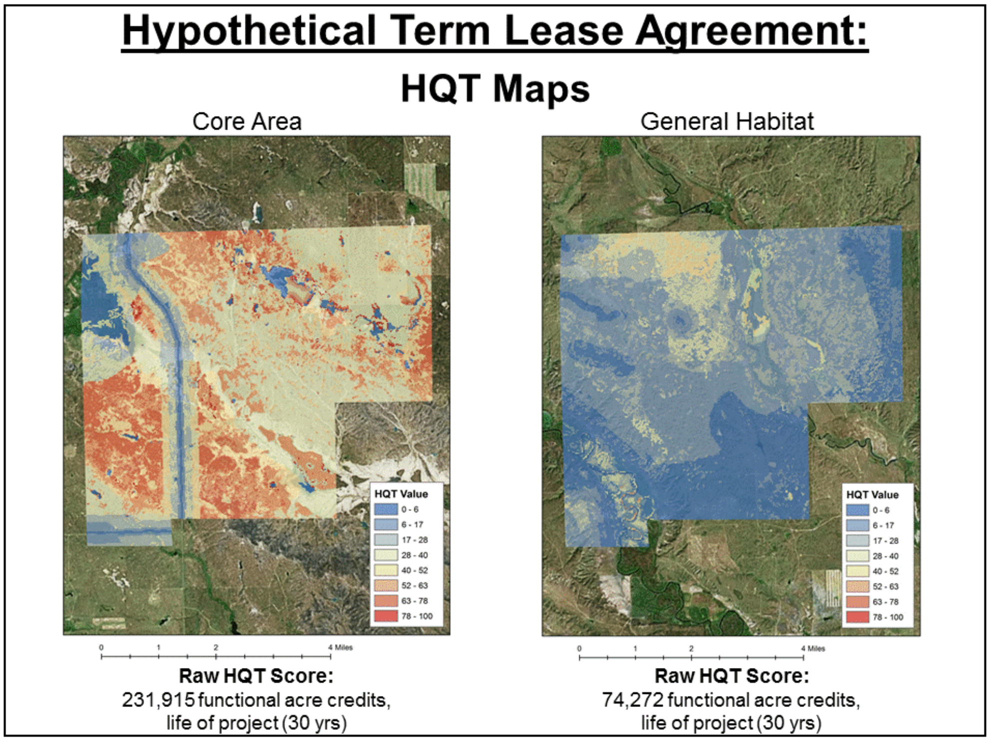

Figure L. 5. The Raw HQT Scores are shown for the same hypothetical term lease agreement project. The Core Area location (left) has a Raw HQT Score of 231,915 Functional Acres. The General Habitat location (right) has a Raw HQT Score of 74,272 Functional Acres. The differences between the scores is shown in the maps by the change in color from red (higher quality habitat) to blue (lower quality habitat).

Debit Development Project Scenarios

The following hypothetical development projects apply the Montana HQT Basemap to various project types by incorporating anthropogenic disturbance buffers (to account for indirect impacts) during the three phases of a given project (e.g., construction, operations, reclamation) for the plausible duration of the project (i.e., life of project) to characterize realistic potential projects and their Raw HQT Scores. In the examples below, the Raw HQT Scores are shown for each project when located in a Core Area compared to General Habitat.

Once the project information is received by the Program, the Raw HQT Score is computed following the steps outlined for Development Projects in Section 5.0. The Raw HQT Score is used to determine mitigation obligation using policy and market valuation described in the *Policy Guidance Document* in Section 3.0.

The Raw HQT Score, which represents the number of Functional Acres lost, is the difference between the pixel values for the Project Basemap HQT and the Project HQT Map. Since the number of Functional Acres depends on habitat quality, higher quality habitat (Core Areas) will create more Functional Acre debits per physical acre of the project than lower quality habitat (General Habitat). Project Developers can minimize the number of Functional Acres lost (e.g., Raw HQT Score) for a given Debit Project by avoiding Core Areas and further, by selecting locations outside of designated GRSG habitat.

1. Hypothetical Debit Project: Mining

The following example shows general project information (e.g., location, type, size, duration) for a 5-acre gravel pit development project (Figure L. 6). To highlight the differences in habitat quality based on location, the project is in a Core Area (Figure L.6, left), or in General Habitat (Figure L.6, right).

Once the project information is received by the Program, the Raw HQT Score will be computed following the steps outlined for development projects in Section 5 (Figures L.7 and L.8). Since the number of Functional Acres depends on habitat quality, higher quality habitat will create more Functional Acre lost (portrayed by the Raw HQT Score) per physical acre. For both Figures L.7 and L.8, the HQT Basemap (left) shows habitat quality pre-project, while the Raw HQT Score (right) shows the project footprint and the indirect effects buffers. Compare the differences in Raw HQT Scores between Core Area and General Habitat for the project.

When the development project is in a Core Area, the Raw HQT Score is 869 (Figure L. 7). This equates to 174 Functional Acres lost per physical acre. When the project is in General Habitat, the Raw HQT Score is 161 (Figure L. 8). This equates to 32 Functional Acres per physical acre. There are 708 fewer Functional Acres lost when this project is located within General Habitat rather than in a Core Area.

This illustrates the concept that Developers can minimize the number of Functional Acres lost (e.g., Raw HQT Score) for a given Debit Project by avoiding Core Areas and further, by selecting locations outside of designated GRSG habitat.

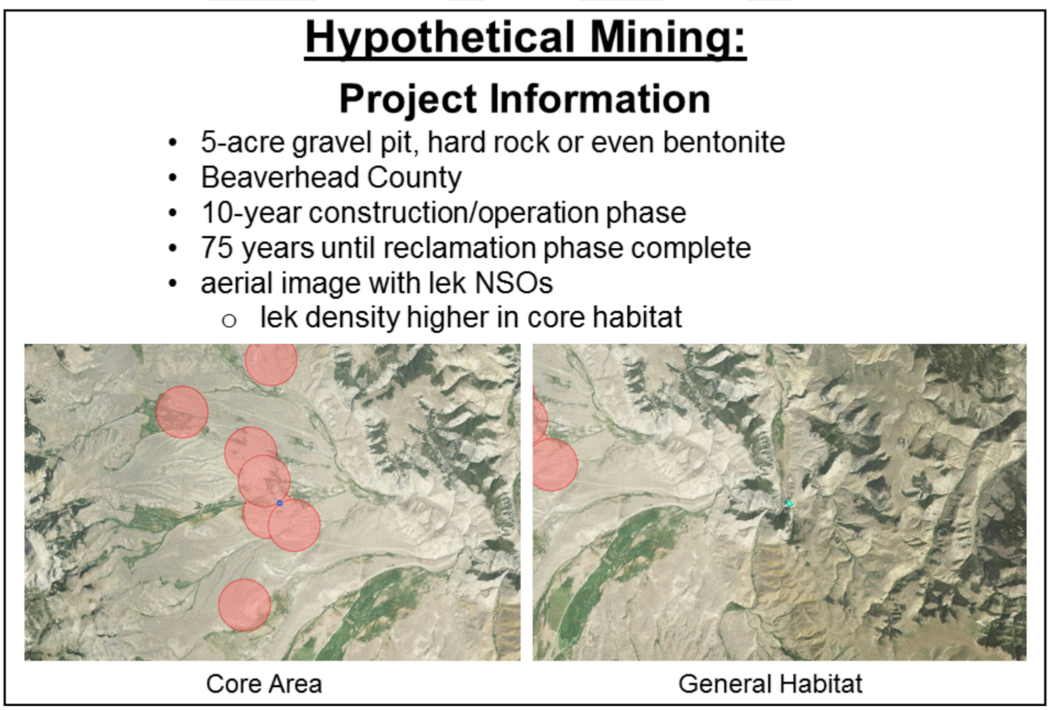

Figure L. 6. Project information for a hypothetical 5-acre gravel pit project. The Core Area project location (left) has more active leks compared to General Habitat (right). Therefore, Core Area is higher quality habitat than the General Habitat location.

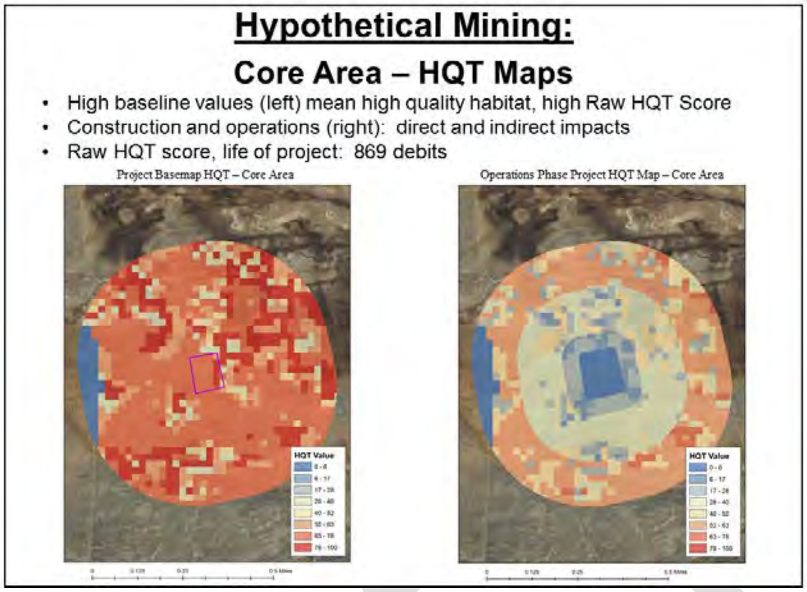

Figure L. 7. The Raw HQT Score is shown for the hypothetical 5-acre gravel pit project. The Core Area location has a Raw HQT Score of 869 Functional Acres. The HQT Basemap (left) shows habitat quality pre-project, while the Raw HQT Score (right) shows the project footprint and the indirect effects buffers. The differences between the habitat quality scores is shown by the change in color from red (higher quality habitat) to blue (lower quality habitat).

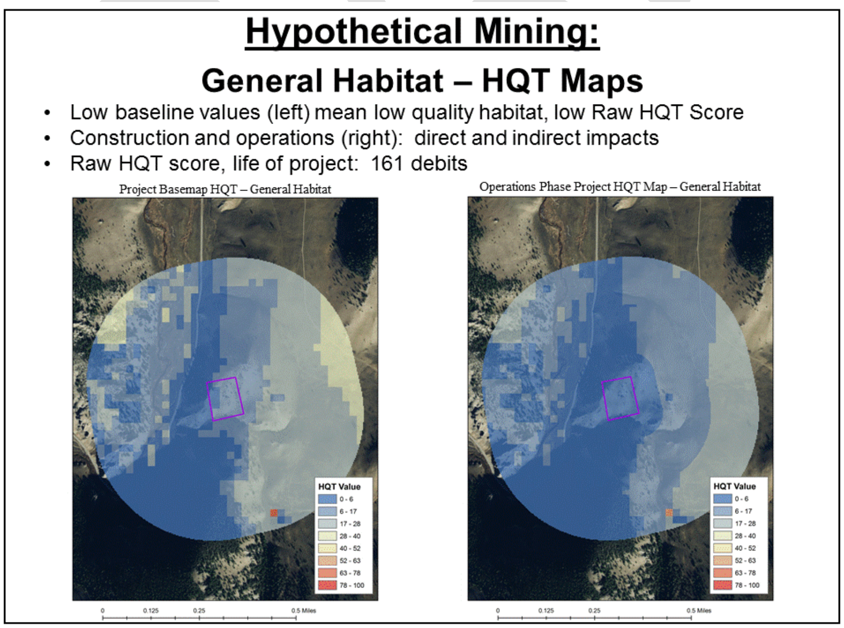

Figure L. 8. The Raw HQT Score is shown for the hypothetical 5-acre gravel pit project. The General Habitat location has a Raw HQT Score of 161 Functional Acres. The HQT Basemap (left) shows habitat quality pre-project, while the Raw HQT Score (right) shows the project footprint and the indirect effects buffers. The differences between the habitat quality scores is shown by the change in color from red (higher quality habitat) to blue (lower quality habitat).

2. Hypothetical Debit Project: Solar Farm

The following example shows general project information (e.g., location, type, size, duration) for a solar farm development project (Figure L.9). To highlight the differences in habitat quality based on location, the project is in a Core Area (Figure L.9, left), or in General Habitat (Figure L.9, right).

Once the project information is received by the Program, the Raw HQT Score will be computed following the steps outlined for development projects in Section 5 (Figures L.10 and L.11). Since the number of Functional Acres depends on habitat quality, higher quality habitat will create more Functional Acre lost (portrayed by the Raw HQT Score) per physical acre. For both Figures L.10 and L.11, the HQT Basemap (left) shows habitat quality pre-project, while the Raw HQT Score (right) shows the project footprint and the indirect effects buffers. Compare the differences in Raw HQT Scores between Core Area and General Habitat for the project.

When the development project is in a Core Area, the Raw HQT Score is 66,921 (Figure L.10). This equates to 67 Functional Acres lost per physical acre. When the project is in General Habitat, the Raw HQT Score is 3,300 (Figure L.11). This equates to 3 Functional Acres per physical acre. Overall, there are 63,621 fewer Functional Acres lost when this project is located within General Habitat rather than in a Core Area.

This illustrates the concept that Developers can minimize the number of Functional Acres lost (e.g., Raw HQT Score) for a given Debit Project by avoiding Core Areas and further, by selecting locations outside of designated GRSG habitat.

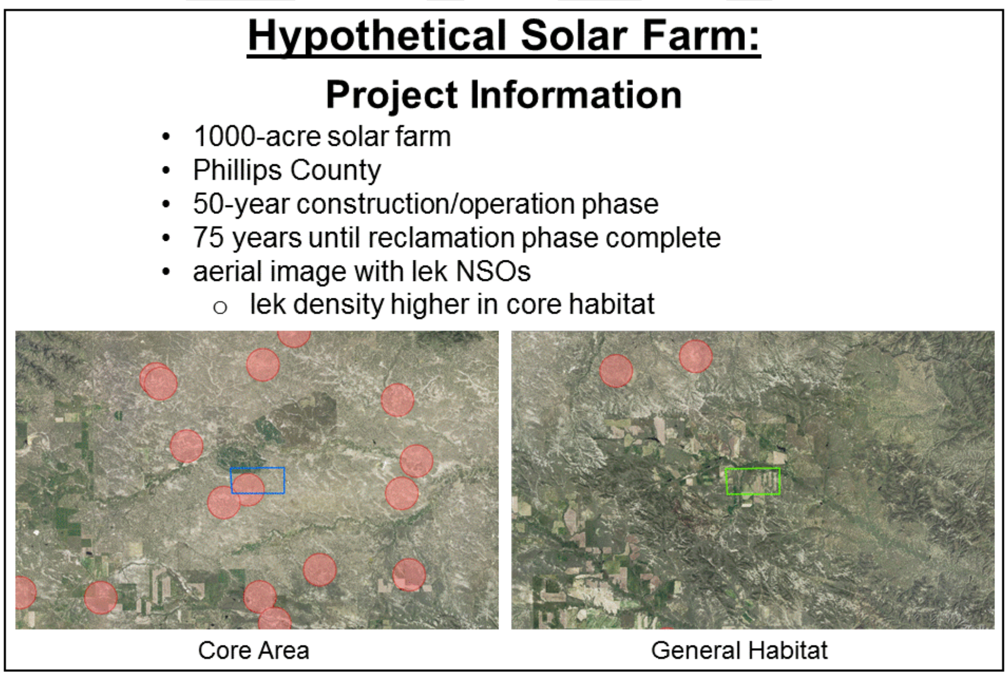

Figure L. 9. Project information for a hypothetical solar farm project. The Core Area project location (left) has more active leks compared to General Habitat (right). Therefore, Core Area is higher quality habitat than the General Habitat location.

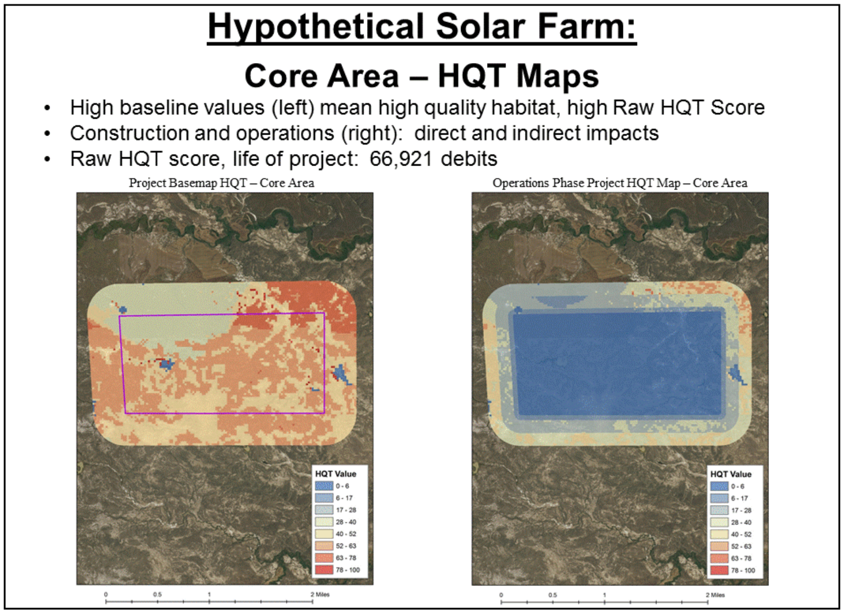

Figure L. 10. The Raw HQT Score is shown for the hypothetical solar farm project. The Core Area location has a Raw HQT Score of 66,921 Functional Acres. The HQT Basemap (left) shows habitat quality pre-project, while the Raw HQT Score (right) shows the project footprint and the indirect effects buffers. The differences between the habitat quality scores is shown by the change in color from red (higher quality habitat) to blue (lower quality habitat).

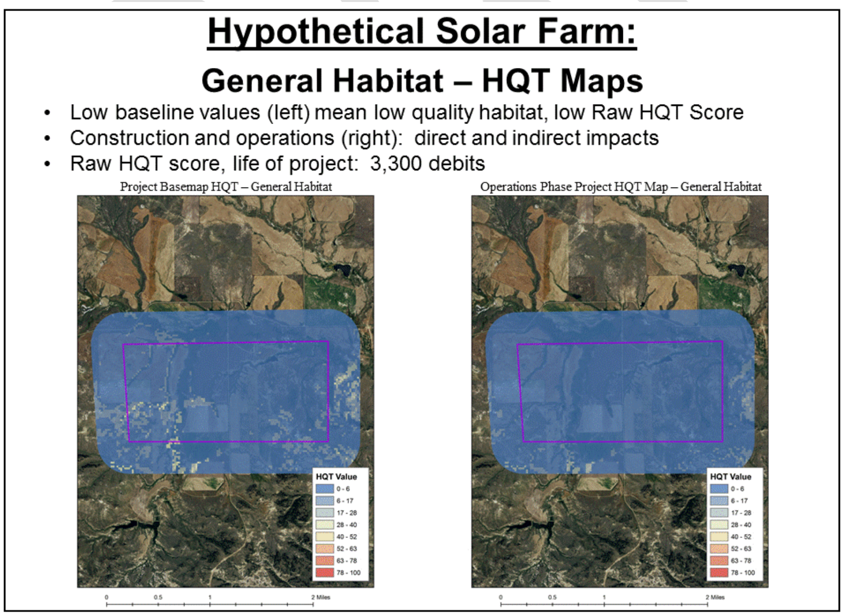

Figure L. 11. The Raw HQT Score is shown for the hypothetical solar farm project. The General Habitat location has a Raw HQT Score of 3,300 Functional Acres. The HQT Basemap (left) shows habitat quality pre-project, while the Raw HQT Score (right) shows the project footprint and the indirect effects buffers. The differences between the habitat quality scores is shown by the change in color from red (higher quality habitat) to blue (lower quality habitat).

3. Hypothetical Debit Project: Major Pipeline

The following example shows general project information (e.g., location, type, size, duration) for a major pipeline development project (Figure L. 12). To highlight the differences in habitat quality based on location, the project is in a Core Area (Figure L.12, left), or in General Habitat (Figure L.12, right).

Once the project information is received by the Program, the Raw HQT Score will be computed following the steps outlined for development projects in Section 5 (Figures L.13 and L.14). Since the number of Functional Acres depends on habitat quality, higher quality habitat will create more Functional Acre lost (portrayed by the Raw HQT Score) per physical acre. For both Figures L.13 and L.14, the HQT Basemap (left) shows habitat quality pre-project, while the Raw HQT Score (right) shows the project footprint and the indirect effects buffers. Compare the differences in Raw HQT Scores between Core Area and General Habitat for the project.

When the development project is in a Core Area, the Raw HQT Score is 14,929 (Figure L. 13). This equates to 21 Functional Acres lost per physical acre. When the project is in General Habitat, the Raw HQT Score is 2,645 (Figure L. 14). This equates to 4 Functional Acres per physical acre. Overall, there are 12,284 fewer Functional Acres lost when this project is located within General Habitat rather than in a Core Area.

This illustrates the concept that Developers can minimize the number of Functional Acres lost (e.g., Raw HQT Score) for a given Debit Project by avoiding Core Areas and further, by selecting locations outside of designated GRSG habitat.

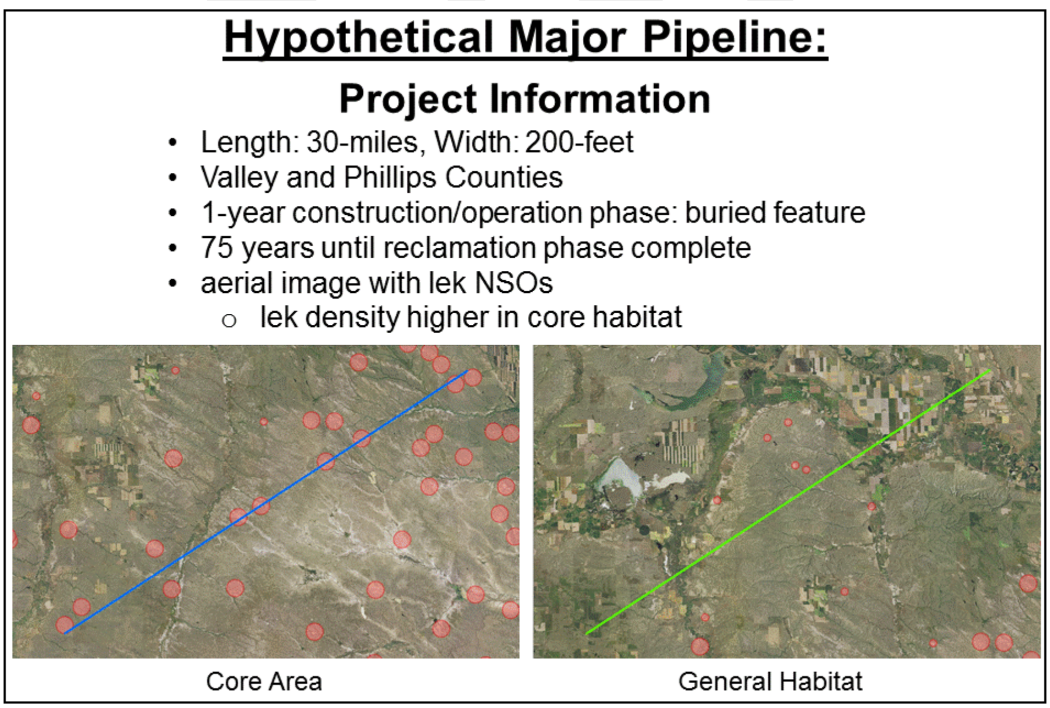

Figure L. 12. Project information for a hypothetical major pipeline project. The Core Area project location (left) has more active leks compared to General Habitat (right). Therefore, Core Area is higher quality habitat than the General Habitat location.

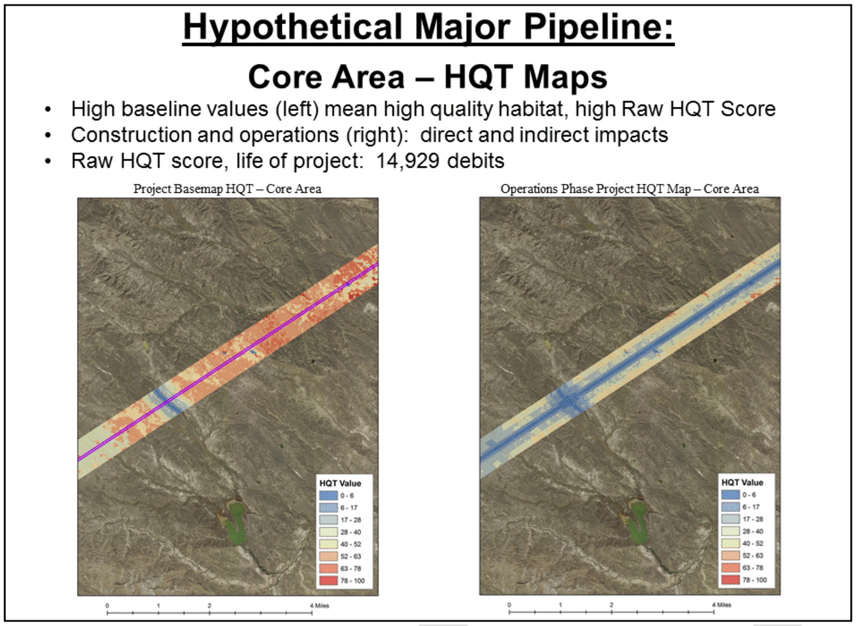

Figure L. 13. The Raw HQT Score is shown for the hypothetical major pipeline project. The Core Area location has a Raw HQT Score of 14,929 Functional Acres. The HQT Basemap (left) shows habitat quality pre-project, while the Raw HQT Score (right) shows the project footprint and the indirect effects buffers. The differences between the habitat quality scores is shown by the change in color from red (higher quality habitat) to blue (lower quality habitat).

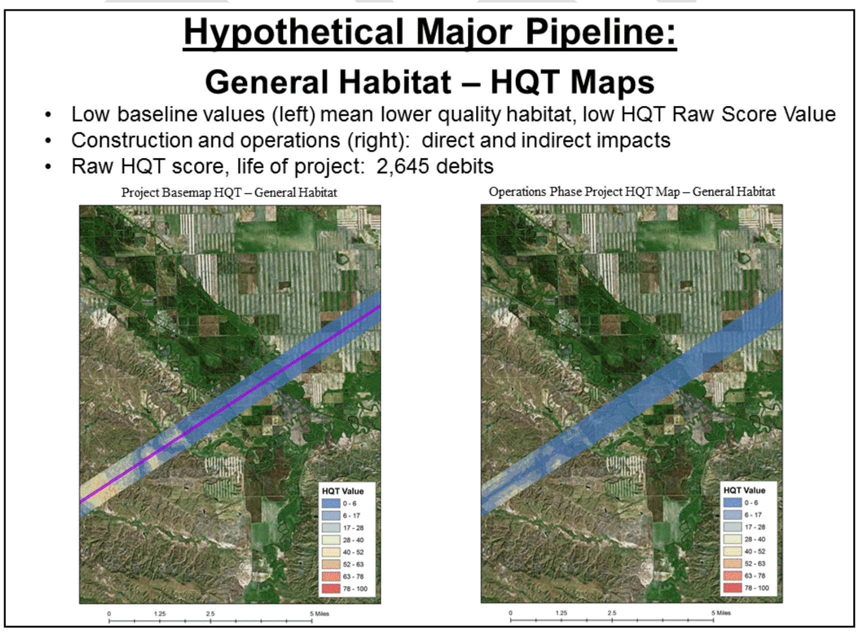

Figure L. 14. The Raw HQT Score is shown for the hypothetical major pipeline project. The General Habitat location has a Raw HQT Score of 2,645 Functional Acres. The HQT Basemap (left) shows habitat quality pre-project, while the Raw HQT Score (right) shows the project footprint and the indirect effects buffers. The differences between the habitat quality scores is shown by the change in color from red (higher quality habitat) to blue (lower quality habitat).

4. Hypothetical Debit Project: 345 kV Transmission Line

The following example shows general project information (e.g., location, type, size, duration) for a major pipeline development project (Figure L.15). To highlight the differences in habitat quality based on location, the project is in a Core Area (Figure L.15, left), or in General Habitat (Figure L.15, right).

Once the project information is received by the Program, the Raw HQT Score will be computed following the steps outlined for development projects in Section 5 (Figures L.16 and L.17). Since the number of Functional Acres depends on habitat quality, higher quality habitat will create more Functional Acre lost (portrayed by the Raw HQT Score) per physical acre. For both Figures L.16 and L.17, the HQT Basemap (left) shows habitat quality pre-project, while the Raw HQT Score (right) shows the project footprint and the indirect effects buffers. Compare the differences in Raw HQT Scores between Core Area and General Habitat for the project.

When the development project is in a Core Area, the Raw HQT Score is 384,667 (Figure L.16). This equates to 529 Functional Acres lost per physical acre. When the project is in General Habitat, the Raw HQT Score is 73,031 (Figure L.17). This equates to 100 Functional Acres per physical acre. Overall, there are 311,636 fewer Functional Acres lost when this project is located within General Habitat rather than in a Core Area.

This illustrates the concept that Developers can minimize the number of Functional Acres lost (e.g., Raw HQT Score) for a given Debit Project by avoiding Core Areas and further, by selecting locations outside of designated GRSG habitat.

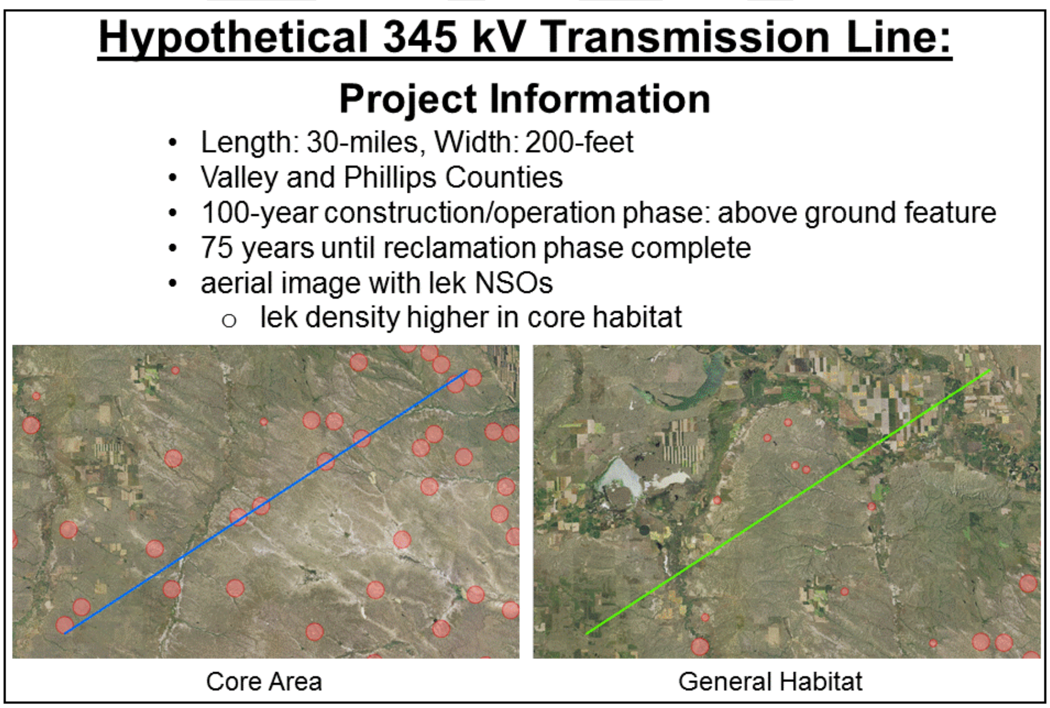

Figure L. 15. Project information for a hypothetical 345 kV transmission line project. The Core Area project location (left) has more active leks compared to General Habitat (right). Therefore, Core Area is higher quality habitat than the General Habitat location.

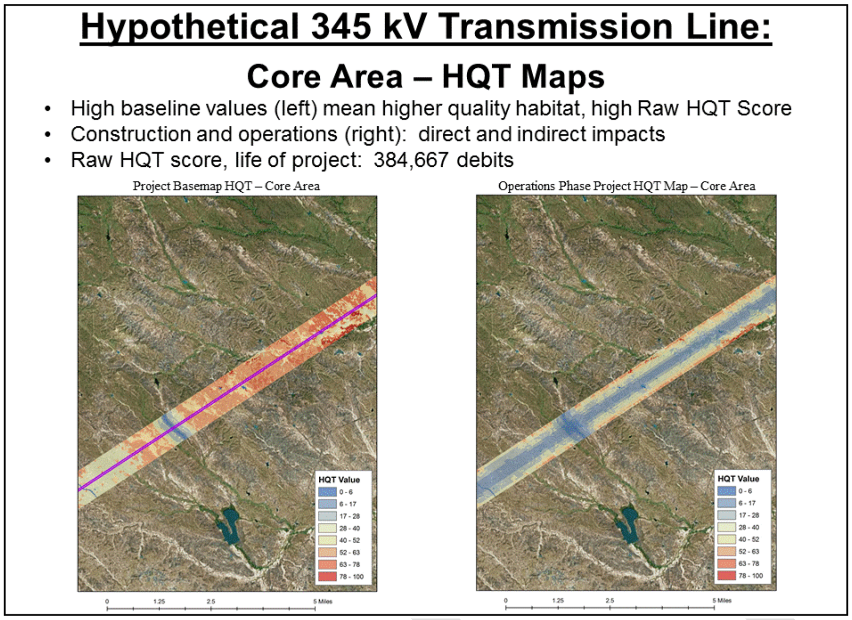

Figure L. 16. The Raw HQT Score is shown for the hypothetical 345 kV transmission line project. The Core Area location has a Raw HQT Score of 384,667 Functional Acres. The HQT Basemap (left) shows habitat quality pre-project, while the Raw HQT Score (right) shows the project footprint and the indirect effects buffers. The differences between the habitat quality scores is shown by the change in color from red (higher quality habitat) to blue (lower quality habitat).

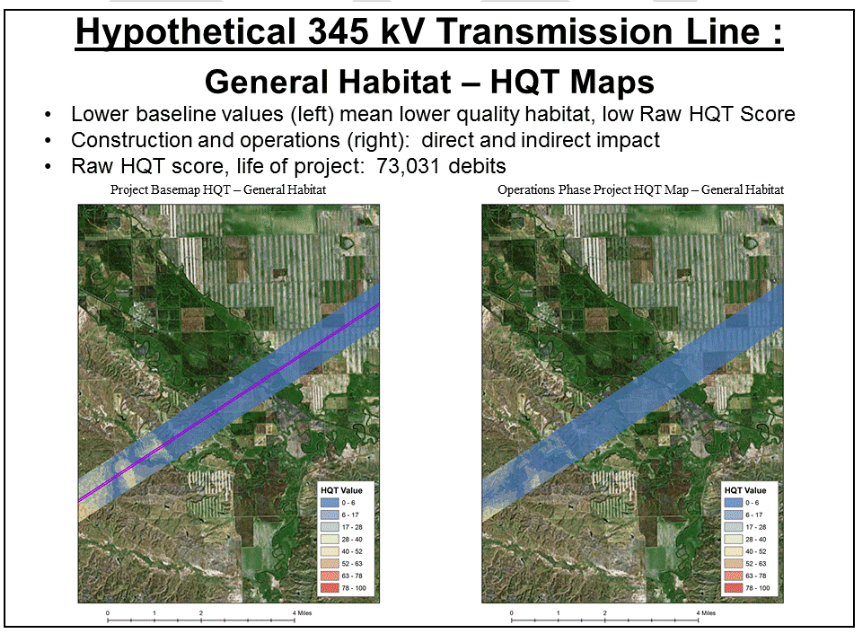

Figure L. 17. The Raw HQT Score is shown for the hypothetical 345 kV transmission line project. The General Habitat location has a Raw HQT Score of 73,031 Functional Acres. The HQT Basemap (left) shows habitat quality pre-project, while the Raw HQT Score (right) shows the project footprint and the indirect effects buffers. The differences between the habitat quality scores is shown by the change in color from red (higher quality habitat) to blue (lower quality habitat).

Appendix M. UNSUITABLE/EXCLUDED LAND COVER TYPES THAT ARE REMOVED FROM THE MONTANA HQT BASEMAP

Table M. 1. Unsuitable and Excluded Land Cover Types Removed from the Montana HQT Basemap.

Land Cover Type	Land Cover Category	Land Cover Subcategory
Alpine Ice Field	Alpine Systems	Alpine Sparse and Barren
Alpine Bedrock and Scree	Alpine Systems	Alpine Sparse and Barren
Alpine Dwarf-Shrubland	Alpine Systems	Alpine Grassland and Shrubland
Alpine Fell-Field	Alpine Systems	Alpine Sparse and Barren
Alpine Turf	Alpine Systems	Alpine Grassland and Shrubland
Aspen Forest and Woodland	Forest and Woodland Systems	Deciduous dominated forest and woodland
Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest	Forest and Woodland Systems	Conifer-dominated forest and woodland (xeric-mesic)
Rocky Mountain Subalpine Woodland and Parkland	Forest and Woodland Systems	Conifer-dominated forest and woodland (xeric-mesic)
Rocky Mountain Mesic Montane Mixed Conifer Forest	Forest and Woodland Systems	Conifer-dominated forest and woodland (mesic-wet)
Rocky Mountain Foothill Limber Pine - Juniper Woodland	Forest and Woodland Systems	Conifer-dominated forest and woodland (xeric-mesic)
Rocky Mountain Lodgepole Pine Forest	Forest and Woodland Systems	Conifer-dominated forest and woodland (xeric-mesic)
Rocky Mountain Ponderosa Pine Woodland and Savanna	Forest and Woodland Systems	Conifer-dominated forest and woodland (xeric-mesic)
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	Forest and Woodland Systems	Conifer-dominated forest and woodland (xeric-mesic)
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland	Forest and Woodland Systems	Conifer-dominated forest and woodland (mesic-wet)
Rocky Mountain Montane Douglas-fir Forest and Woodland	Forest and Woodland Systems	Conifer-dominated forest and woodland (xeric-mesic)
Rocky Mountain Poor Site Lodgepole Pine Forest	Forest and Woodland Systems	Conifer-dominated forest and woodland (xeric-mesic)
Great Plains Ponderosa Pine Woodland and Savanna	Forest and Woodland Systems	Conifer-dominated forest and woodland (xeric-mesic)
Aspen and Mixed Conifer Forest	Forest and Woodland Systems	Mixed deciduous/coniferous forest and woodland
Mountain Mahogany Woodland and Shrubland	Forest and Woodland Systems	Deciduous dominated forest and woodland
Great Plains Wooded Draw and Ravine	Forest and Woodland Systems	Deciduous dominated forest and woodland
Rocky Mountain Foothill Woodland-Steppe Transition	Forest and Woodland Systems	Conifer-dominated forest and woodland (xeric-mesic)
Open Water	Open Water / Wetland and Riparian Systems	Open Water
Geysers and Hot Springs	Open Water / Wetland and Riparian Systems	Open Water

Land Cover Type	**Land Cover Category**	**Land Cover Subcategory**
Rocky Mountain Conifer Swamp	Open Water / Wetland and Riparian Systems	Forested Marsh
Rocky Mountain Wooded Vernal Pool	Open Water / Wetland and Riparian Systems	Depressional Wetland
Alpine-Montane Wet Meadow	Open Water / Wetland and Riparian Systems	Wet meadow
Recently burned forest	Recently Disturbed or Modified	Recently burned
Harvested forest-tree regeneration	Recently Disturbed or Modified	Harvested Forest
Insect-Killed Forest	Recently Disturbed or Modified	Insect-Killed Forest
Rocky Mountain Cliff, Canyon and Massive Bedrock	Sparse and Barren Systems	Cliff, Canyon and Talus
Great Plains Cliff and Outcrop	Sparse and Barren Systems	Cliff, Canyon and Talus
Wyoming Basin Cliff and Canyon	Sparse and Barren Systems	Cliff, Canyon and Talus

Appendix N. LIST OF ACRONYMS

AADT	Annual average daily traffic
AIM	Assessment Inventory and Monitoring
BLM	Bureau of Land Management
EDF	Environmental Defense Fund
GRSG	Greater sage-grouse
HAF	Habitat Assessment Framework
HQT	Habitat Quantification Tool
LPI	Line-point intercept
MCA	Montana Code Annotated
MRLC	Multi-Resolution Land Characteristics Consortium
MSGOT	Montana Sage Grouse Oversight Team
FWP	Montana Sage Grouse Work Group
MTFWP	Montana Fish, Wildlife, and Parks
MTNHP	Montana Natural Heritage Program
NLCD	National Land Cover Database
NNHP	Nevada Natural Heritage Program
PVT	Potential vegetation type
SETT	Sagebrush Ecosystem Technical Team
WHCWG	Washington Wildlife Habitat Connectivity Working Group

DRAFT

Montana Mitigation System Policy Guidance Document For Greater Sage-Grouse

Version 1.0

May 2018

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- ABS Legal
- Browning, Kaleczyc, Berry & Hoven
- Cloud Peak Energy
- Denbury Resources
- Diane Ahlgren (MSGOT)
- Environmental Defense Fund
- Great Northern Properties
- HC Resources
- Mike Lang (MSGOT and Montana Senate)
- Montana Association of Land Trusts
- Montana Audubon
- Montana Coal Council
- MT Dept. of Natural Resources & Conservation
- Montana Electric Cooperatives' Association
- Montana Farm Bureau Federation
- Montana Fish, Wildlife, and Parks
- Montana Land Reliance
- Montana Petroleum Association
- Montana Rangeland Resources Committee
- Montana Sage Grouse Conservation Program
- Montana Stockgrowers Association
- Natural Resource Conservation Service
- Renewable Northwest
- The Nature Conservancy
- Theodore Roosevelt Conservation Partnership
- Treasure State Resources
- Trout Headwaters
- US Bureau of Land Management
- US Fish and Wildlife Service
- US Forest Service

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This content was created in part through the adaptation of procedures and publications developed by Environmental Incentives, LLC, Environmental Defense Fund, and Willamette Partnership, but is not the responsibility or property of any one of these entities.

Contents of this Document

The Montana Mitigation System *Policy Guidance* document for Greater Sage-Grouse (*Guidance or Policy Guidance*) defines the processes and information necessary to create, buy, or sell mitigation credits suitable for meeting sage grouse mitigation requirements within the State of Montana. The State of Montana will apply these standards to mitigation credits developed under the Montana Sage Grouse Stewardship Account. All other entities engaged in the Montana Mitigation System are expected to apply identical standards and criteria to any other sage grouse mitigation mechanisms or projects that seek approval to create, buy, or sell credits for use in Montana.

The primary audiences of this *Guidance* Document are the Montana Sage Grouse Habitat Conservation Program, the Montana Sage Grouse Oversight Team, state regulatory agencies, federal land management agencies, current and potential credit providers and project developers, and any third parties engaged in Greater Sage-Grouse mitigation in Montana.

This document is organized into seven major Sections, as follows.

Mitigation *Policy Guidance* Document Contents		
Section 1:	**Overview and Roles**	Introduces the purpose and need for and the goals of an integrated approach to sage grouse mitigation; summarizes the processes for generating and acquiring credits under the *Policy Guidance*; outlines the roles and responsibilities of organizations and individuals involved in credit production and use
Section 2:	**For Credit Providers**	Defines the detailed processes and requirements for generating mitigation credits for sage grouse habitat
Section 3:	**For Project Developers**	Defines the detailed processes and requirements for acquiring credits to offset impacts to sage grouse habitat
Section 4:	**Administration and Adaptive Management**	Outlines the processes and requirements for administration and adaptive management of the sage grouse mitigation program
Section 5	**Glossary**	Defines the terms and acronyms used in this *Policy Guidance*
Section 6	**References**	Lists the references used and relied upon by the Mitigation Stakeholders Group and cited in the *Policy Guidance*
Section 7	**Appendices**	Executive Order 12-2015 Exempt Activities not subject to mitigation Legal Descriptions of the four Montana Service Areas

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1. INTRODUCTION AND OVERVIEW OF THE MONTANA MITIGATION SYSTEM

The Greater Sage-grouse (sage grouse) is an iconic species of the sagebrush-grassland habitats of Montana. Sage grouse were once a candidate for listing under the federal Endangered Species Act across its range in 11 western states. Montana and 10 other western states developed conservation strategies to conserve sage grouse and sage grouse habitats.

While the species is common in the remaining high-quality habitat blocks, ongoing loss, fragmentation and degradation of sage grouse habitat prompted legislative and executive action at the state and federal level to ensure that the species and its habitat continue to remain healthy and abundant, and that management authority for the species remains in state, rather than federal hands.

Because approximately 64% of sage grouse habitat in Montana is in private ownership, the State's strategy for conservation of sage grouse populations and habitats depends heavily on voluntary and collaborative efforts to conserve existing high quality habitat and restore and enhance lower quality habitat.[1] The threats to the species in Montana include habitat loss, degradation and fragmentation due to energy and other infrastructure development, conversion of native habitat to cultivated agriculture, and encroachment by invasive annual plant species.

Through Montana's Executive Orders 12-2015 and 21-2015 (EO, EO 12-2015, or Order), the State of Montana established the Montana Sage Grouse Oversight Team (MSGOT) and the Montana Sage Grouse Habitat Conservation Program (Program) as the entities responsible for oversight, guidance, and staffing of the state's sage grouse conservation efforts. The EO applies to all programs and activities of state government and for individuals whose proposed activities occur within designated habitats (defined in Executive Order 21-2015; Figure 1.1) and require a state permit, technical assistance, or entail state grant funds.

The Bureau of Land Management (BLM) and the U.S. Forest Service Beaverhead-Deerlodge National Forest (hereinafter USFS) also developed designated habitats and adopted specific sage grouse conservation provisions into agency-specific land use plans, respectively, in 2015 (Figure 1.2). The State of Montana and its federal agency partners endeavor to take an "all lands, all hands" approach and work collaboratively to maintain and enhance sage grouse habitats and populations and ensure adequate, consistent conservation across all land ownerships. The BLM and USFS will implement their respective land use plans as consistently with the state's conservation strategy, but will adhere to their respective plans, federal law, regulations, and policies where deviations exist.

The State intends to sign a memorandum of understanding with the BLM and USFS outlining coordinated implementation of Montana's Mitigation System (this *Policy Guidance* and the accompanying *HQT Technical Manual*). The State and federal agencies aspire to provide a consistent and integrated approach to fulfilling mitigation requirements for impacts to designated sage grouse habitat on all private, state, and federal lands in Montana. Where federal land use plans and policies differ from Montana's Mitigation System, the BLM and USFS will follow federal guidance, as appropriate.

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[1] Montana Executive Order 12-2015. "Executive Order Amending and Providing for Implementation of the Montana Sage Grouse Conservation Strategy," available at https://governor.mt.gov/Portals/16/docs/2015EOs/EO_12_2015_Sage_Grouse.pdf ("EO 12-2015").

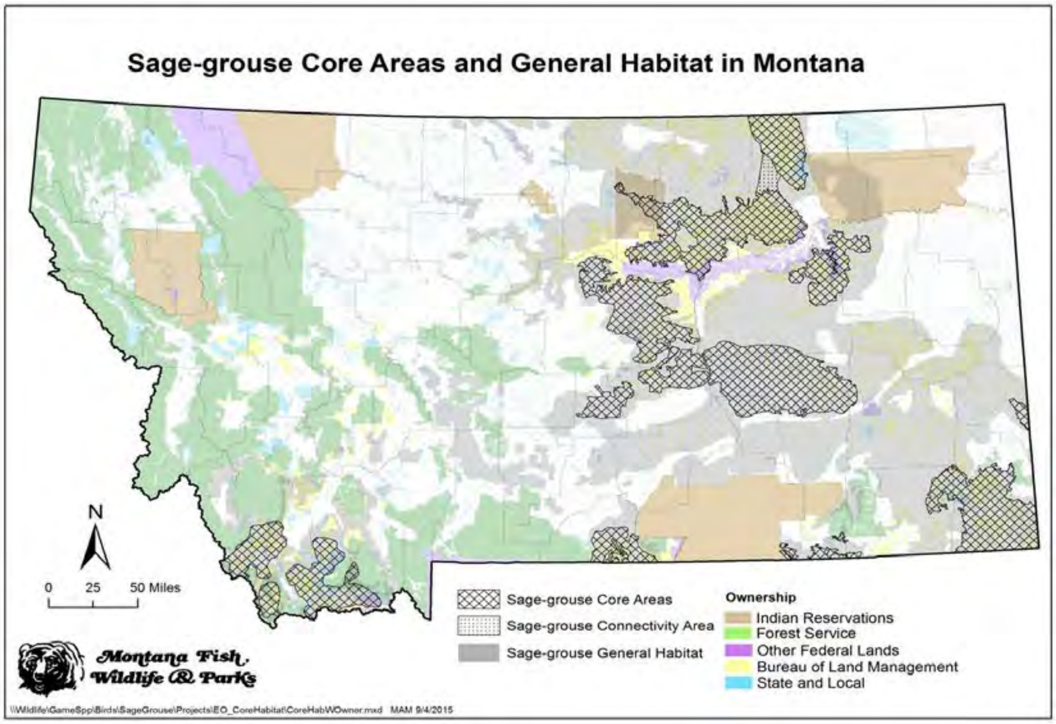

Figure 1.1. State of Montana sage grouse habitats designated in Executive Order 21-2015 where this mitigation *Guidance* document applies.

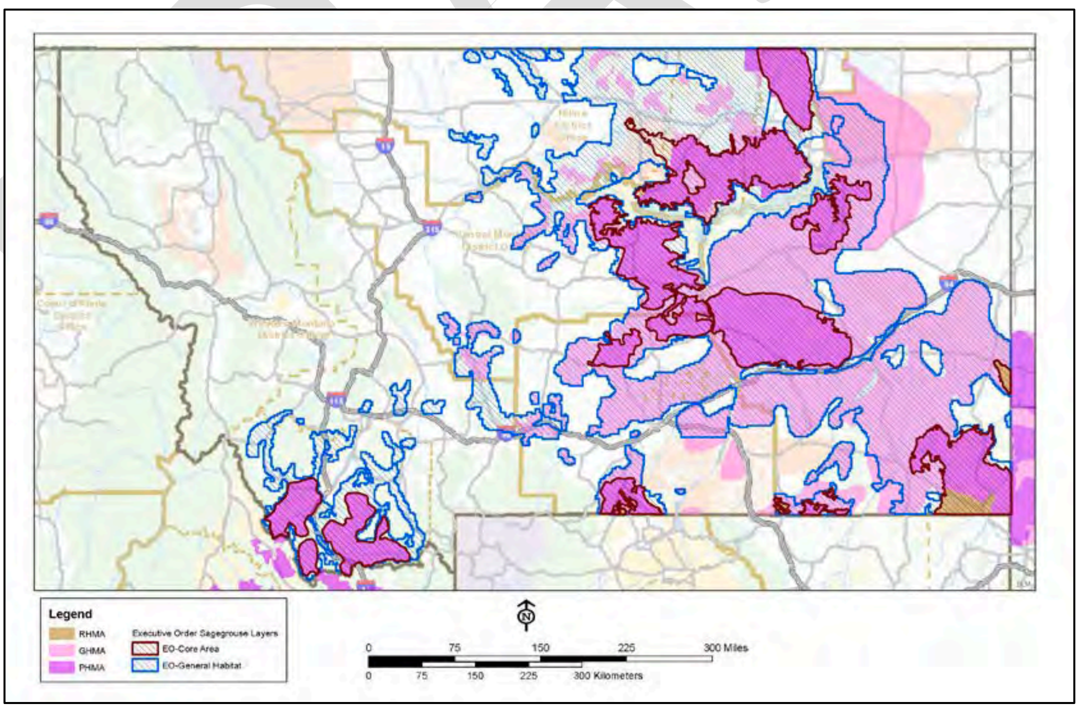

Figure 1.2. Federal lands designated by BLM and USFS land use plans (or amendments) for sage grouse conservation where this mitigation *Guidance* document applies and shown in pink and purple.

All states within sage grouse range rely upon mitigation as a fundamental part of their approach to conservation, which along with compensatory mitigation advanced by the federal land management agencies, was highly relevant to the USFWS 2015 finding that sage-grouse

Montana's EO and the federal land use plans contemplate development and mitigation. With some minor differences, the respective state and federal approaches put forth elements that:

- outline stipulations and a review process for land uses and activities occurring in designated sage grouse habitat; and

- require newly-proposed land uses and activities to avoid, minimize, and reclaim impacts to sage grouse habitat to the extent feasible, and to provide *compensatory mitigation* for any remaining impacts, including those that are indirect or temporary.[2]

In 2015, the Montana Legislature found that it was in Montana's best interests to enact the Montana Greater Sage-Grouse Stewardship Act to "provide establish free-market mechanisms for voluntary, incentive-based conservation measures that emphasize maintaining, enhancing, restoring, expanding, and benefiting sage grouse habitat and populations on private lands, and public lands as needed that lie within Core Areas, General Habitat or Connectivity areas."[3]

Montana's Greater Sage-grouse Stewardship Act (Stewardship Act or Act) provided further guidance on developing a consistent approach to meeting compensatory mitigation requirements in the state. Specifically, the Montana Legislature found that "allowing a project developer to provide compensatory mitigation for the debits of a project is consistent with the purposes of incentivizing voluntary conservation measures."[4] Taken together, the Act and EO 12-2015 establish Montana's Mitigation System (Figure 1.3).

The legislature also established the Sage Grouse Stewardship Account ("Stewardship Account"), a special revenue fund dedicated to maintaining and improving sage grouse habitat and populations. The Act requires the majority of state funds from the Stewardship Account to be awarded to projects that generate *credits* for compensatory mitigation, effectively establishing a revolving fund for advance funding of credit-producing projects.[5]

This *Policy Guidance* outlines Montana's approach to mitigation for impacts to sage grouse habitat (Montana's Mitigation System or System). It is based upon Executive Orders 12-2015 and 21-2015 and the Greater Sage-grouse Stewardship Act. Montana's Mitigation System is not only informed by the best available science, it is required to incorporate new science as it becomes available. The System draws on findings and science from the U.S. Fish and Wildlife Service's (USFWS) Conservation Objectives Report (COT),[6] the USFWS Not Warranted Finding,[7] and the recommendations of the Montana Greater Sage-grouse Habitat Conservation Advisory Council.

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[2] A 2015 document, "State of Montana Review of State Regulatory Authority over Activities in Sage Grouse Country" clarifies the intent of Executive Order No. 12-2014 and the state's authority to implement it.
[3] MCA §§ 76-22-101(1)-(2) and generally *et seq* (2017).
[4] MCA § 76-22-111 (2017).
[5] MCA §§ 76-22-101 *et seq* (2017).
[6] U.S. Fish and Wildlife Service. 2013. Greater Sage-grouse (*Centrocercus urophasianus*) Conservation Objectives: Final Report. FWS, Denver, Colorado. (Often referred to as the COT Report).
[7] 80 Fed. Reg. 59858 (Oct. 2, 2015).

These sources describe the key threats to sage grouse and their habitat and offer biologically-based strategies for management and conservation in both the short and long-term. Lastly, the approach is based on deliberations of the Montana Mitigation Stakeholders Team (Stakeholders Team).

Montana envisions that all mitigation efforts and particularly compensatory mitigation will contribute toward the stated goal of keeping sage grouse populations healthy and under state management so that a listing or designation as a candidate species under the federal Endangered Species Act is not warranted. Additionally, Montana is statutorily required to consider applicable USFWS policies such as the voluntary prelisting conservation programs, Greater Sage Grouse Range-wide Mitigation Framework (2014), and other applicable USFWS mitigation policies.[8]

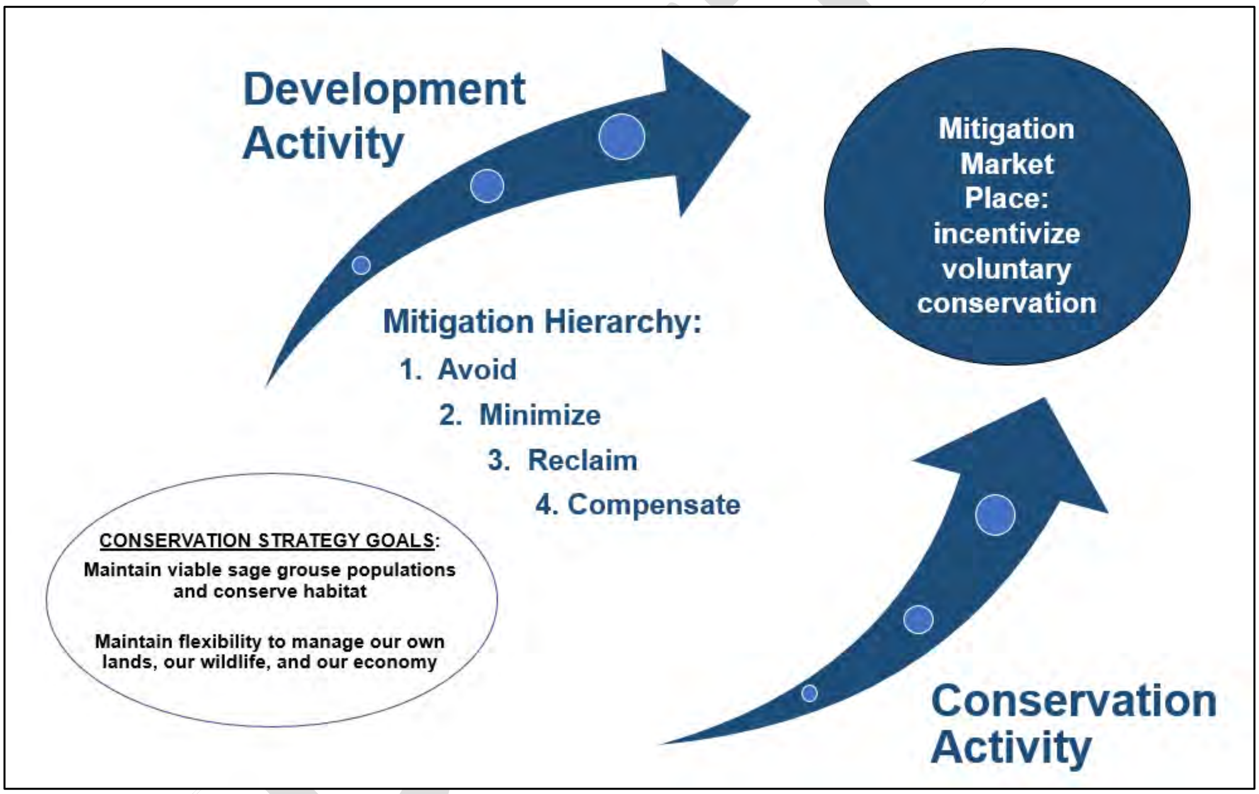

Figure 1.3. Montana's Mitigation System seeks to incentivize voluntary conservation activity to increase the quantity and quality of sage grouse habitat while simultaneously incentivizing conservation by project developers through implementation of the mitigation hierarchy where impacts are offset. A mitigation market place provides a platform where conservation actors and developers exchange credits and debits.

[8] MCA § 76-22-111(2) (2017).

Montana also aspires to implement a mitigation approach that would not require substantive changes should sage grouse become listed as a candidate, threatened, or endangered species under federal law in the future. There are several advantages to maintaining consistency with existing federal policies:

1. The USFWS would recognize mitigation efforts undertaken when analyzing habitat and population status during any future status review or conservation assessment of sage grouse to determine whether federal Endangered Species Act protections were warranted.

2. Credit providers and developers would be subject to significantly less risk that new, different or additional mitigation requirements would be imposed if sage grouse were ever listed in the future.

3. The USFWS could consider prior mitigation actions by credit providers and developers during future Section 7 consultations (evaluation of federal agency actions) and future Section 10 (incidental take permits, habitat conservation plans).

The principles and elements of the Montana's overall Conservation Strategy and specifically the Mitigation System are derived from and informed by:[9]

- State guidance, including but not limited to:[10]
  - Montana Executive Orders 12-2015, and 21-2015;
  - The Montana Greater Sage-Grouse Stewardship Act of 2015, as amended in 2017;
  - Montana's 2015 Review of State Regulatory Authority over Activities in Sage Grouse Country;
  - The Governor's 2013-2014 Advisory Council Recommendations Report (January 29, 2014); prepared pursuant to Executive Order 2-2013 (issued February 20, 2013); and
  - Management Plan and Conservation Strategies for Sage Grouse in Montana (2005) (prepared by the Montana Sage Grouse Work Group, rev. 2-1-2005).

- Federal guidance, including, but not limited to:[11],[12]
  - Sage grouse provisions included in BLM and USFS land use plans or amendments, respectively;
  - The Bureau of Land Management's (BLM's) Manual Section 1794 and Mitigation Handbook;[13]
  - The U.S. Fish and Wildlife Service Greater Sage Grouse Range-Wide Mitigation Framework (2014);[14]

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[9] *See* Section 6, References, for a more complete list; *see also* the *HQT Technical Manual*.

[10] USFWS's PECE Evaluation for the Greater Sage-Grouse Executive Order in Montana (Sept. 9, 2015) pursuant to USFWS Policy for Evaluation of Conservation Efforts When Making Listing Decisions (68 Fed. Reg. 15100 (March 28, 2003)).

[11] MCA § 76-22-111(2) ("all mitigation undertaken pursuant to this section must be taken in consideration of applicable United States fish and wildlife sage grouse policies") (2017).

[12] As of April 16, 2018, the USFWS Policies listed are still in effect and are being implemented by the USFWS until a revised version/s is announced and made available to the public.

[13] U.S. Bureau of Land Management Instructional Manual Section 1794 and Mitigation Handbook H-1794-1 (2016), available at https://www.blm.gov/policy/im-2017-021.

[14] U.S. Fish & Wildlife Service, Greater Sage-Grouse Range-Wide Mitigation Framework (2014), available at http://www.fws.gov/greatersagegrouse/documents/Landowners/USFWS_GRSG%20RangeWide_Mitigation_Framework20140903.pdf.

- The U.S. Fish and Wildlife Service Policy Regarding Voluntary Prelisting Conservation Actions (Director's Order No. 218, expiring 18 months from January 18, 2017);[15]
- The U.S. Fish and Wildlife Service Mitigation Policy;[16]
- The U.S. Fish and Wildlife Service Endangered Species Act Compensatory Mitigation Policy;[17]
- Council on Environmental Quality Regulations;[18]
- The USFWS's Candidate Conservation Agreements with Assurances Final Rule.[19]

Box 1.1. Habitats Where this *Policy Guidance* is Applicable.

For the purposes of this *Policy Guidance*, "*sage grouse habitat*" includes sage grouse *Core Areas*, *Connectivity Area*, and *General Habitat* as defined and mapped in Montana's Executive Orders 12-2015 and 21-2015 and also defined in the Act.[20] See Figure 1.1.

BLM land use plans covering BLM lands in Montana designated areas as Priority Habitat Management Areas (PHMA), General Habitat Management Areas (GHMA), and Restoration Habitat Management Areas (RHMA). USFS land use plans also designated sage grouse habitats for conservation and these areas are named and classified similar to BLM. See Figure 1.2.

With some deviations, boundaries for state-designated habitats are the same as for BLM and USFS. Collectively, these designated areas are expected support the sage grouse populations under current and/or likely future conditions. The applicable state or federal habitat designation boundaries will be observed for purposes of implementing mitigation in Montana, respectively.

Figures 1.1 and 1.2 above provide a coarse-scale map of Montana's designated sage grouse habitats. Detailed information on the actual presence of sage grouse on a site is not required so long as a credit site or proposed development projected is located within one of the mapped and designated habitat areas. A site level assessment will be voluntary, but encouraged, for development projects to further refine results of habitat functionality calculations by the Habitat Quantification Tool (HQT). A site level assessment will be required for all proposed credit sites.

[15] U.S. Fish & Wildlife Service, Policy Regarding Voluntary Prelisting Conservation Actions (2017). Director's Order No. 218, available at https://www.fws.gov/policy/do218.pdf.

[16] 81 Fed. Reg. 83440 (Nov. 21, 2016)); *see a*lso 82 Fed. Reg. 51382 (Nov. 6, 2017) (requesting additional comment on portions of the Mitigation Policy and the Endangered Species Act Compensatory Mitigation Policy whether to retain or remove net conservation gain as a mitigation planning goal).

[17] 81 Fed. Reg. 95316 (Dec. 27, 2016)); *see a*lso 82 Fed. Reg. 51382 (Nov. 6, 2017) (requesting additional comment on portions of the Mitigation Policy and the Endangered Species Act Compensatory Mitigation Policy whether to retain or remove net conservation gain as a mitigation planning goal).

[18] National Environmental Policy Act regulations pertaining to mitigation. See 40 CFR § 1508.20 (setting out the mitigation hierarchy).

[19] 81 Fed. Reg. 95053 (Dec. 27, 2016); *see also* 82 Fed. Reg. 8501 (Jan. 26, 2017) (delaying effective date until March 21, 2017, in accordance with a White House memo instructing agencies to postpone effective dates of any published regulations for 60 days if those regulations have not yet taken effect as of Jan. 20, 2017).

[20] *See* https://sagegrouse.mt.gov/About and MCA § 76-22-103 (2017).

1.1 Montana's Approach to Greater Sage-Grouse Mitigation

The goal of Montana's Greater Sage-Grouse Conservation Strategy is to maintain viable sage grouse populations and conserve habitat so that Montana maintains flexibility to manage its own lands, wildlife and economy and so that a listing or designation as a candidate species under the federal Endangered Species Act is not warranted in the future. Mitigation is one tool, among many, included in Montana's conservation toolbox. This goal is complimentary to goals and objectives set forth in BLM and USFS land use plans, respectively.

Implementation of the full mitigation hierarchy or mitigation sequence - avoidance, minimization, reclamation, and compensation using a systematic approach is an important facet of Montana's overall conservation strategy to address the threat of habitat loss, degradation, and fragmentation while at the same time allowing development and economic activity in Montana's sage grouse habitats.

The Stewardship Act and EO 12-2015 establish that Montana will observe the mitigation hierarchy for development projects that require state permits, authorizations, or utilize state funds in habitats designated as Core Areas, General Habitat, or Connectivity Areas. Mitigation is an important tool that incentivizes efforts to conserve habitat and to proactively plan development to have the least impact as possible and to account for impacts that may still occur using free market principles. Effective mitigation can promote both rangeland health and responsible economic development. See Box 1.2.

Montana's intent is to provide an approach to mitigation decision-making that incentivizes voluntary conservation to maintain, enhance, restore, expand and benefit sage grouse habitat and populations through free-market mechanisms. Specific goals in mitigation decision-making are to:

1. maintain viable sage grouse populations and habitat such that the species does not warrant listing or designation as a candidate species under the Endangered Species Act;

2. support rangeland health, balanced with economic development within sage grouse range habitat; and

3. provide an approach that is flexible, predictable, transparent, equitable, and science-based so the State of Montana, federal agencies, and all parties engaged in the Mitigation System can make informed, proactive decisions.

Where questions, conflicts, or uncertainties arise in the application of this *Policy Guidance*, these goals should be used to guide case-by-case decisions by the responsible parties.

This *Policy Guidance* is part of the State of Montana's broader approach to avoiding, minimizing, and compensating for permitted activities that adversely impact sage grouse habitat (i.e., application of the *mitigation hierarchy*). It represents the efforts of the Montana Sage Grouse Oversight Team (MSGOT), and its Stakeholders Team, which includes private, local, state, industry, and non-profit partners, as well as the BLM, USFS, and USFWS. It is the intent and expectation that federal partners will work with the State to the extent practicable to use this approach to implement their mitigation policies and requirements.

Box 1.2. Key Mitigation Terms and Definitions.

Mitigation refers to the process of first avoiding impacts to resources where practicable, then minimizing impacts that cannot reasonably be avoided, then rectifying and reducing impacts over time as possible (for example, through post-impact remediation of resources), and finally allowing for compensatory mitigation in the case of unavoidable impacts. Impacts that remain after application of the earlier steps and thus may require compensation are often referred to as residual impacts. Compensatory mitigation refers to replacing or providing substitute resources or environments to "offset" an impact.[21]

The sequential application of these steps is often referred to as the **mitigation hierarchy or mitigation sequence**. The terms are used interchangeably. The, formal definition means taking steps to:

1. avoid impacts by not taking a certain action or parts of an action;
2. minimize impacts by limiting the degree or magnitude of the action and its implementation;
3. rectify impact by repairing, rehabilitating, or restoring the affected environment;
4. reduce or eliminate the impact over time by preservation and maintenance operations during the life of the action; and
5. compensate for impact by replacing or providing substitute resources or environments.

The purpose of sequencing is to analyze all reasonable options to first avoid and minimize impacts before allowing impacts that require compensatory mitigation – especially for important ecological areas and functions.

The *Policy Guidance* document defines the processes and information necessary for creating, buying, and selling mitigation credits within the Stewardship Account or any other sage grouse mitigation programs or projects that seek approval to create, buy, or sell credits for use in Montana. More specifically, this *Policy Guidance* sets forth how the results of the habitat quantification tool (HQT) are applied in decision making. It will be the foundation for sage grouse mitigation under MSGOT, the Montana Sage Grouse Habitat Conservation Program ("Program"), and, pending formal agreement, the state's federal partners, consistent with the State's "all lands, all hands" approach to sage grouse conservation.

The Stewardship Act contemplated that an independent, third party would step forward to administer the Mitigation System. As of April 2018, that has not occurred. Until there is a third-party administrator, the state and federal agencies will endeavor to transparently implement this *Guidance* and the accompanying *HQT Technical Manual* consistent with the stated goals.

Montana's stated goals provide for a flexible approach that allows those engaged in Montana's Mitigation System to take creative approaches to either conservation or offsetting impacts to development, respectively, in service to Montana's Conservation Strategy. Accordingly, Montana recognizes four different mechanisms through which a project developer can fulfill compensatory mitigation obligations.

[21] Definitions adapted from 40 CFR 1508.20.

In recent years, several different mechanisms, or market-based approaches, have emerged for meeting compensatory mitigation needs. It is a key premise of the State of Montana's approach, and of relevant federal policies, that all compensatory mitigation projects should be held to equivalent standards regardless of delivery mechanism.[22] This *Guidance Document* and the *HQT Technical Manual* assure that all mitigation credit opportunities and debit obligations will be determined and implemented consistently, regardless of the actual mechanism.

The most common mechanisms for compensatory mitigation include:

1. **Permittee-responsible mitigation**, in which the debit (impact) project developer is solely responsible for ensuring that compensatory mitigation activities (which may occur later in time at or away from the site of impact through indirect effects) are completed and successful. The permitted entity works directly with the Program and MSGOT (or federal agency) but undertakes all mitigation actions, retains liability and responsibility to ensure offsets are in place for the duration of the permitted activity.

2. **Mitigation or conservation banks**, in which a private entity develops a site or suite of sites that provides ecological functions that are translated into compensatory mitigation credits and made available to offset impacts occurring elsewhere. Developers work directly with the bank administrator to ensure that adequate mitigation is in place within the conservation bank site or sites. Documentation that the mitigation is fulfilled is provided to the Program and MSGOT (or federal agency). Liability to ensure mitigation is in place for the duration of the permitted activities is transferred from the developer to the bank administrator. Credit providers developing conservation land banks who seek to be recognized by the USFWS should refer to applicable USFWS policies and approval requirements.

3. **In-lieu fee programs**, in which a governmental or non-profit sponsor entity or provider uses compensatory mitigation funds to establish sites to offset impacts. Developers work with the governmental or non-profit entity to ensure that adequate mitigation is in place for the duration of the permitted activities. The project developer makes a payment into an in-lieu fee fund, with the result that impacts often occur prior to the establishment of compensatory mitigation sites. Mitigation offsets become the responsibility of the in-lieu fee program provider and liability is transferred from the project developer to the provider.

4. **Habitat credit exchanges**, in which an exchange administrator establishes an environmental market clearinghouse, facilitating credit transactions between debit project developers and compensatory mitigation providers.[23] Credit site providers and developers work with the exchange administrator, who conducts buy-sell transactions with the respective parties. The exchange provider retains the responsibility and liability that credit sites are providing offsets successfully.

The primary differences among these mechanisms include the relative timing of impacts and compensation; the roles and responsibilities of different public and private entities; and the contractual arrangement for which party carries liability for performance of compensatory

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[22] *See*, for example, Mitigation Policy of the US Fish and Wildlife Service at 81 CFR 224, p. 83479.
[23] Adapted from Mitigation Policy of the US Fish and Wildlife Service at 81 CFR 224.

mitigation through their duration. For example, in permittee-responsibility mitigation, the debit project developer typically maintains liability for mitigation performance, whereas mitigation and conservation banks involve the legal transfer of that liability to the credit provider. In-lieu fee programs and habitat credit exchanges typically involve some contractually-defined sharing of that liability between the in-lieu fee sponsor or exchange administrator and the credit provider (although in many in-lieu fee programs the sponsor entity is also the credit provider).

1.2 Parts of this Guidance Document and How It Fits within the Mitigation System

This *Policy Guidance* works in concert with the *HQT Technical Manual* (Figure 1.4). The *HQT Technical Manual* describes the scientific method used to evaluate vegetation and environmental conditions related to the quality and quantity of sage grouse habitat. Specifically, it describes how the number of functional acres gained as a result of a conservation action or the number of functional acres lost as a result of a development activity, respectively, is calculated.

The results of the HQT are expressed as functional acres gained or lost and reported as the Raw HQT Score. This *Policy Guidance* describes how the Raw HQT Score is applied in a decision framework to determine how many credits are available or how many debits accrued from a development project. Credits and debits are then exchanged in the mitigation marketplace. More specifically, this *Policy Guidance* sets forth policies intended to incentivize voluntary conservation by entities engaged in conservation actions and by entities engaged in development through free-market principles, consistent with legislative intent.

More specifically, this *Guidance* will:

1. Describe the State's intent in establishing a mitigation approach, and outline roles and responsibilities related to sage grouse mitigation actions (Section 1);

2. Define standards and requirements for conservation crediting projects (Section 2);

3. Facilitate application of the full mitigation hierarchy to avoid and minimize development impacts to sage grouse populations and habitat to the extent required and practicable, reclaim unavoidable impacts where possible and appropriate, and ensure residual impacts are fully and effectively compensated (Section 3);

4. Identify tools for managing risk or *uncertainty* associated with mitigation actions that collaboratively engage landowners in conservation, including ensuring that compensatory mitigation funds are sufficient to cover all costs of a successful mitigation project, and that an adequate reserve of credits is available to guard against unforeseen losses of habitat or failed mitigation sites (Sections 2 and 3); and

5. Establish administrative, *adaptive management,* and processes to monitor the effectiveness to evaluate and track mitigation performance over time and improve the State's approach as needed (Section 4).

6. Define terms, provide the scientific foundation, and other supporting information in Sections 5, 6, and 7, respectively.

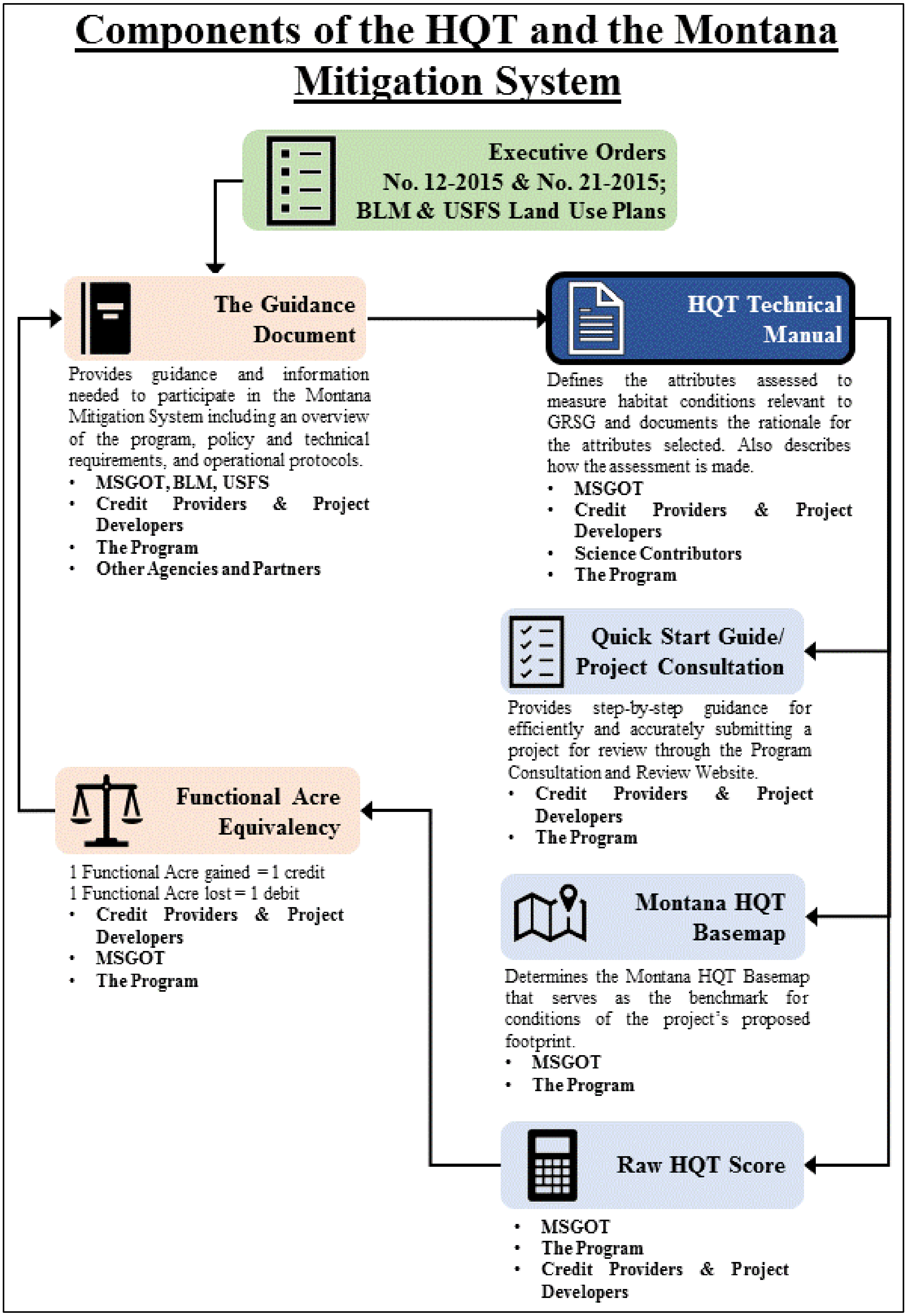

Figure 1.4. Components of the Mitigation System and how they work together.

To further assist the reader, the sections of this *Policy Guidance* document are organized to provide the information needed for particular audiences:

- **All Mitigation Participants and the Interested Public:** stakeholders interested in the standards and processes for sage grouse habitat mitigation and the associated roles and responsibilities of participants (Sections 1 and 4);

- **Credit Providers:** entities generating credits[24] as compensatory mitigation for impacts to sage grouse habitat (Section 2);

- **Project Developers:** an entity proposing an action that will result in a debit[25] (Section 3).

1.3 Roles and Responsibilities

This section provides a brief overview of different entities involved in the production and use of mitigation credits, and their roles and responsibilities under the Stewardship Account and other current or potential mitigation mechanisms. More detailed information is provided in Sections 2, 3, and 4.

Montana Sage Grouse Habitat Conservation Program (Program): Established by Montana Executive Order 12-2015, the Program is responsible for consulting with and providing guidance to other state agencies, permitting agencies, and project developers on how to meet impact avoidance, minimization, reclamation, and compensatory mitigation requirements. The Program is also responsible for providing staff support for MSGOT in executing its responsibilities in overseeing implementation of mitigation outlined in EO 12-2015 and the Stewardship Act. Those responsibilities include evaluating grant applications to the state's Stewardship Account and making recommendations to MSGOT for funding awards from the Stewardship Account, oversight of projects selected for funding, and maintenance of a habitat quantification tool and registry of compensatory mitigation credits. The Program and MSGOT may designate or recognize a third-party to fulfill some of its responsibilities, upon MSGOT's approval.

Montana Sage Grouse Oversight Team (MSGOT): Established under the Stewardship Act of 2015, MSGOT provides oversight and direction to the Program in implementing its mitigation responsibilities under the Act and relevant executive orders. Its responsibilities include reviewing and approving compensatory mitigation plans, rulemaking, tracking and annual reporting of compensatory mitigation outcomes, assuring the Stewardship Account is reimbursed when credits created from Stewardship Account funds are sold, and receiving payments for credits it tracks. MSGOT is also responsible for selecting grant applications for funding from the state's Stewardship Account.

State or Federal Permitting Agencies: Under Executive Order No. 12-2015, "All new land uses or activities that are subject to state agency review, approval, or authorization shall follow" avoidance, minimization, reclamation, and compensation requirements outlined in the order.[26] State agencies reviewing, approving, or authorizing these new land uses or activities or awarding state grant funds for projects in sage grouse habitat must consult with the Program to ensure these requirements are

[24] MCA § 76-22-103(4) (2017).
[25] MCA § 76-22-103(5) (2017).
[26] Montana Executive Order 12-2015, Attachment A, paragraph 10, page 3.

met. Regulatory authority still resides with the respective permitting agency, while the Program develops the mitigation approach collaboratively with project developers and the permitting agency or agencies. Mitigation is often addressed in documents prepared to fulfill requirements of the Montana Environmental Policy Act, other agency-specific statutes, state administrative rules, or policies.

In parallel fashion, BLM, USFS, USFWS, or other federal agencies authorize new or amended uses of federal lands. Decision authority for uses of federal lands resides with the federal land management agency. The federal agency, the Program, and the project developer also work collaboratively when federal permits or authorizations are required. Mitigation is often addressed in documents prepared to fulfill requirements of the National Environmental Policy Act, other federal statutes, regulations, or policies. The State of Montana intends to enter into a formal agreement with relevant federal agencies to ensure mitigation requirements of those federal agencies for actions in Montana sage grouse habitat can be met through the standards and processes outlined in this *Guidance*.

<u>Interagency Review Team</u>: As needed due to project complexity or size, the Program will convene a team of staff from all relevant permitting agencies to coordinate mitigation requirements, standards, and expectations for both debiting projects and crediting actions, and to provide efficient consultation for with multiple permitting agencies. This team would include any permitting agencies with decision authority over a particular development project, but may also include other resource management agencies such as Montana Fish, Wildlife, and Parks or USFWS in an advisory role. The USFWS role may be more than advisory if the project occurs on USFWS-administered lands or is subject to USFWS approval such as a conservation bank.

<u>Project Developer who creates debits as result of impacts</u>: An entity seeking to undertake a new land use or activity in sage grouse habitat that receives state funding or is subject to state agency review, approval, or authorization, is responsible for consulting as needed with the Program and all relevant permitting agencies to determine necessary avoidance, minimization, reclamation, and compensatory mitigation requirements. In similar fashion, a project developer may require federal authorization from a federal agency such as the BLM or USFS. For some types of development projects and depending on the location, both state permits and federal authorization may be required.

The project developer may meet any compensatory mitigation requirements for residual impacts by purchasing credits created through the Stewardship Account or other approved mechanisms, making a payment to the Stewardship Account if sufficient credits are not available, or conducting permittee-responsible mitigation that meets the standards and processes outlined in this *Guidance*. The project developer holds responsibility for performance of any compensatory mitigation projects or credits used to offset impacts, unless that responsibility is contractually transferred to another party (e.g., the credit provider).

<u>Credit Provider</u>: An entity that undertakes voluntary *preservation*, *restoration*, or *enhancement* actions in sage grouse habitat to generate credits to offer as mitigation for impacts to sage grouse habitat. A credit provider may be a landowner, land trust, private mitigation banker, or other private or public entity. Multiple parties may be involved in creation of credits (for example, a landowner and land trust, credit aggregator, or conservation banker). For credits to be used to meet mitigation requirements in the State of Montana, they must meet the standards and processes outlined in this *Policy Guidance*, including approval, verification, and tracking requirements and have been estimated using the state's HQT. A credit provider may accept a contractual transfer of responsibility for credit performance from a debit project developer. The price of credits that allows for the transfer of responsibility would be expected to reflect this assumption of risk and is set by the credit provider. Similarly, a credit provider may accept transfer of credits from MSGOT that were created through funding provided by the Stewardship Account.[27]

Third Party Administrator: The Stewardship Act envisioned that third parties could participate in Montana's Mitigation System. For example, the Act allows for a third party to open a habitat exchange and conduct transactions of credits and debits. It further allows MSGOT to transfer the credits created using Stewardship Account funds to the exchange administrator. Third parties may also open conservation banks.[28] Third parties may conduct transactions directly with credit providers (e.g. private landowners) or project developers.

Technical Support Provider: The Program may provide technical support to both debit project developers and credit providers in developing successful proposals and projects, to the extent practical given budget and staffing constraints. However, third-party technical support providers may also help plan, design, and assess the results of credit and debit projects, including collecting and submitting information needed to estimate credit and debit amounts. The Program may also recognize qualified technical support providers to support verification, tracking, and other administrative activities consistent with this *Guidance*.

1.4 General Overview of Steps to Generate Credits and to Acquire Credits to Offset Impacts

This section provides a brief overview of the steps used to generate and acquire credits under the Stewardship Account and other mitigation mechanisms in the State of Montana. These steps are also depicted in Figure 1.5. Blue chevrons signify the steps undertaken to generate credits and green chevrons represent the steps for a developer to acquire credits to offset impacts. The grey box in the center represents the administrative roles performed by MSGOT, the Program, or their designees. These processes are defined in greater detail in Sections 2 and 3 of this document.

Figure 1.5. Overview of the steps followed by credit providers to create and sell credits (reading left to right in blue) and steps to followed by developers to obtain credits to offset impacts of the development project (reading right to left in green).

[27] MCA § 76-22-105(2) (2017).
[28] MCA § 76-22-111(1)(b)(iv) (2017).

1.4.1 To Create or Generate Credits

The following steps outline the process for generation, *verification*, and *registration* of credits created by a project that creates or generates credits (i.e. a crediting project):

1. **Propose crediting project:** Crediting projects may be proposed through a request for proposals issued by the Program under the state's Stewardship Account granting process. Projects may also be proposed directly to the Program by landowners, non-profit conservation organizations, mitigation bankers, or any other party interested in providing credits outside of the Stewardship Account granting process. Projects may also be proposed by project developers intending to conduct their own permittee-responsible mitigation projects[29] to offset development impacts.

2. **Calculate functional acres gained and convert to credits:** Credit providers work with the Program or a technical support provider to develop a draft *site management plan* ("site plan") and use the habitat quantification tool (HQT), which includes required site-scale evaluation conducted in the field to estimate the number of functional acres gained as a result of the project. The Raw HQT Score of functional acres gained is then adjusted according to this *Guidance* (see Section 2). The adjusted total number of functional acres gained is then converted to credits at a 1:1 ratio.

   A full proposal, including site plan, credit estimate, long-term stewardship plan, and other documents outlined in Section 2, is submitted to the Program for review. The Program will review and evaluate proposed projects for consistency with policy and guidance. MSGOT will make the decision regarding final approval.

3. **Implement actions and verify conditions:** Credit providers implement preservation, restoration, or enhancement actions, monitor site outcomes, and work with the Program as needed to refine credit calculations based on post-project conditions on the ground. All projects undergo verification by the Program or an approved technical support provider to confirm that the *Guidance* and associated policies and agreements were followed correctly and estimated credits have been appropriately calculated and match on-the-ground conditions. Actions outlined in the long-term stewardship plan are also implemented and monitored over time.

4. **Register and issue credits:** Supporting documentation is submitted to the Program. Program staff review documentation for completeness and accuracy, and the credits are registered and issued to the credit provider's account on a state-wide *registry*. Credits are assigned a unique serial number so they can be tracked over time. Credit providers demonstrate through *monitoring* reports whether performance standards are met (as outlined in the site plan). If the Program determines that performance standards are met or partially met, the full or partial release of credits is allowed as described in Section 2.

1.4.2 To Acquire Credits to Offset Impacts

The following steps outline the process to determine and meet mitigation responsibilities consistent with Montana state laws and policies or federal requirements, respectively. Potential project developers should consult with the Program and any relevant permitting agencies at least

[29] MCA § 76-22-111(1)(b)(iv) (2017).

45-60 days prior to submitting a permit application for a proposed project that may impact sage grouse habitat.

1. **__Propose project__:** The project developer contacts the permitting agencies and/or the Program when proposing a project that impacts sage grouse habitat and is not identified as an *exempt use* as outlined in Executive Order 12-2015, Attachment F or otherwise exempted from the consultation requirements by MSGOT (copied here in Appendix A for convenience; please also check directly with the Program as MSGOT exemptions are subject to change). For development projects proposed on Montana State Trust Lands, developers are advised to contact the Trusts Lands Management Division first for an initial assessment. Proposals may be revised or denied for reasons other than sage-grouse.

2. **__Avoidance and minimization review__:** The project developer provides the Program and applicable permitting agency(ies) with a project description, including construction, maintenance, and reclamation periods and activities and what, if any, avoidance and minimization measures are proposed. The Program reviews impacts and proposed mitigation actions and determines whether the proposal meets all state-required stipulations and whether residual temporal or spatial impacts remain that will require compensatory mitigation based on HQT results. Projects requiring federal permitting may be subject to different or additional mitigation requirements, and the Program may convene an interagency review team to coordinate as needed.

3. **__Calculate and verify the number of functional acres lost and convert to debits__:** The state will make the HQT available on the Program's website so that developers can first consider outcomes of various options for design and siting of the project, as well as implementation of the mitigation hierarchy prior to contacting the Program in Step 2. Developers are encouraged to use the HQT as a decision tool when planning and siting projects in sage-grouse habitat to minimize impacts and the resulting mitigation obligations to their benefit as a business decision.

   The project developer (or designee) either uses the Program's webtool to run the HQT or provides the Program with information needed to run the HQT. The number of functional acres lost is determined by the HQT and may be adjusted by a voluntary site visit to estimate the total functional acres lost (by determining *baseline* and post-project conditions of the debit site). The total adjusted functional acres lost is converted to debits at a 1:1 ratio.

   The total functional acres lost is then adjusted according to this *Guidance* to:
   - encourage siting new development on top of existing surface disturbance and keeping project direct footprints and indirectly affected areas as small as possible;
   - discourage locating the project in sensitive or high priority areas (such as Core Areas); and
   - encourage consistency with EO 12-2015 (see Section 3).

   The project developer provides the Program with a draft *mitigation plan* that includes details of the proposed project, its location and associated actions, and HQT results, which will provide an estimate of credits needed. The Program and any permitting agencies review the mitigation plan to determine that relevant policy and guidelines are met and credit need is correct. The Program works with the project developer and any permitting agencies involved to resolve any concerns as described in Section 3. MSGOT review and approval of proposed compensatory mitigation plans is required by the Act. Federal agencies may request MSGOT review, but ultimately make decisions according to their own federal guidance.

4. **Purchase or create credits to offset the total number of debits:** To offset the total number of debits, a project developer may purchase credits from the Stewardship Account, making a payment into the Account if credits are not available, or propose their own crediting projects to meet compensatory mitigation requirements. Credits may also be purchased through any other MSGOT-approved mitigation mechanisms and third-party entities who adhere to the state's *Guidance* and use Montana's *HQT Technical Manual*.

   All debits and the credits used to offset impacts are tracked using unique serial numbers and cataloged in the state-wide registry to ensure that credits used cannot be purchased or used again.

2. FOR CREDIT PROVIDERS: GENERATING CREDITS FOR COMPENSATORY MITIGATION

This section describes the process for developing sage grouse habitat credits for compensatory mitigation, including the review and approval process for a credit project. See Figure 2.1.

Developing and selling credits in the Mitigation System by preserving, restoring, or enhancing land which increases the functional habitat quality or quantity for sage grouse could generate revenue for the respective landowner. Developing credit sites and participation in the Montana Mitigation System is voluntary on the part of private landowners and Montana State Trust Lands.

Mitigation credits may be produced through grant funding provided by the Stewardship Account, developed under any other MSGOT-approved mitigation mechanism (e.g., conservation bank or habitat exchange), or created and used by project developers conducting their own compensatory mitigation projects to offset development impacts (i.e. permittee-responsible mitigation). Funding from the Stewardship Account is not required to create credit sites.

Projects funded by the Stewardship Account may be proposed through a request for proposals (RFP) by the Program. Alternatively, credits can be generated outside of the Stewardship Account by individuals or entities such as private landowners, public land managers, non-profit organizations, mitigation bankers, or other entities such as State Trust Lands Management Division.[30]

The overall management goal of crediting projects is to increase the quantity and/or quality of sage grouse habitat beyond baseline conditions (see Section 2.1.1) in ways that adequately account for risk and uncertainty. Mitigation actions may create credit through preservation, restoration, or enhancement of sage-grouse habitat. The conservation actions taken at a given credit site should reflect its ecological context, as well as current and likely future threats.

[30] Individual private citizens may not receive Stewardship Account funds directly; however, they can create and market mitigation credits of their own accord or with a third-party administrator; private landowners may work with other organizations or agencies, such as a land trust or other non-profit to obtain Stewardship Account funds to create credit projects.

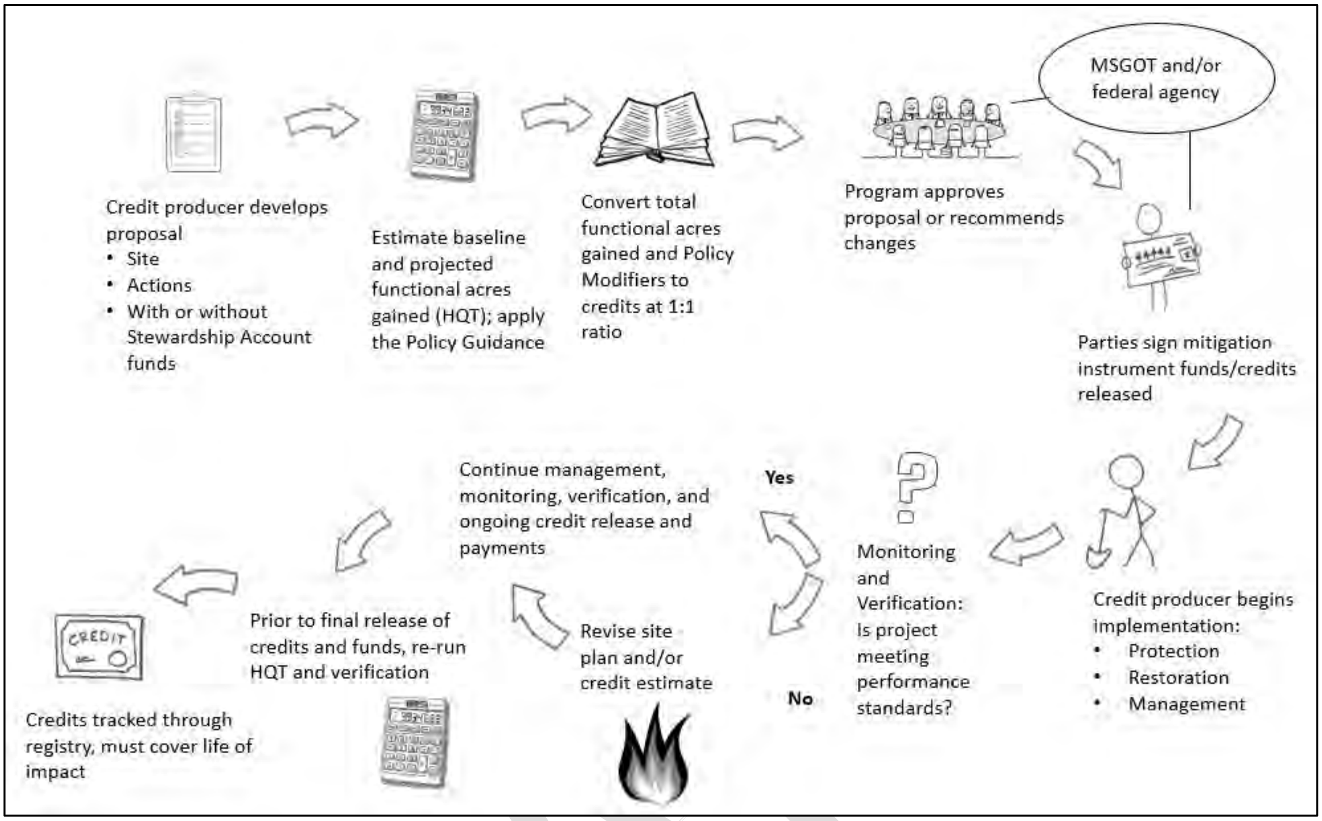

Figure 2.1. Schematic overview of the life of a credit from creation of functional acres to conversation to credits, approval, monitoring, and inclusion in the registry.

2.1 Proposing a Crediting Project

Mitigation credits are created by removing or limiting a threat to GRSG through preservation or by improving habitat quantity and/or quality through restoration or enhancement actions.

Creating preservation credits through perpetual conservation easements or lease agreements avoid future habitat loss or fragmentation by the voluntary, legal removal of identified threats such as subdivision or land conversion to cultivated agriculture.

Credits may also be generated on a property through restoration. Restoration is the process of assisting the recovery of a resource (including its values, services, and/or functions) that has been degraded, damaged, or destroyed to the condition that would have existed if the resource had not been degraded, damaged, or destroyed.[31] Restored areas can be important links for connectivity, provide important mesic habitat for late summer brood rearing, or can provide other seasonal habitat components, thereby increasing the value of surrounding, intact sagebrush lands. Restoration actions can increase existing credits by restoring or substantially improving habitat quality or function.

[31] Bureau of Land Management. 2016. Mitigation Handbook (H-1794-1): Mitigation Manual Section (M-1794). Pp. 79.

Examples of restoration include the re-establishment of suitable sage grouse habitat on abandoned mining claims, abandoned industrial sites, eradication of invasive plant species, removal of encroaching conifers, removal of abandoned transmission lines and towers or other anthropogenic structures, converting cropland back to rangeland with a sagebrush component, or restoration of wet meadows by restoring proper hydrology and plant communities.

Credits can also be generated on a property through enhancement. Enhancement requires an increase or improvement in quality, value, or extent of sage grouse habitat that has been degraded, or could be managed to increase the value of that habitat over its current value.[32] Enhancement actions can increase existing credits by improving the habitat quality or function to sage grouse, thereby increasing the Raw HQT Score and the amount of credits available to the market. Examples include improving existing suitable GRSG habitat by adding a sagebrush component to existing native grasslands, or increasing native forb diversity in mesic areas.

Each crediting project will receive credit only for actions that meet all eligibility requirements. Eligibility criteria help to ensure that crediting projects will support the long-term health and maintenance of sage grouse populations and habitats. The Program, with direction, oversight, and approval from MSGOT, determines whether proposed projects meet all eligibility requirements.

Credit providers are encouraged to investigate the potential of credit site using the HQT on the Program's website, and consult with the Program proactively to obtain a preliminary Raw HQT Score.

The Stewardship Account is a source of funds to create credit sites, but use of Stewardship Account funds is not required. More specific examples of conservation actions that may create compensatory mitigation credit by maintaining, enhancing, restoring, expanding, or otherwise benefitting sage-grouse habitat are listed below. This list is not exhaustive, but does include actions that are eligible for funding from the Stewardship Account:

- Reduction of conifer encroachment into sagebrush habitat;
- Reduction and management of invasive weeds;
- Maintenance, restoration or improvement of sagebrush and other native vegetation;
- Purchase or acquisition of leases, term easements, or permanent conservation easements that afford legal land protections from identified threats such as cultivation or subdivision;
- Incentives to reduce the conversion of grazing land to crop land;
- Restoration of cropland to grazing land with a sagebrush component;
- Demarcation of fences to reduce risk of collisions;
- Reduction of unnatural perching platforms for avian predators; and
- Reduction of unneeded anthropogenic predator subsidies and infrastructure.

Crediting projects may occur on private or public lands. To generate credits, a mitigation site will need to occur in designated state or federal sage-grouse habitats and meet all the eligibility criteria in Table 2.1. The proposal review process will include a pre-proposal step to screen for project eligibility and provide an estimate of credit potential based on HQT results.

[32] Bureau of Land Management. 2016. Mitigation Handbook (H-1794-1): Mitigation Manual Section (M-1794). Pp. 79.

Table 2.1. Eligibility requirements for crediting projects.	
Eligibility Requirement	**Criteria**
Additionality: conservation actions are additional (Section 2.1.1)	• Credit provided for outcomes that exceed baseline, including avoided loss of sage-grouse or sage-grouse habitat • Exceeds pre-existing, non-EO related legal obligations • Use of public conservation funds other than Stewardship Account cost-shared projects are prohibited from generating credits
Duration and Durability: project benefits are durable (Section 2.1.2)	• Legal protection of site, filed with the county • No imminent threat • Benefits expected to meet or exceed duration of impact • Financial assurances • Stewardship plan
Appropriate Site Selection and Conservation Actions: consistent with *Policy Guidance* and respective federal requirements (Section 2.1.3)	• Site within core, connectivity, or general habitat or the equivalent designations by federal land management agencies (e.g. USFS and BLM) • Will "maintain, enhance, restore, expand, or benefit sage grouse habitat and populations" • Consistent with EO 12-2015, the Act, administrative rules, and MSGOT guidance; consistent with federal requirements if the project is on federal land.

Recommendations to approve crediting project proposals, and to fund Stewardship Account projects, will be made by the Program, with final decisions made by MSGOT or the respective federal land management agency for credit projects proposed on federal lands. MSGOT may also provide guidance on general funding priorities for the Stewardship Account.

As part of the proposal process and prior to final approval by the Program and MSGOT, a credit provider will need to work with the Program to prepare a set of documents outlining the following elements (see Table 2.3 for more detail):

- documentation that the site and proposed actions meet eligibility requirements;
- an estimate of credit availability, based on HQT results provided by the Program or its designee such as a third party technical provider;
- a description of the site, its location, the conservation actions proposed for crediting, their anticipated timing, and performance standards and corresponding monitoring that will be used to evaluate results ("site plan");
- a long-term stewardship plan outlining how the desired outcomes will be maintained for the full term of the project;

- detailed financial information on initial costs, on-going stewardship costs, and financial assurance plans for meeting those to assure the durability of credits;

- land protection documents that would be filed with the county; and

- third-party verification of information included in the above documents.

2.1.1 Project Additionality and Baseline

Each crediting project must demonstrate additionality. Additionality refers to the requirements that: (1) regulatory -- credit-generating habitat benefits from a project must be in addition to what would have happened in the absence of a mitigation project (baseline) and in addition to what is already otherwise required by existing law and legal; and (2) legal and financial commitments.

For permanent credits created through permanent conservation easements, the easement itself satisfies the additionality requirement, but the baseline will be adjusted. For restoration or enhancement credit sites, a legal site protection instrument permitting or prohibiting certain activities to preserve the integrity of the habitat, respectively, satisfies the additionality requirement.

Regulatory additionality and baseline are determined somewhat differently for each type of credit project, as follows.

Preservation credit sites*:* Montana recognizes credit projects that avoid future loss or fragmentation of otherwise intact habitat through conservations easements or term leases. Preservation credit projects create credits through land preservation using perpetual conservation easements or term leases. Long term, voluntary protection of remaining habitat is the gold standard of habitat conservation in Montana.

Montana's Mitigation System will set the duration of perpetual easement credit sites as 100 years. The duration or term leases is the number of years identified in the lease agreement.

Voluntary permanent conservation easements entail the sale of certain development rights to an accredited third party in perpetuity, while the private landowner retains certain rights. As a result of the sale of certain development rights, the property's value decreases from the pre-easement value.

Development rights commonly severed from properties through perpetual easements correspond to previously identified threats to sage-grouse habitat, such as: cultivation, subdivision, elimination of sagebrush and other native vegetation, and commercial scale surface energy development. The fair market value of the development is appraised by qualified appraisers. Appraised values of permanent easements vary, for example, based on the easement's terms and the location of the land parcel.

Voluntary term leases entail a third party leasing certain development rights (i.e. surface uses) for a fixed term of years. Landowners retain certain rights. Preservation credit sites under a term lease similarly would prohibit uses previously identified threats to sage-grouse habitat, such as: cultivation, subdivision, elimination of sagebrush and other native vegetation, and commercial scale surface energy development. Landowners typically retain rights to continue cultivating areas already in cultivation and graze livestock.

Determination of baseline for preservation credit projects must take into account that while remaining sage grouse habitat in Montana is at risk of future loss or fragmentation (e.g. conversion, subdivision, energy development), habitat is being provided in the present. In these instances, credits are provided for avoided loss, or the reduction or elimination of anticipated threats in the future where the risk can't be easily quantified. In the absence of any other restoration or enhancement action, easements or leases do not provide new, additional, or higher quality habitat. Therefore, preservation credit projects preserve the status quo.

To more accurately reflect that perpetual easements, in the absence of any other enhancement or restoration work, simply preserve the status quo and do not create new functional acres, Montana defines baseline for preservation credit projects as 65% of post-project habitat function determined by the HQT.[33] (See Section 2.1.4). Therefore, 35% of the credits calculated within the boundaries of permanent conservation easements or term leases using the HQT will be recognized as being available in the marketplace to offset impacts of development when there are no restoration or enhancement actions in addition to the easement or lease.

This method for providing credit for preservation or actions that maintain the status quo endeavors to account for and reflect the actual magnitude and likelihood of existing and future threats of development which the preservation credit site avoids.[34] It also avoids singling out any single market appraisal or location within Montana.

Restoration and enhancement credit projects: Montana also recognizes credit projects that restore or enhance habitat through active management such as removal of encroaching conifers or reseeding areas formerly managed for cultivation. Unlike typical preservation credit sites, restoration or enhancement credit sites increase the quantity or quality of functional habitat.

To establish baseline for restoration or enhancement credit projects, the HQT will calculate the number functional acres on the site prior to habitat management actions. The HQT will be re-run at pre-determined milestones to detect changes in habitat over time attributed to the restoration or enhancement actions. The milestones will be based on desired future condition.

Legal and financial additionality are also required. To demonstrate legal additionality, credit-producing conservation actions must exceed all existing affirmative obligations relevant to the project site and must comply with all applicable federal, state, and local laws. Affirmative obligations include land use restrictions, range health standards, minimum requirements of candidate conservation agreements (CCAs and CCAAs), and other land use or management restrictions that are not discretionary.

Financial additionality ordinarily requires that mitigation credit not be allowed for actions that receive public conservation funding (such as that provided by the Natural Resource Conservation Service's conservation programs or state grant programs). Funds provided by the state's

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[33] Because the kinds of development rights typically purchased by conservation easements are also identified as threats to sage-grouse habitat and because Montana presently lacks a track record of the percent diminution of property values for credit projects in each mitigation service area, baseline is set to the average percent diminution of value for three different conservation easements funded by the Stewardship Account, as determined by market appraisals prepared to determine the fair market value of the conservation easements at the time of their purchase. As more preservation credit sites are created and the market matures, the 65% baseline determination will change.
[34] USFWS Policy Regarding Voluntary Prelisting Conservation Actions (2017).

Stewardship Account may be used to create mitigation credits, provided the full cost of credit production is reimbursed to the Account at the time of credit sale and there is no private enrichment from public funds as a result of credit sales.

Projects that are partially funded by other public funds may generate credits in proportion to the amount of private investment and non-conservation public funds (including required matching funds), provided:

- Crediting of the non-federal contribution to the USDA conservation easement program to mitigation purposes is necessary in order to make participation financially feasible for the affected private landowners; and
- USDA agrees to allow the non-federal contribution to be credited for mitigation, and
- All other eligibility requirements are met.[35]

That is, the total amount of credit generated by a project should be reduced by the proportion of federal funds used when the source of the matching funds prohibits the generation of credits for compensatory mitigation.[36]

Transportation, utility, county, and many other types of funds that are not restricted to providing conservation benefit may be used to generate credits. Public funds may also be used to meet eligibility requirements (i.e., to meet existing obligations that are not eligible for crediting under the description of additionality above).

2.1.2 Project Duration and Durability

Crediting projects must be durable. The period of time that mitigation is effective must be equal or greater in duration than the impacts being offset. The minimum acceptable duration, or term, of credit projects is 15 years, to ensure that actions taken persist on the landscape long enough to benefit sage grouse, given their unique life history and habitat requirements (such as high level of site fidelity) and dependence on sagebrush. The Program may allow a limited number of duration categories (for example, 15, 30, 50, and 75-year and permanent credits) to simplify registration and accounting, and may provide for exceptions to these categories (but not below the minimum credit duration) at the Program's and MSGOT's discretion.

Demonstrating durability of credit actions requires both legal protection and financial assurances to ensure appropriate management throughout the life of the credits.

Legal protection: Legal protection may be demonstrated through term or permanent conservation easements or deed restrictions, all of which must be filed with the appropriate county. Land purchase or conveyance to a public or non-profit conservation manager may also meet the State's legal protection standard, provided other elements of durability are demonstrated.

At the discretion of the Program, and with MSGOT approval, alternative methods for legal protection may be allowed if the supply of mitigation credit projects is insufficient to meet demand

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[35] Consistent with USFWS Policy Regarding Voluntary Prelisting Conservation Actions (2017).
[36] MCA § 76-22-110(5) (2017).

or to spend available Stewardship Account funds in a timely fashion. These alternative methods could include agricultural leases, multiparty agreements, or conservation land use agreements. If allowed, the Program should identify a suitable method for discounting the value of credits produced to address the greater uncertainty associated with these instruments. An easily reversible voluntary agreement such as a candidate conservation agreement (with or without assurances) is not sufficient to demonstrate legal durability.

Crediting projects on state and federal lands must also demonstrate durability as defined above, although the legal instruments available to meet that standard may differ from those on private lands. On state lands, credits may be created through conservation actions authorized and implemented directly by the Trust Lands Management Division or other state entities and offered for sale to project developers, or through an agreement with a third-party credit provider. For example, Trust Lands Management Division could enter into a conservation agreement with a third party, who then compensates the state for some portion of the value of credits generated by the third party.

On federal lands, legal instruments for demonstrating legal durability are determined by federal laws and policy (such as the Federal Land Policy and Management Act and BLM mitigation policies). The most durable compensatory mitigation sites are those located on national conservation lands due to these lands' protected status in law; however, it may be difficult or impossible to demonstrate additionality on these lands. Other durability provisions on public lands may include, but are not limited to, (1) secretarial withdrawals under the authority of FLPMA; (2) leases or conveyances of public land under the authority of the Recreation and Public Purposes Act; (3) protective land use plan allocations, including land use restrictions; (4) issuance of a land use authorization (e.g., leases or easements) to a member of the public for purposes of conservation; or (5) modification or relinquishment of an existing lease (with consent of the lessee) to remove potential incompatible uses from the site for the duration of the impact.

Financial Assurances: All credit projects must also provide financial assurances of durability, including demonstrating the availability of funding for implementation of conservation actions, long-term site management, and/or credit replacement in case of avoidable credit project failure. These assurances could include financial instruments such as: (1) an endowment; (2) a bond: (3) a contingency fund; and (4) an insurance policy, or other type of financial guarantee. The Program will work with credit providers to determine a type and amount of financial assurances needed based on location, conservation actions, and other project characteristics.

Unavoidable credit project failure due to *force majeure* events such as wildfire are addressed through a reserve account of credits that will be managed by the Program or a designated third party. These credits are in addition to credit project-level financial assurances. Reserve account credits will be included in the state's credit registry and may not be sold. The reserve credit account is created and supplemented through required contributions by debit project developers who buy credits or make payments to the Stewardship Account and is described in more detail in Section 3. The processes for resolving failure of crediting projects and for accessing reserve account credits in the case of project failure are described in Section 2.4.3 below.

2.1.3 Site Selection and Conservation Actions

Appropriate compensatory mitigation site selection is key to ensuring the use of mitigation funds provides the greatest possible benefit for sage grouse (Table 2.1 above and Tables 2.2 or 2.3 below). Small, isolated sites are less likely to contribute to sustainable habitat and are less likely to be used by sage grouse. Certain sites may be at higher risk of damage by wildfire or invasive species. All crediting projects or permittee responsible mitigation projects for compensatory mitigation must occur in sage grouse Core Areas, Connectivity Habitat, or General Habitat[37] or on federal lands classified as PHMA, GHMA, or RHMA.

Efforts to develop credit sites should be targeted to the extent possible towards the locations where the greatest benefit to sage grouse habitat and populations can be provided. Benefits to sage grouse habitat and populations could even be documented where local populations have declined or residual populations exist by undertaking management actions that address limiting factors.

Crediting projects may not be located on sites or in areas that are under imminent threat of direct or indirect disturbance likely to prevent the project from meeting performance standards. Evidence of an imminent threat include recently acquired subsurface rights, recent energy leasing activity, development plans or permitting is already underway, or development designations on or off site. Similarly, crediting projects should not be located on sites or in areas that fall within the zone of influence of development that would negate the effectiveness of the site to provide functional habitat.

In Montana, it is possible for surface lands and the mineral estate to be owned by two separate entities (i.e. split estate). While the law is well settled that the mineral estate is the dominant right and reasonable use of the surface is allowed, split estate does not automatically disqualify a potential credit site that meets all other requirements. In other words, the presence of a credit site is not mutually exclusive of mineral development and the two uses can coexist.[38] The likelihood that minerals will actually be developed should be considered. A Remoteness Review Report can inform decisions as to appropriateness of the parcel as a credit site and whether there is an imminent threat of direct or indirect disturbance sufficient to negate the quantity and quality of habitat afforded by the proposed credit site.

A Remoteness Review Report assesses the likelihood or potential that economically viable mineral resources exist and may be developed in the future. Such a report is typically prepared by a qualified geologist and describes the geology of the subject property and nearby properties. The preparer usually makes a site visit and studies publicly-available data and information. The preparer ultimately makes a determination as to the potential or probability of future mineral extraction and whether the likelihood of future mining is so remote as to be negligible.

A Remoteness Review Report is commonly included as a matter of due diligence by entities when considering whether to enter into a perpetual conservation easement. The potential for development to be "so remote as to be negligible" is typically required for a perpetual conservation easement to move forward. Such a finding is absolutely required by the U.S. Internal Revenue Service in order for the site to quality for tax deductions pursuant to the U.S. Tax Code.[39] For credit site developers seeking funds from the Stewardship Account, a minerals remoteness report is required.

Other considerations when selecting appropriate credit sites include, but are not limited to the following:

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[37] MCA § 76-22-111(3) (2017).

[38] Credit providers engaged in primarily perpetual conservation easements should consult the Internal Revenue Service Code Title 26 Subtitle A Chapter 1 Subchapter B Part VI Section 170 and Montana laws for guidance as to development of mineral resources, preservation of conservation values, and the tax implications.

[39] *See* Internal Revenue Service Code Section 170(h).

- The site and the surrounding area have low levels of anthropogenic disturbance (e.g. cultivation, energy development, or other human-related infrastructure and below the 5% disturbance threshold outlined in EO 12-2015).
- The site is near or adjacent to large blocks of functional habitat.
- The site has potential for additional habitat restoration or enhancement actions which further increase habitat quality or quantity (i.e. increase functional acres / credits.
- The landowner is amendable to longer duration site projection, thereby increasing the number of functional acres and thus credits available.
- The site or area supports active leks or is within five miles.
- The site meets the definition of suitable habitat provided in EO 12-2015.

Conservation actions that involve preservation, restoration, and/or enhancement actions must meet the requirements of this *Policy Guidance* and relevant state or federal policies.

Each credit provider must develop and submit a site management plan ("site plan"), which identifies the extent, type, and description of all proposed conservation actions to preserve, restore or enhance habitat. Individual site plans will describe:

- the type and location of vegetation communities present on the project site;

- current and future threats to sage grouse habitat function for the site, including adjacent competing land uses;

- specific conservation practices that will be implemented on the site to maintain or improve habitat for the species;

- site-specific performance standards, that describe the actions or outcomes on which results will be evaluated and credit and payment release predicated; and

- proposed monitoring methods and duration, including reporting, to document site conditions and verify credit production.

A site plan may be developed by any credit provider or third party, with or without assistance by Program staff or technical support providers. The Program will determine whether a site plan is appropriate and adequate.

As staff capacity allows, the Program will provide credit providers with guidance and information on site-appropriate actions. The Program may consider approving credit for conservation actions not listed in Table 2.1 on a case-by-case basis if the gain in sage grouse habitat function or population benefits can be adequately quantified and clear and approved best practices exist for how to plan, implement, and maintain those conservation actions over time.

Not all possible conservation actions will be appropriate for generating credits on every site. The actions selected for a given site should reflect threats affecting sage grouse locally and regionally, site potential, current vegetation and other conditions, and the risks or likelihood of success of a given action. Multiple conservation actions can occur on a single site, which will increase the quality and quantity of habitat and subsequent credits available.

Project developers conducting permittee-responsible mitigation should consult with the Program for assistance in identifying appropriate compensatory mitigation sites and conservation actions to ensure consistency with policies and to maximize credit availability.

Prior to release of a request for crediting proposals for the Stewardship Account, MSGOT will identify priorities for a funding cycle. These priorities may identify regions, populations, habitat types, threats, or specific conservation actions that will receive preference for funding. They may be based on best available science, information on landscape-scale priorities, and/or information about likely future impacts related to sage grouse habitat use and management needs.

2.1.4 Calculating Functional Acres Gained and Converting to Credits

Determining the amount of mitigation credit provided by a project requires a method for measuring both the impact of the debiting project and the benefit of the crediting project using the same currency. Montana's Sage Grouse Habitat Quantification Tool (HQT) is used to measure the results of all debiting and crediting projects (see the HQT Technical Manual). The Program (or its designee) is responsible for creation and maintenance of the HQT and ensuring public access to the tool and its underlying data.

The HQT estimates not only the quantity of habitat affected by an action, but also its quality in terms of value to sage grouse. The HQT's assessment of habitat quality includes both local context and site condition, combined into a single metric and expressed as *functional acres*. A functional acre is a unit of habitat, which in turn is expressed as a credit or debit or a unit of trade in a mitigation market place.

In the case of credit sites, functional acres gained are calculated using the HQT and are then converted to credits after application of this *Policy Guidance*. One functional acre is the equivalent of one credit. (i.e. ratio is 1:1). See Figure 2.2

The HQT will be used to estimate the results of conservation actions at full implementation, based on likely future conditions at the site. For example, a project involving only preservation through legal protection can project future site condition largely based on current condition. A project that includes restoration or enhancement components can run the HQT based on a set of assumptions about how these actions will affect future condition (for example, restoration actions to remove juniper would be assumed to reset HQT juniper canopy cover to 0%).

At the completion of the term of the credit project and/or prior to the final release of credits based on the site-specific credit release schedule for restoration or enhancement projects, the Program runs the HQT to determine how many credits were created over the life of the project. Additional collection and verification of field data may be required, and the amount of final credit release may be adjusted accordingly.

For preservation credit projects, the policy step in Figure 2.2 considers the following, in addition to policy signal multipliers summarized in Table 2.2:

- For perpetual easements, the duration is 100 years.
- For perpetual easements with no additional restoration or enhancement actions, the number of credits available is 35% of the Raw HQT Score times 100 years.
- For term leases, the duration is the number of years identified in the lease agreement.
- For term leases, with no additional restoration or enhancement, the number of credits available is 35% of the Raw HQT Score times the number of years in the lease agreement.

- For either perpetual easements or term leases, a multiplier of 10% will be applied to the number of newly-created functional acres, as described in Section 2.1.5.
- The minimum preservation credit duration is 15 years.

For restoration and enhancement credit projects, the policy step in Figure 2.2 considers the following, in addition to policy signal multipliers summarized in Table 2.2:

- The duration is the number of years identified in the site protection instrument.
- Baseline is the pre-project condition as calculated by the HQT. The number of new functional acres is determined by re-running the HQT to predict outcomes of the habitat management actions.
- Phased credit release schedules will account for the length of time required for restoration or enhancement actions to actually increase habitat quality or quantity and the number of credits available from restoration and enhancement sites at any given time.
- The minimum restoration or enhancement credit duration is 15 years.

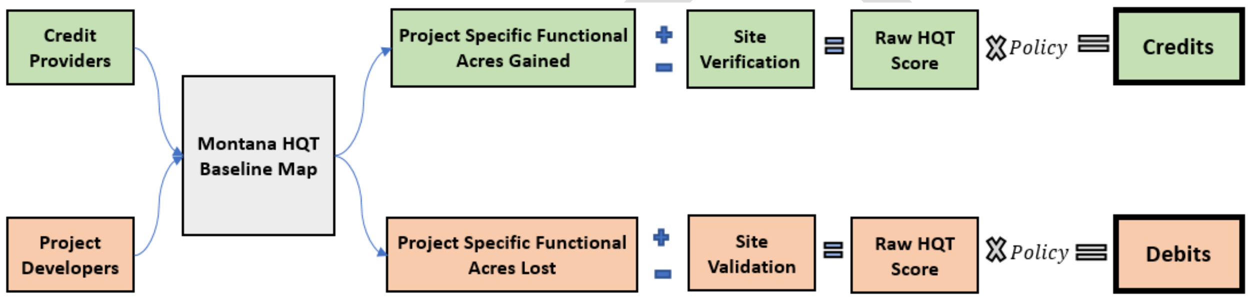

Figure 2. 2. General process to determine the number of credits produced during the life of a credit project using the HQT and applying this *Policy Guidance* (top row, in green).

2.1.5 Adjustments to Credit Amounts to Incentivize Conservation

The HQT result for credit sites will adjusted to further enhance voluntary, incentive-based mechanisms to preserve, restore, and enhance sage grouse habitats.

The total number of credits available from a credit site is the Raw HQT Score (adjusted for baseline in the case of preservation credits as described in Section 2.1.1) plus any adjustments.

The amount of credit available on a project site is adjusted when <u>new</u> functional acres are created, as follows (Table 2.2)

<u>Core Area or PHMA</u>: To further incentivize credit actions in sage-grouse Core Areas or PHMA (see Figure 1.1), a positive multiplier of 10% will be added to the number of functional acre credits *newly* produced at a given credit site. For example, preservation credit sites (perpetual conservation easements or term lease agreements) maintain the status quo and remove threats, but do not create new, additional functional acres as is the case for restoration or enhancement credit sites which increase functional acres above the baseline. Providing a positive 10% multiplier for all *newly* produced functional acre credits in the areas of highest priority for conservation will incentivize additional voluntary conservation actions.[40]

For example, a credit project in a Core Area or PHMA may start with a baseline of 50 functional acres. After implementing the conservation action, there is a total of 150 functional acres. This represents a change (or addition) of 100 new functional acres. Therefore, a total of 110 functional acres, or 110 credits will be available [100 newly created x 0.10].

A similar multiplier is applied to debit amounts in Core Areas or PHMA to incentivize developers to site projects outside of these highest priority areas. See Section 3.3.1.

General Habitat or GHMA: A positive multiplier of 5% will be added to the number of functional acre credits *newly* produced at a given credit site. A similar multiplier is applied to debit amounts in General Habitat or GHMA to incentivize developers to site projects outside of these areas that also provide sage grouse habitat. See Section 3.3.1.

For example, a credit project in General Habitat or GHMA starting at a baseline of 50 functional acres and resulting in a post-project condition of 150 functional acres, the addition of 100 new functional acres, a total of 105 functional acres of credit will be provided.

Table 2.2. Summary of policy signal multipliers for credit projects to incentivize voluntary conservation of Montana's sage grouse habitats.

Policy Signal Multiplier	Core Areas or PHMA	General Habitat, GHMA, Connectivity Area
Newly-produced functional acres (credits)	10% of the new functional acres created	5% of the new functional acres created

2.2 Implementing and Verifying Conditions on Credit Sites

This section describes the process that all mitigation credit projects will use to verify the number of credits their project is projected to generate, as well as the number of credits actually generated over time through implementation.

Monitoring and third-party verification of credit outcomes is critical to ensuring that credit providers meet their contractual obligations and deliver anticipated outcomes, or that if unavoidable losses occur, appropriate remediation or replacement actions are taken in a timely fashion.

Verification is an essential component of ensuring that debit project developer's mitigation obligations are met in full and allowing a full transfer of credit responsibility when desired by both parties. An initial verification will occur in year "zero" of a project that includes a site visit and review of documentation. The initial verification confirms credit site eligibility, estimates of credits, and adequacy of stewardship/monitoring plans. Verification of a site's ecological performance will

[40] See MCA §76-22-102 (Legislative findings and purpose of the Montana Greater Sage-Grouse Stewardship Act).

occur regularly throughout the life of a project. Verification frequency should be outlined in the site plan and may vary based on an individual mitigation site's characteristics and ongoing performance.

The Program will either conduct site visits and other forms of verification in coordination with permitting agencies and credit providers, or may designate one or more parties as third-party verifiers. Third parties could include consultants, conservation district staff, contractors, restoration professionals, or others. Verifiers should be approved by the Program, use standardized forms and processes, and have the expertise needed to use the HQT and identify problems with project implementation and outcomes.

Differences in opinion may occur among the several parties involved in credit generation – the credit provider, Program, permitting agencies, verifier, etc. These disagreements might involve the adequacy of documentation, whether the project was implemented correctly, whether credits are estimated accurately, whether a credit provider is correctly estimating for ongoing performance costs, or other concerns.

MSGOT is the initial point of review for disputes that arise and cannot be handled within an interagency review team or between a credit provider, the Program, and/or other parties. The Program may also choose to set up internal processes to deal with disputes involving its decisions. These may include separate processes for minor and significant, or material, disputes. All dispute resolution processes will be consistent with applicable Montana law and any other relevant laws.

2.3 Project Approval and Credit Release

Credit release is the point at which conservation actions proposed as part of a credit project are officially translated into credits that are available for sale or use in the mitigation marketplace. With a verification report that confirms eligibility and credit quantification, the Program is ready to finalize project approval and certify credits for release.

2.3.1 Approving a Mitigation Instrument

Prior to project approval and credit release, the Program will review the following documentation for completeness and accuracy. Table 2.3 lists the documents needed to gain final approval of a mitigation instrument and release the initial phase of credits.

2.3.2 Registering Credits

The State of Montana will identify or develop a database (i.e. registry) to track creation and sale of sage grouse habitat mitigation credits for credits created through funding from the Stewardship Account, including all permittee-responsible compensatory mitigation projects. All credits and their accompanying documents must be recorded in that database for the State of Montana, BLM, USFS, and other permitting agencies to determine compliance with applicable rules and laws. The database will include geographic locations, site plans, verification documents, credit quantities, and credit purchases. Information on the general location of impacts and mitigation sites and the quantity of credits being generated and sold should be easily accessible to the public to ensure availability of the information to all credit providers and developers, transparency, and confidence in the system's outcomes.[41]

Table 2.3. Documents required for final approval of credit site mitigation instruments.	
Document Title	**Description**
Eligibility Narrative	See Table 2.2 and Section 2.1.3 for what should be addressed
Total Credit Estimate	Estimate of project sage grouse habitat benefits based on HQT results and multiplier adjustments as appropriate
Site Plan	Description of the location, extent, type, and design of conservation actions and management, as well as monitoring and reporting requirements throughout the term of the credit project
Stewardship Plan	Identification of stewardship costs, plans and timeline for demonstrating the availability of funding for stewardship (endowment or other tool) who will be the steward, how maintenance will be conducted, and contingency plans for events such as drought, wildfire, etc.
Monitoring and Verification Plan	Monitoring methods and duration, including reporting, to document site conditions and verify credit production.
Financial Management Plan	Detailed financial management plan including initial costs (acquisition, field surveys, habitat restoration, capital equipment, etc.), on-going annual costs (monitoring, maintenance, management, reporting, contingency allocation, etc.), and stewardship funding requirements accounting for inflation and investment strategy. Plan should outline all costs needed for predictable, effective, and durable creation of credits, in order to allow for all costs of credit generation to be fully reflected in credit cost.
Land Protection Documents	Recorded easements and/or other legal instruments protecting the land for the duration of the credit life
Verification Report	Produced by a verifier and confirms the appropriateness of the documents listed above

2.3.3 Credit Release

Credits that are released are available for offsetting impacts. Prior to selling or using any credits, a credit provider must have an approved site plan in place described in the sections above. The Program will conduct a pre-sale check-in with any relevant regulatory and permitting agencies to ensure full agreement on credit estimates (and credit need, in the case of permittee-responsible mitigation).

[41] MCA § 76-22-104(3) (2017).

Credits funded by the Stewardship Account will be released or assigned to specific development projects upon MSGOT's approval. Under the Act, MSGOT may transfer credits created through Stewardship Account funded-projects to third parties operating approved habitat exchanges. Ultimately, the Stewardship Account must be reimbursed with the proceeds when those credits are sold.

MSGOT may recommend or approve future creation of a habitat credit exchange, where mitigation credits may be freely bought and sold. Regardless of credit project type or mitigation mechanism, all credit sales used to fulfill mitigation obligations in the State must be listed and tracked in the State's registry database.

In some circumstances, not all credits are released immediately on approval of a site plan, recording of a land protection agreement, or project implementation. Instead, credits are leased in phases. This is called phased release of credits and is appropriate for restoration or enhancement credit projects. Releasing a limited number of credits in stages prior to its completion is a common way of balancing the need to demonstrate ecological benefits of project with the need for up-front funds to finance implementation actions.

For strictly preservation credit projects, credits can be released as soon as a project is implemented and approved. This will typically be the case after the perpetual easement has closed and been recorded or after a term lease agreement has been executed.

For restoration or enhancement credit projects, the amount and timing of payments to credit providers will be based on an agreed-upon set of performance standards and timeline. The timing and amount of payments need not necessarily match the timing and amount of credit release if another mutually agreeable schedule serves to better match expenses with reimbursements.

A default credit release schedule for restoration and enhancement credit projects is included below. However, the schedule included in a specific mitigation proposal may have additional phases and requirements necessary for credit release. For example, credits may be released on meeting ecological performance standards rather than specific actions, or more credit release could be provided earlier if a credit project is focused on preservation rather than restoration and is therefore providing most of its benefit early in the term. If performance standards are not being met (i.e., the project is not on a path to provide the projected number of credits), credit release may be halted as described in Section 2.4.3 below.

Default Credit Release Schedule if No Other Project-specific Schedule is Proposed and Approved by MSGOT:

- **Phase 1:** 20% of projected credits are released on approval of site plan and recording of a land protection agreement.
- **Phase 2:** Up to 20% of credits are released at the end of years 1 and 5 (up to 40% total) if site plan actions have been implemented and appropriate progress toward performance standards is documented and verified.
- **Phase 3:** Up to 20% of credits are released when financial assurances are fully executed and funded, provided appropriate progress toward performance standards is documented and verified.

- **Phase 4:** All remaining credits are released when a site has met all of its final performance standards, based on verification of the final total number of credits produced at the site. If a site exceeds its final performance standards and generates additional credits, these credits will be released.

2.4 Implementation, Verification, Tracking, and Adaptive Management

For any mitigation site, the credit provider is responsible for conducting ongoing monitoring and demonstrating progress toward meeting the performance standards outlined in their site plan. A credit provider needs to submit monitoring reports to the Program. Reports are due before December 31 of each year in which a report is required, depending on the verification schedule agreed to in the site plan. The Program will review monitoring reports and report a summary of results across projects to MSGOT and other permitting agencies.

2.4.1 Site Performance Standards

Credit-generating sites will need to maintain a certain level of performance over time to sustain the habitat functions on which their credits are based and upon which project developers have relied to fulfil mitigation obligations. Every site will have an agreed-to set of measurable performance standards that need to be met at agreed-to time intervals.

Performance standards for each mitigation site will be customized in the site plan but should, at a minimum, require the credit provider to maintain the existing level of habitat quality, barring unavoidable events as described in Section 2.4.3. Any additional performance standards should be built around existing site condition, proposed actions, and the projected future condition of the credit site, and should be based on the best available science on sage grouse habitat assessment and management, available data on the needs of sage grouse and other relevant species, and any reference/historic conditions that are applicable.

To ensure appropriate management for the life of the credits, each proposed crediting project must also include a *stewardship plan* that identifies a long-term steward, stewardship goals and activities, the amount and source of funds needed to maintain the site, and documentation of the time needed to implement the full stewardship plan. The stewardship plan is one set of documents submitted to the Program before credits can be released (see Table 2.3).

2.4.2 Requirements for Monitoring Credit Sites and Verification of Credits

Monitoring and verification reports will be required and the timing and content of those results must be approved by the Program and any permitting agencies as part of the set of documents submitted for final credit project approval. Monitoring reports should be required annually for most credit projects and should demonstrate progress toward meeting and sustaining agreed-to performance standards. Monitoring components should include the following, at a minimum:

- a restatement of the agreed-upon performance measures and the implementation schedule;

- a summary of overall site conditions, challenges (including anticipated and unanticipated costs), and progress;

- a table demonstrating progress toward performance standards, and what data/findings were used to support that demonstration;

- documentation of circumstances in which site conditions improved beyond what was anticipated or alternatively why site conditions did not improve as anticipated, and discussion of potential reasons why as input into the adaptive management aspect of the program;

- recommendations for rectifying the site conditions if performance standards are not being met and an action plan for implementing such measures, including a timeline;

- a list of credits sold, retired, or used; and

- any suggested improvements in the mitigation procedures and policies for the Program to consider in adaptive management.

In cases where multiple parties are involved in credit creation, the monitoring and performance responsibilities of each party should be clearly outlined in easements or other land protection instruments or contracts.

2.4.3 What Happens if Performance Standards are Not Being Met

The Program and MSGOT are responsible for enforcing the mitigation obligations incurred by credit providers at execution of a mitigation instrument to which the Program is a party, as will typically be the case when Stewardship Account funds are used to create credits. Where specific enforcement responsibility has been delegated to a third party, the third party is responsible.

In cases where multiple parties are involved in credit creation, responsibilities for performance and remediation should be clearly outlined for each party in easements and/or contracts.

Credit projects can fail to meet performance standards for three reasons: (1) unavoidable *force majeure* events beyond the credit provider's control, such as wildfire, flooding, extreme drought, or the unintended failure of management interventions; (2) avoidable implementation failure, neglect, or actions that are willful or that a credit provider has the reasonable ability to foresee and correct; and (3) land use conflict from a conflicting use that cannot be legally precluded, such as development of mineral rights or impacts from actions on neighboring properties.

The Program manages this risk of project failure through judicious use of the credit reserve pool, phased credit release, financial assurances, and other tools for managing uncertainty outlined in this *Policy Guidance*.

Unavoidable Failure or *Force Majeure* Events: When a credit project fails to meet performance standards as a result of an unavoidable event, the credit provider should notify the Program as soon as possible. Both parties should work together to identify appropriate actions and an acceptable time-frame in which actions needed to correct the issue and return to a positive trajectory would be accomplished.

Credit release and payments should immediately be halted and remain suspended until the issue is corrected and the credit project returns to meeting agreed-upon performance standards. At the end of that set time for project correction, the Program will re-evaluate the conservation outcomes.

In the case of wildfire, the recovery time could be very long. The parties may tap the reserve account earlier than waiting for a set time.

Credit providers are not required to replace credits that have already been sold and are then invalidated by unavoidable failure, but no further credits will be released from the site unless it returns to meeting performance standards. Invalidated credits will be replaced by the Program with credits in the reserve account managed by the Program or its designee.

Permittee-responsible mitigation projects may contribute to and access the pooled credit reserve account, or may create their own pool of reserve credits to access in case of project failure. Unlike other mitigation mechanisms, if permittee-responsible mitigation has not contributed to a reserve account at the rate described in 3.3.1, the debit project developer retains responsibility for credit generation or replacement even in the event of unavoidable failure.

<u>Avoidable failure</u>: When a project fails because of actions or circumstances that the credit provider has the ability to foresee and correct, the credit provider should similarly notify the Program as soon as possible and work to identify an acceptable timeframe and actions needed to correct the issue and return to a positive trajectory.

Credit release and payments should immediately be halted and remain suspended until the issue is corrected and the credit project returns to meeting agreed-upon performance standards. If the project remains deficient at the end of that time-frame, the credit provider must purchase replacement credits from the Stewardship Account, another credit provider, or the reserve account (at the discretion of the Program, with MSGOT approval, and at full cost), or begin a contract cancellation process. If a contract is cancelled due to implementation failure, the credit provider will be liable for replacement of all funds (if Stewardship Account funds were used, plus reimburse the State's expenses) or credits that were released for the site and invalidated by the failure. Performance bonds or other forms of financial assurances help ensure this responsibility is met.

<u>Land use conflict</u>: Land use conflict should generally be avoided through the site eligibility requirements described in Section 2.1, because appropriate legal protections should generally preclude competing uses on the credit site. However, it may not be possible to legally preclude all incompatible uses on credit-generating sites (e.g. offsite impacts impairing on-site habitat quality or quantity, loss of land due to eminent domain, or development of the mineral estate). Similarly, it is not possible to legally preclude all incompatible uses on lands adjacent or near to credit-generating sites. Reserve pool credits are a potential source of replacement credits.

In the instance of newly-proposed development project that are subject to state and/or federal permitting authority and subject to mitigation requirements to offset the impacts, the permitting agency has the option to add replacement of the compromised credit site to the total mitigation obligation for the new project. For example, the contribution to the reserve account may be increased for the new project or a new credit project could be proposed at another site through permittee-responsible actions. The permitting agency, the Program, the developer, and the credit provider should work together to establish an acceptable time-line and means for replacing all lost or impaired credits.

In the instance of split estate situations, the mineral estate has the prior existing legal right to reasonable use of the surface lands of a credit site, pursuant to laws governing split estates in Montana. This is a special case and such circumstances will be addressed on a case by case basis. Typically, the mineral estate owner would not be a signatory to the mitigation credit instruments. The reserve account may be used to replace lost or impaired credits due to mineral development, alongside any required reclamation or mitigation associated with the mineral development permits. The permitting agency, the Program, the developer, and the credit provider should work together to establish an acceptable time-line and means for replacing all lost or impaired credits.

3. For Project Developers: Applying the Mitigation Sequence, Determining the Number of Debits, and Acquiring Credits

The 2015 Montana Legislature found that "allowing a project developer to provide compensatory mitigation for the debits of a project is consistent with the purpose of incentivizing voluntary conservation measures for sage grouse and populations."[42] The Stewardship Act provides for a variety of ways that a project developer can fulfill compensatory mitigation requirements. The Act, EO stipulations, and mitigation work in concert to balance the competing needs of conservation and economic activity / development in designated sage grouse habitats.

The following section outlines the steps project developers take to meet avoidance and minimization requirements and then compensate for residual impacts to sage grouse habitat for a proposed project. An overview of the entire process is shown in Figure 3.1.

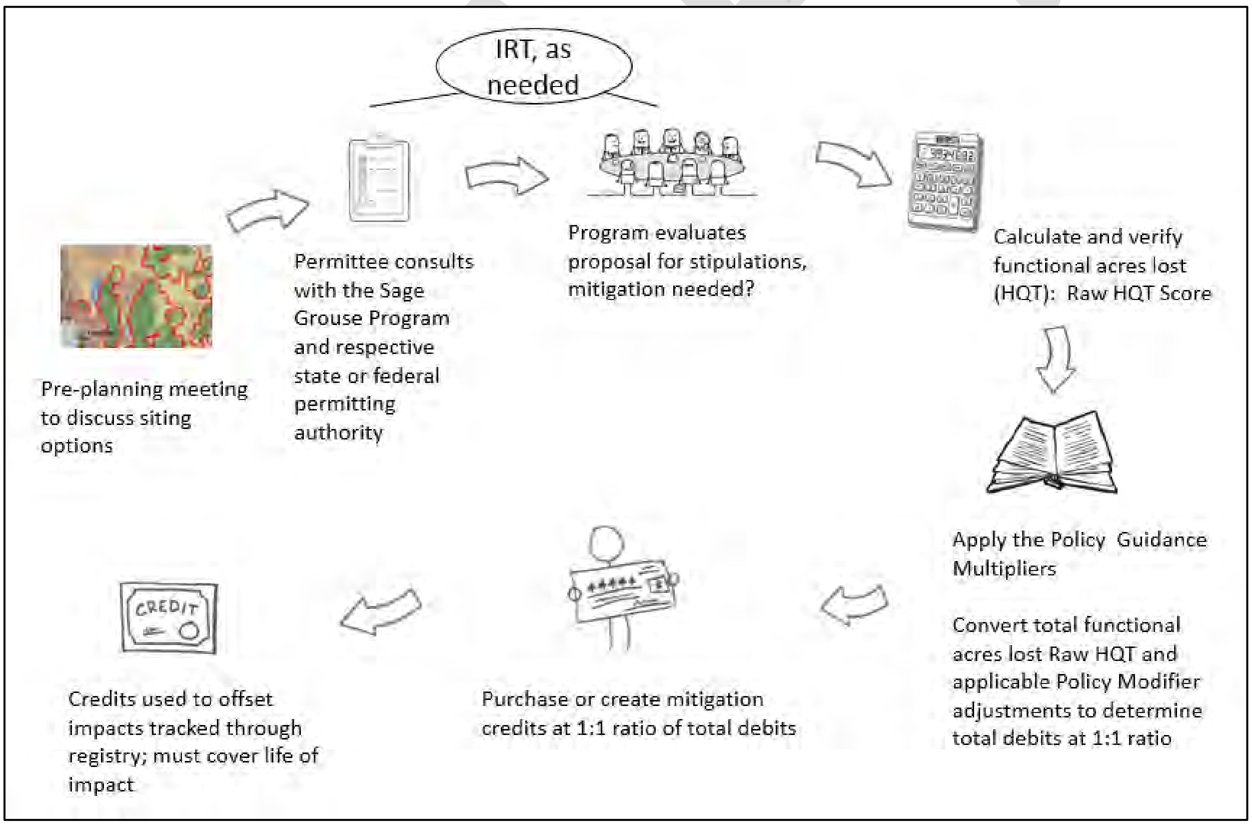

Figure 3.1. Schematic overview of the process a project developer would follow to determine mitigation obligation and obtain the appropriate number of credits.

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[42] MCA § 76-22-111(1) (2017).

3.1 Proposing a Development Project that Will Impact Habitat and Create Debits

This section addresses development activities that are subject to avoidance, minimization, and compensatory mitigation requirements under state and/or federal law. Under EO 12-2015, all new land uses or activities that are subject to state agency review, approval, or authorization are required to avoid, minimize, and reclaim impacts to sage grouse habitat, and to provide compensatory mitigation for any residual effects.[43] For development projects on federal lands, federal land use plans, regulations control.

Table 3.1 provides example list of project types and disturbances that require a state permit or authorization or may involve state grant funds and would be subject to the mitigation requirements of EO 12-2015 and the Act. Projects reviewed, approved, or authorized by federal agencies may have additional avoidance, minimization, reclamation, and mitigation requirements under federal law.

EO 12-2015 Attachment F[44] (copied in Appendix A of this document) provides a list of activities that are exempt from these requirements under certain circumstances and as described in greater detail in Appendices 7.1 and 7.2. Additionally, MSGOT may approve exceptions to the consultation requirements of EO 12-2015. Observance of the mitigation hierarchy is not required for activities listed in Attachment F and MSOGT-approved exceptions. Contact the Program for additional information regarding MSGOT-approved exceptions as they are subject to change.

Project developers proposing development activities that require a state permit or authorization, utilize state grant funds (or require a federal permit) and that occur in sage-grouse habitat should consult with the Program and any permitting agencies to set up a pre-planning meeting at least 45-60 days prior to submitting a permit application or proposing an action that may impact sage grouse habitat in Core Areas, General Habitat, or the Connectivity Area.

Permitting agencies requiring mitigation of impacts to sage grouse habitat in Montana will refer the project developers to the Program for guidance and information about developing a mitigation plan that is consistent with all relevant agreements, policies, administrative rules, or laws. The mitigation plan should be developed in coordination with the Program and permitting agencies and should outline the proposed action(s), quantify projected impacts on sage-grouse habitat quality and quantity using the HQT, and describe how the project developer will generate or secure sufficient credits to offset residual impacts.

[43] Executive Order 12-2015 Attachment A, paragraph 10, page 3.
[44] Executive Order 12-2015 Attachment A, starting on page 24.

Table 3.1. Activities that are reviewed under Executive Order 12-2015 that typically require a state permit or authorization or utilize state grant funds. Authorization by federal agencies are also likely required for these activities if they involve federal surface or federal minerals. Adherence to the mitigation hierarchy is required.

Project Type	Typical Disturbances: Spatial and Temporal	
Energy: Oil & Gas	• Well drilling/pump jacks • Well pad construction • Roads • Pipelines • Compressor Stations • Central Battery Systems • Storage yards	• Transmission lines • Ponds • Building sites / storage tanks • Well maintenance • Temporary or Plug and Abandon sites
Energy: wind facility	• Turbine pads and turbines sites • Roads • Facilities or buildings • Substation	• Storage yard • Pipelines • MET (weather) towers • Transmission lines
Energy: solar farm	• Solar array • Facilities or buildings • Substation	• Roads • Fencing • Transmission lines
Infrastructure: buildings	• Building site • Roads • Parking areas • Transmission lines	• Pipeline • Storage yard • Substation
Pipelines: major or minor	• Buried pipeline • Roads	• Compressor stations • Transmission lines
Mining: coal, bentonite, hard rock, gravel	• Mine site • Roads • Stock piles; drying areas • Bore holes	• Fence • Monitoring well • Transmission lines • Storm water outlet
Transmission Lines: major or minor	• Transmission lines • Towers	• Roads • Substation
Communications, Fiber Optic Cable	• Communication towers (cellular) • Buried cable	• Transmission lines • Roads
Roads/Transportation	• Road • Railway • Staging areas • Borrow pit	• Culvert • Bridge • Storage yard
Agriculture	• Crop • Livestock area • Irrigation • Water pipeline	• Stock pond/tank/reservoir • Water diversion • Transmission line
Habitat Treatment	• Prescribed Fire	

3.2 Application of the Mitigation Sequence and Consultation

Executive Order 12-2015 and the Stewardship Act set forth that Montana will observe the mitigation sequence (i.e. mitigation hierarchy). Observing the mitigation hierarchy reduces project impacts to the smallest possible effect and requires compensation for residual impacts that can't be avoided. Residual impacts are unavoidable because new or increased activity or surface disturbances will have some level of impact on sage-grouse and sage grouse habitat. Remaining unavoidable residual impacts are reconciled through compensatory mitigation. The only way to avoid residual impacts is to not implement a development project in designated sage grouse habitat.

For those projects that must be located in designated habitats, consideration of the mitigation sequence also encourages strategic planning to avoid and minimize landscape-level and site-specific impacts. By strategically planning a project's type, location, size, duration, and striving to be consistent with EO 12-2015, developers will decrease their total mitigation obligations.

Like the State of Wyoming's approach, Montana encourages developers to pay particular attention to whether or not the newly-proposed activity is located on a site where the surface has already been disturbed by prior activity (e.g. existing disturbance). Montana's Mitigation System incentivizes developers to locate new projects within existing disturbance. Attention should also be paid to other project details to assess their consistency with stipulations set forth in the EO and/or federal land use plans, as appropriate.

To initiate a review of sage grouse impacts and mitigation requirements, a project developer provides the Program, BLM, or USFS with a description of the proposed activity, including the location and type of land use or activity being proposed and whether and how applicable avoidance and minimization measures will be implemented through the Program's website. For projects requiring a state permit or for activities proposed on federal lands classified as PHMA, this is typically accomplished using the Program's web application.

For purposes of compliance with State policy, minimization measures will be focused around stipulations outlined in EO 12-2015 (Attachment D), although Program staff may also work with the project developer and/or permitting agencies to use the HQT to explore alternative siting or design options that could further limit impacts to sage grouse and therefore reduce mitigation needs. This is typically accomplished using the Program's web application as a matter of pre-project planning.

The Program may convene an interagency review team (IRT) for larger, more complicated projects and for projects for which environmental analyses are required (e.g. environmental assessments or environmental impact statements). An IRT will typically be composed of staff members from the Program and all permitting agencies relevant to the proposed project, as well as other resource agencies in an advisory capacity. The interagency review team would be convened on an as-needed basis and may work with the permitting agency preparing environmental analysis documents or their contractors.

The IRT's purpose is to review and evaluate the proposed activity, avoidance and minimization measures, and ensure consistency with relevant State policies, this *Guidance*, federal policies, and all other relevant policies and agreements. Project developers should continue to communicate with the IRT as needed to finalize an approved final mitigation plan. Guidelines for convening and operating an IRT, including a process for timely dispute resolution, may be formalized in an interagency agreement.

3.3 Calculating Functional Acres Lost and Converting to Debits

Determining the amount of mitigation credit provided by a project requires a method for measuring both the impact of the debiting project and the benefit of the crediting project using the same currency. Montana's Sage Grouse Habitat Quantification Tool (HQT) is used to measure the results of all debiting (development) projects. (See the *Montana Habitat Quantification Tool Technical Manual*). The Program (or its designee) is responsible for creation and maintenance of the HQT and ensuring public access to the tool and its underlying data.

The HQT estimates not only the quantity of habitat affected by an action, but also its quality in terms of value to sage grouse. The HQT's assessment of habitat quality includes both local context and site condition, combined into a single metric and expressed as functional acres. A functional acre is a unit of habitat, which in turn is expressed as a credit or debit or a unit of trade in a mitigation market place.

The HQT analyzes specific development projects according to their direct footprint and the indirect effects in the nearby area (Figure 3.2). Projects are further broken down into phases: construction, operations – usually the permit duration, and reclamation when all infrastructure is removed and the site is in active reclamation. HQT output reflects functional acres lost in the direct footprint and the indirect area of impact and for each phase of the project, respectively, and for the total life of the project. See the *HQT Technical Manual* for complete details on how the HQT calculates functional acre losses for different types of development projects.

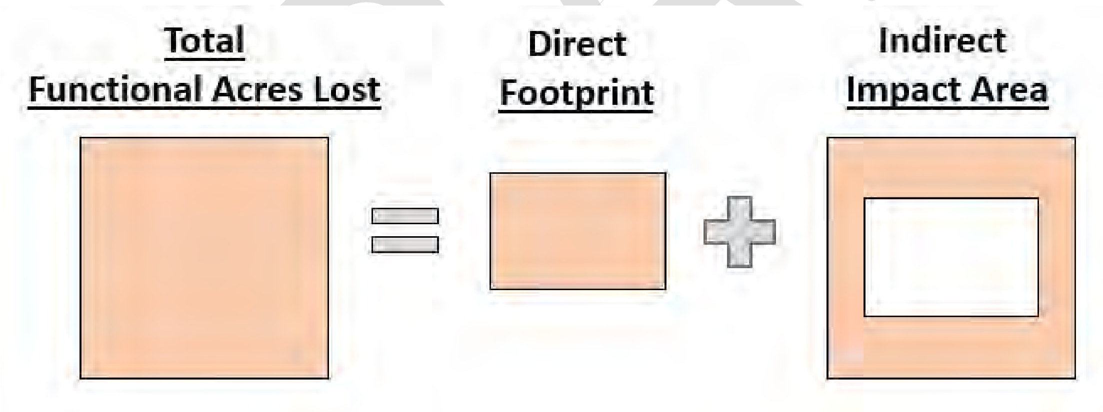

Figure 3.2. The HQT calculates the number of functional acres lost by analyzing the functional acres lost due to the direct footprint separately from the indirect impact area affected by the project. The total of functional acres lost is the sum of the functional acres lost due to the direct footprint plus the functional acres lost in the indirect impact area.

Once avoidance and minimization measures are incorporated into a proposed development project to the extent practicable, compensatory mitigation will be required for residual impacts to sage grouse habitat, including temporary or indirect impacts.[45] The HQT will be used for all proposed development projects to determine whether residual impacts exist that will require compensatory mitigation.[46]

The HQT is policy-neutral. It is based on the best available science, to quantify gains or losses of functional habitat. From a planning perspective, determining the Raw HQT Score is first step to strategic planning to minimize mitigation obligations and ultimately the cost of mitigation. Because the HQT is objective and repeatable, it can quantify habitat losses using consistent methodologies despite different project types and designs and different locations.

The total number of functional acres lost will depend: (1) the project location; (2) the underlying habitat quality at the site location and nearby area; (3) the project type; (4) the project size; (5) project complexity and the number of additional disturbance features such as new roads; and (6) project duration or how long the development project will be on the landscape.

In the case of debit projects, functional acres lost are converted to debits after application of the HQT and this *Policy Guidance*. One functional acre is the equivalent of one debit. (i.e. ratio is 1:1). See Figure 3.3.

To obtain the Raw HQT Score, a project developer will provide the Program with information about the project, and Program staff will run the HQT. Alternatively, the project developer can use the HQT as a strategic planning tool by considering alternative scenarios using the HQT on the Program's website.

The Raw HQT Score will be adjusted through the use of policy multipliers to provide clear, transparent incentives for voluntary conservation by developers. Multipliers could be applied to either the direct footprint and/or the indirect area of impact, as described more fully in Section 3.3.1. The total functional acres lost and the applicable policy modifier adjustments are converted to the total number debits at a 1:1 ratio.

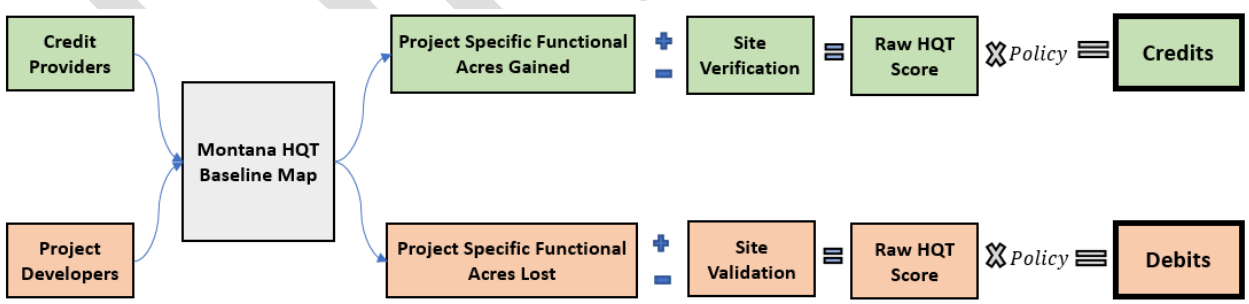

Figure 3.3. General process to determine the number of debits created by a development project for the life of the project using the HQT and applying this *Policy Guidance* (bottom row in tan).

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[45] MCA § 76-22-111 (2017); *see also* EO 12-2015, Attachment A, paragraph 10, page 3.
[46] *See* Section 3.3.3, Modified Approach to Mitigation for the Cedar Creek Core Area and the Elk Basin area of the Carbon County Core Area.

The project developer has flexibility to decide how to secure an equivalent number of credits necessary to offset the total number of debits for the entire duration of the project. The project developer can either purchase the needed credits from a credit provider, make a payment to the Stewardship Account if sufficient credits are not available, or submit a proposal and site plan for a permittee-responsible project. Additional details on meeting compensatory mitigation requirements are outlined in Sections 3.3.1 – 3.3.6 below.

3.3.1 Adjustments to Credit Requirements to Incentivize Voluntary Conservation, Consistency with Executive Order 12-2015, and Ensure Mitigation is Timely and Effective

Project developers are encouraged to design and site projects to impact the fewest number of functional acres as possible using the HQT to consider alternatives. To further incentivize voluntary conservation, Montana's Mitigation System incorporates multipliers as a matter of policy. This section describes policy-based multipliers which adjust the Raw HQT Score to incentivize conservation, consistency with Executive Order 12-2015, and ensure mitigation is timely and effective.

Policy modifiers are implemented by increasing the number of credits required to offset the number of debits by multiplying the Raw HQT Score by a fixed percentage. This enables developers to consider alternative scenarios during the pre-project planning stage because the Raw HQT Score can be calculated for each alternative. Applying the multipliers to the alternative having the smallest Raw HQT Score will result in the smallest total mitigation obligation. Business decisions can be made which optimize trade-offs and minimize total project costs, including mitigation.

Analyzing alternative scenarios could entail moving the project to a different location where baseline habitat functional value scores are lower, timing implementation so that construction avoids sensitive periods associated with breeding and nesting season, and finding ways to be as consistent with the EO stipulations as possible. This is how mitigation helps incentivize voluntary conservation using free market principles. Ultimately, mitigation obligations will be the lowest when developers site projects in low quality habitat or on top of existing disturbance in the first instance and when the project and all of its features are consistent with the EO for the entire duration of the project.

Applying multipliers to the Raw HQT Score provides clear policy signals to incentivize voluntary actions which conserve habitat and cause the least amount of impact. The total mitigation obligation is determined after applying the policy modifiers.

Development projects will usually be subject to more than one multiplier. Each individual multiplier is only applied to the Raw HQT Score (either the total or only the indirect impact portion). For example, a Raw HQT Score of 100 functional acres loss is the equivalent of 100 debits and the initial score prior to the application of multipliers. A project located in a Core Area having a 10% multiplier and a 15% reserve account contribution would require 125 credits or [100 initial score + (100 x 0.10) + (100 x 0.15)].

The following multipliers are calculated using the Raw HQT Score. In some cases, the adjustment is based the total HQT Raw Score (direct footprint plus the indirect impact). In other cases, the adjustment is based only on the portion of the Raw HQT score attributed to a project's indirect impacts.

<u>Reserve Account Contribution</u>: A reserve account is a pool of credits to timely replace lost or impaired credits lost in unforeseen events such as wildfire (i.e., unavoidable loss or *force majeure* or

"Acts of God"). Because this risk is shared among all participants in the Mitigation System, it functions as a common insurance pool. This helps insure against the potential failure of projects due to unavoidable causes, such as fire or extreme weather and that no single Mitigation System participant is overly affected.

Developers will be required to contribute 15% of the Raw HQT Score (direct footprint plus indirect effects) to the reserve account, regardless of the mechanism to obtain credits selected by developer. Contributions to the reserve account allow: (1) project developers to transfer responsibility for credit project impairment or failure to the credit provider; and (2) credit providers to avoid responsibility for unavoidable credit failure. The reserve account assures there is a ready supply of credits to achieve the mitigation standard of no net loss of habitat in the face of random, unforeseen events.

Reserve account credits will be included in the statewide registry. The service area will also be noted. Transferring credits from the reserve account to replace credits lost due to unforeseen circumstances must be approved by MSGOT. The Program will revisit the predicted and actual rate of project failure as part of regular adaptive management reviews. MSGOT may adjust the reserve account contribution requirement or adopt other tools for managing uncertainty and risk, pending the outcome of periodic reviews.

Landscape Scale Multiplier to Incentivize Avoidance of Sage Grouse Habitat Altogether: The landscape scale factor incentivizes project developers to site new projects outside of designated sage grouse habitats altogether. Sage grouse are sensitive to habitat loss and fragmentation. Site fidelity is very high, so sage grouse are poor pioneers of new areas. Once fragmented or lost, sagebrush habitat is not only difficult to restore, but restoration also takes a very long time.

Avoiding all new development would take Montana a long way towards achieving the Conservation Strategy goal of maintaining habitat and populations to that a listing under federal law is never warranted. However, prohibiting all new development and economic activity in designated habitats is not practical.

Montana's overall conservation strategy is premised on a Core Areas approach where the areas determined to have the highest habitat values and most robust populations of sage grouse are prioritized.[47] Montana's designated Core Areas support about 75% of the breeding males, and the Core Areas receive the highest priority for conservation and the closest scrutiny for newly-proposed development. Executive Order 12-2015 discourages new land uses in Core Areas and states they should be avoided altogether when possible.[48] It further guides that Montana will observe the mitigation hierarchy.

Montana's designated General Habitat and Connectivity areas are only provide important habitat, they also are important for long term population persistence and provide stepping stones for dispersal and connectivity between Core Area populations. Executive Order 12-2015 provides that application of the mitigation hierarchy in general habitat should occur "under less rigorous standards to be developed by MSGOT."[49] MSGOT is to develop incentives to encourage new land uses in general habitat to minimize impacts to populations and habitats.[50]

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[47] MCA §§ 76-22-101 *et seq*. (2017) (especially definitions of core area, general habitat, and connectivity area).
[48] Executive Order 12-2015, Attachment A, paragraph 21, page 5.
[49] Executive Order 12-2015, Attachment A, paragraph 21, page 5.
[50] Executive Order 12-2015, Attachment A, paragraph 8, page 3.

To further incentivize avoidance and minimization of impacts to Core Areas, General Habitats, and the Connectivity area, for newly-proposed activities, the number of required credits will be adjusted as follows:

- Core or PHMA Areas: 10% of the total Raw HQT Score (direct footprint plus indirect impacts);

- General Habitat or GHMA Areas: 5% of the total Raw HQT Score (direct footprint plus indirect impacts); or

- Connectivity Area: 5% of the total Raw HQT Score (direct footprint plus indirect impacts).

There will no adjustment for newly-proposed activities in RHMA areas. The mitigation emphasis here is restoration of habitats already impacted, with the goal to sustain residual populations.

<u>Site-Specific Multipliers to Incentivize Consistency with Executive Order 12-2015 or Federal Land Use Plans</u>: The site-specific multiplier incentivizes developers to implement their projects consistent with EO 12-2015, particularly the stipulations in Attachment D, if the project must be located within habitats designated by the state or federal land management agencies.

The stipulations themselves are based on the best available science and grew out of the recommendations of a diverse stakeholder advisory council.[51] Deviations from the stipulations are understood to be detrimental to sage grouse and habitats in the immediate area of the project at the minimum, but detrimental impacts also occur indirectly.

Stipulations include limitations on surface disturbance, surface occupancy, noise, time-of-day, and seasonal use, as well as siting and design requirements for specific project and types of surface disturbance types. Among all the stipulations, limitations on the total surface disturbance within four miles of active leks, the no-surface-occupancy buffer requirement near active leks, seasonal restrictions within two miles of active leks during the breeding, nesting, and early-brood rearing season are particularly critical to meeting the State's conservation goals according to the scientific literature.

To incentivize consistency with the EO stipulations or federal land use plans, developers will be required to obtain additional credits for each deviation from the EO stipulations or federal plans, for each deviating project feature, and for as long as the project feature deviates from EO 12-2015.[52]

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[51] Some council members submitted minority reports for some stipulations because they believed the best available science supported more stringent stipulations.

[52] The Program will review individual projects to ensure that use of this multiplier does not unintentionally disincentivize co-location of impacts. For example, an exemption from the Core Area stipulation multiplier may be provided if an impact occurs in an area where disturbance has already exceeded 5%, or where co-location with existing impacts is used to minimize impacts to sage grouse. The Program may waive the stipulations adjustment where needed to accommodate this kind of situation. Note that federal land managers may not be able to provide permits to projects that do not meet PHMA or GHMA stipulations, regardless of compensatory mitigation.

Here, the intent is to further incentivize locating projects in areas of existing disturbance, which is like Wyoming's approach.[53]

- **In Core or PHMA Areas:**
  - *Project is within existing surface disturbance*: If the project footprint is located within existing surface disturbance, 10% of the Raw HQT Score attributed to functional acres lost due to indirect impacts only and for only the construction and operations phases of the project. This incentivizes locating projects on top of existing disturbance.
  - *Project causes new surface disturbance*: If the project is located outside of existing surface disturbance and causes *new* surface disturbance, 10% of the Raw HQT Score (direct footprint plus indirect impacts) and only for the construction and operations phases of the project. This further incentivizes locating projects on top of existing disturbance (or avoiding undisturbed areas) because the mitigation obligation will be higher when new land uses impact otherwise intact habitats.
- **In General Habitats or GHMA Areas:**
  - *Project is within existing surface disturbance*: If the project footprint is located within existing surface disturbance, 5% of the Raw HQT Score attributed to functional acres lost due to the indirect impacts only and for only the construction and operations phases of the project. This incentivizes locating projects on top of existing disturbance.
  - *Project causes new surface disturbance*: If the project is located outside of existing surface disturbance and causes *new* surface disturbance, 5% of the Raw HQT Score (direct footprint plus indirect impacts) and only for the construction and operations phases of the project. This further incentivizes locating projects on top of existing disturbance (or avoiding undisturbed areas) because the mitigation obligation will be higher when new land uses impact otherwise intact habitats.
- **Connectivity Area:**
  - *Project is within existing surface disturbance*: If the project footprint is located within existing surface disturbance, 5% of the Raw HQT Score attributed to functional acres lost as a result of the indirect impacts only and only for the construction and operations phases of the project. This incentivizes locating projects on top of existing disturbance.
  - *Project causes new surface disturbance*: If the project is located outside of existing surface disturbance and causes *new* surface disturbance, 5% of the Raw HQT Score (direct footprint plus indirect impacts) and only for the construction and operations phases of the project. This further incentivizes locating projects on top of existing disturbance (or avoiding undisturbed areas) because the mitigation obligation will be higher when new land uses impact otherwise intact habitats.
- **RHMA Areas:** no multipliers or additional credits required; emphasis is on restoration.

[53] Executive Order 12-2015 defines surface disturbance as "any conversion of formerly suitable habitat to grasslands, croplands, mining, well pads, roads, or other physical disturbance that renders the habitat unsuitable for grouse." Unsuitable habitat is defined as "land within the historic range of sage grouse that did not, does not, nor will not provide sage grouse habitat due to natural ecological conditions such as badlands or canyons."

No Net Loss at a Minimum Required, Net Conservation Gain (or Benefit) Preferred: As noted previously, the State of Montana's Conservation Strategy seeks to maintain viable sage grouse populations and conserve habitat so that sage grouse never warrant a listing or designation as a candidate species under the federal Endangered Species Act. To that end, mitigation avoids, reduces and/or eliminates current and future threats through preservation, restoration, and enhancement conservation crediting actions that will be sufficient to offset habitat loss and fragmentation due to development.

Consistent with that, Montana's required minimum standard for mitigation is "no net loss" so that the habitat quantity and quality currently available is maintained through time via timely, effective mitigation. Mitigation assures that new activities do not contribute to habitat loss or fragmentation and declines in sage grouse populations. No net loss assures there is no net loss of functional habitat at any given time and within any given service area.

Developers will be required to show that there is no let loss of functional habitat and that credits obtained will at least offset the debits created by a project.[54] The state will not implement an explicit additional multiplier for net conservation gain.

Should federal authorization be required, projects developers may be required to meet a net conservation gain (or benefit) standard by the federal land management agency. Under these circumstances, the net conservation gain standard would be calculated to be 10% of the Raw HQT Score (direct plus indirect effects) or as determined on a case-by-case by federal agencies.

While preferred for all development projects, net conservation gain will be voluntary on the part of project developers who require state permits. Through incorporation of other adjustments to the total number of credits required to fulfill a mitigation obligation and particularly the reserve account, Montana is confident that a standard of no net loss will at least maintain current habitat quantity and quality, in part, because of the landscape and site-specific multipliers.

Advance Payment: The Stewardship Act allows direct payments to Stewardship Account if sufficient credits are not available for purchase.[55] While offering flexibility to the developer, advance payments transfer the responsibility to secure adequate compensatory mitigation to the State, the Program and/or federal agencies. Advance payments are based on the average cost of credits that would otherwise be required.[56]

The option of making an advance payment can improve certainty for project developers by ensuring that mitigation requirements can be met and development projects can move forward immediately, once reviewed and approved, regardless of credit availability.

However, advance payments create significant uncertainty for the State, the Program, and federal agencies about when and how functional acres lost will actually be mitigated. A time lag-effect could result in impacts to habitat in advance of mitigation actions and cause temporal habitat losses that are not presently offset by a specific credit project. There is the potential to violate a universal principle of mitigation that mitigation offsets are in place before impacts occur (i.e. durability and timeliness).

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[54] This means that impacts caused by a project are balanced or outweighed by measures taken to avoid and minimize the project's impacts and compensate for any residual impacts so that no loss remains.
[55] MCA § 76-22-111(1)(b)(ii) (2017).
[56] MCA § 76-22-111(1)(b)(ii) (2017).

Developers who elect to make advanced payments to the Stewardship Account instead of utilizing some other mitigation mechanism will be required to obtain additional credits equivalent to 10% of the Raw HQT Score (direct footprint plus and indirect impacts). This is intended to incentivize developers to secure effective mitigation *prior to* implementing a debit project (observe the principle of durability) and to compensate for the temporal lag between development impact and mitigation benefit.

Once financial contributions are deposited to the Stewardship Account, MSGOT will endeavor to award Stewardship grants to expend advance payments within three years of receipt. Advance payment funds will also be spent within the same service area of the impact, as would ordinarily be required if project developers were obtaining their own credits.

<u>Summary</u>: Table 3.2 summarizes policy modifiers that adjust the total number of debits created by a project and thus the total number of credits required. It's important to note that the policy modifiers have an objective, consistent, and scaled proportional effect on the total mitigation obligation because they are applied to the Raw HQT Score. Most project developers are expected to have the ability to affect the Raw HQT Score through strategic planning.

For example, Raw HQT Scores will be lower where the pre-project underlying functional habitat values are lower, such as in General Habitat vs. Core Areas or siting a project on top of existing disturbance where there is already other development. Therefore, the total number of credits required *after* applying the multipliers to the Raw HQT Score will also be scaled and proportionally lower for locations with low functional habitat values. See the development project examples in the *HQT Technical Manual* comparing Raw HQT scores for the exact same project located in a Core Area vs. General Habitat.

3.3.2 Modified Approach to Mitigation Requirements for New Oil and Gas Development in the Cedar Creek Core Area and Elk Basin within the Carbon County Core Area

Montana has previously recognized that the Cedar Creek Core Area (Fallon County) and the Elk Basin area within the Carbon County Core Area had levels of oil and gas development that already exceeded the surface disturbance and well density thresholds set forth in EO 12-2015 (Figure 3.4).[57] The Cedar Creek Core Area includes delineated oil and gas fields covering multiple producing formations, federal exploratory units, enhanced oil recovery units, shallow natural gas production, and a federally-approved natural gas storage unit. The Elk Basin area includes a delineated field with multiple producing horizons, federal- and state-recognized enhanced recovery units, and a federally-approved gas storage unit.

Accordingly, it was recognized that any new development in these two areas could not be consistent with EO 12-2015. Unlike Wyoming, Montana did not carve out known areas having significant levels of oil and gas development from larger Core Area blocks. Instead, Montana opted to provide for flexibility to address these limited circumstances through EO implementation and MSGOT discretion.[58]

[57] Montana Greater Sage-grouse Habitat Conservation Advisory Council. 2014. Greater Sage-grouse Habitat Conservation Strategy, January 29, 2014.

[58] Executive Order 12-2015 provides the option for project developers to petition MSGOT to create their own conservation plan and accompanying mitigation approach in areas already having significant surface disturbance exceeding thresholds in EO 12-2015 and where it will very difficult, if not impossible, to be consistent with EO 12-2015 stipulations. See Executive Order 12-2015 Attachment A, Attachment E starting on 22.

Table 3.2. Summary of Policy Signal Multipliers for development projects to incentivize voluntary conservation and consistency with Executive Order 12-2015.[59]

Policy Signal Multiplier	Core Areas or PHMA	General Habitat, GHMA, Connectivity Area
Reserve Account, all development projects	15% of total Raw HQT Score (direct + indirect)	15% of total Raw HQT Score (direct + indirect)
Landscape Multiplier, all development projects	10% of total Raw HQT Score (direct + indirect)	5% of total Raw HQT Score (direct + indirect)
Site-Specific EO Consistency Multiplier: • applied for each deviation and for as long as the deviation exists (i.e. construction only or construction/ operations phases) • varies depending on whether or not project causes new surface disturbance	• if project on existing disturbance: 10% of Raw HQT Score attributed to indirect impacts only • if project causes new surface disturbance (i.e. not located on existing disturbance), 10% of total Raw HQT Score (direct + indirect)	• if project on existing disturbance: 5% of Raw HQT Score attributed to indirect impacts only • if project causes new surface disturbance (i.e. not located on existing disturbance), 5% of total Raw HQT Score (direct + indirect)
No Net Loss, Net Gain Preferred	• N/A for state authorizations; • a showing of net gain is required for projects seeking federal authorizations (flexibility to add a fixed 10% or determine on a case-by-case basis	• N/A for state authorizations; • a showing of net gain is required for projects seeking federal authorizations (flexibility to add a fixed 10% or determine on a case-by-case basis 10% possible for federal authorizations
Advance Payment, if applicable	10% of total Raw HQT Score (direct + indirect)	10% of total Raw HQT Score (direct + indirect)

[59] *See* Section 3.3.2 for a modified approach to mitigation requirements for new oil and gas development in the Cedar Creek Core Area and Elk Basin within the Carbon County Core Area.

The BLM similarly recognized that these two areas had a high level of existing oil and gas activity and that future development was highly likely. BLM classified the Cedar Creek Core Area and Elk Basin within the Carbon County Core Area as RHMAs (Restoration Habitat Management Areas). In these areas, BLM seeks to balance ongoing uses and future development with maintaining enough quality habitat to support a residual population of sage grouse. Habitat restoration is prioritized.

Objectives are to: (1) strive for an area-wide restoration plan created by developers working together rather than smaller project- and site-specific plans; (2) strive for no net loss of existing habitat; and (3) strive for restoration of previously disturbed landscapes to increase or improve habitat quantity and quality to achieve a long-term reduction in surface disturbance.

Local, residual populations of sage grouse still exist in these two areas. These areas still provide habitat and connect with General Habitat and/or other Core Areas within Montana and elsewhere. Specifically, the Cedar Creek Core Area provides important connectivity to sage grouse in North Dakota. The Elk Basin area is situated between two Wyoming Core Areas that extend to the Wyoming-Montana border. Because of the existing development, new oil and gas development cannot be undertaken in either the Cedar Creek Core Area or the Elk Basin consistent with EO 12-2015. Therefore, a modified approach to mitigation is warranted.

The modified approach to mitigation in these two areas will emphasize avoidance, minimization, short term reclamation efforts, and long-term restoration (similar to BLM). The goal is to reduce surface disturbance over the long-term and maintain a residual sage grouse population that will re-occupy habitats as they are restored.

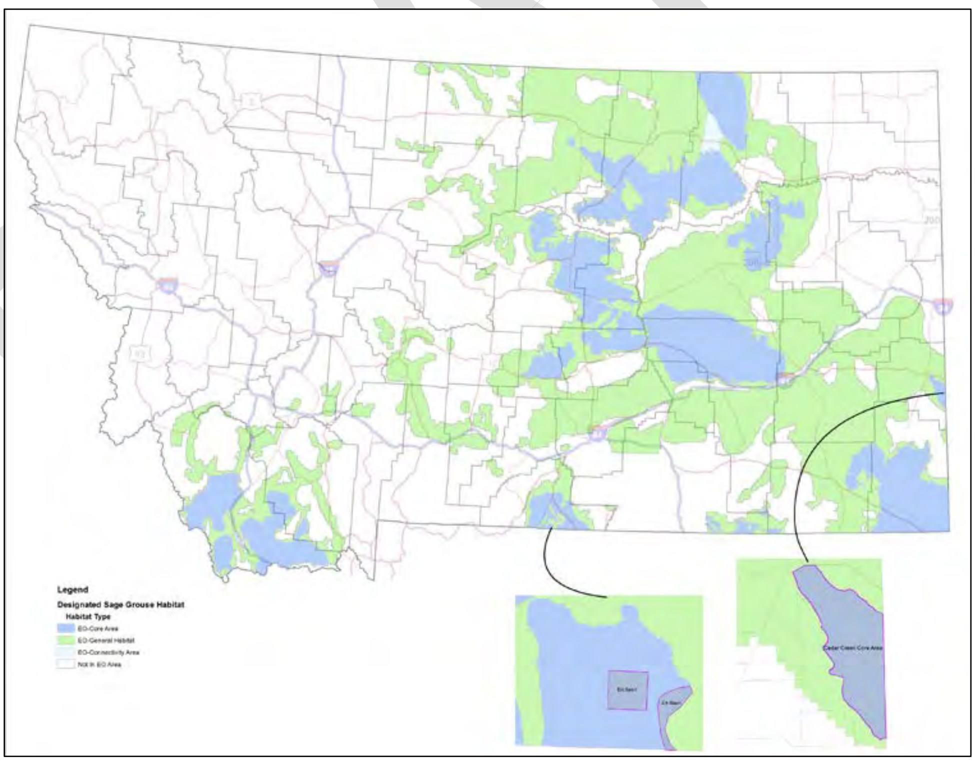

Figure 3.4. Location of the Cedar Creek Core Area (right inset) and Elk Basin (left inset) within the Carbon County Core Area where the modified approach to the mitigation hierarchy requirements for new oil and gas development will be applied.

Consistent with Wyoming, this modified approach will incentivize location of new oil and gas wells within the boundaries of existing disturbance and emphasize restoration, as follows:

For new oil and gas wells when the drilling site and all the associated disturbance features (e.g. access road, well pad, etc.) will occur on existing surface disturbance:

- The operator will provide a plan of development that will outline avoidance and minimization efforts, in addition to robust site reclamation after drilling is complete, consistent with existing state or federal requirements. Additionally, the plan should also include measures for undertaking commensurate restoration actions within the Cedar Creek Core Area or Elk Basin of the Carbon County Core Area, respectively. Examples include removal of anthropogenic features like old fences, abandoned structures that provide subsidies for avian or terrestrial predators, reseeding of abandon fields, enhanced noxious weed control, or removal and reclamation of roads. Collaboration with other operators and BLM will be encouraged, consistent with the "all lands, all hands" approach.
- Operators are expected to avoid the 0.6 mile no-surface occupancy areas around active leks.
- Operators are expected to avoid drilling new wells within two miles of active leks between March 15 and July 15 during the nesting, breeding, and early brood-rearing seasons.
- Operators are expected to avoid discretionary maintenance and production activities between 4:00 a.m. – 8:00 a.m. and 7:00 p.m. – 10:00 p.m. from March 15 and July 15 within two miles of active leks.
- The HQT will not be used to calculate functional acres lost. Compensatory mitigation will not be required. Instead, implementation of the hierarchy will emphasize restoration within the respective Core Areas.

For new oil and gas wells and the associated disturbance features (e.g. access road, well pad, etc.) proposed on sites that are <u>not</u> presently disturbed and would cause *new* surface disturbance:

- The operator will provide a plan of development that will outline avoidance and minimization efforts, in addition to robust site reclamation after drilling is complete, consistent with existing state or federal requirements.
- The HQT will be used to calculate functional acres lost due the direct footprint and indirect impacts for the drilling and operations phases of the project.
- Compensatory mitigation will be required and the total mitigation obligation will be the sum of the following:
    - Raw HQT Score (direct and indirect impacts)
    - 10% landscape multiplier applied to the Raw HQT Score
    - 15% reserve account multiplier applied to the Raw HQT Score
    - 10% site-specific multiplier for deviations from two specific EO 12-2015 stipulations:[60]
        - the 0.6 mile no-surface-occupancy buffer area around active leks; and
        - the seasonal timing restriction within two miles of active sage grouse leks during the breeding, nesting, and early brood-rearing seasons from March 15 to July 15.
- Operators will be encouraged to fulfill compensatory mitigation requirements through restoration actions within the Cedar Creek or Carbon County core areas, respectively. Examples include removal of anthropogenic features like old fences, abandoned structures that provide subsidies for avian or terrestrial predators, reseeding of abandon fields, and

[60] All other site-specific multipliers for deviations from EO 12-2015 are waived (e.g. > 5% DDCT, > 1 well/640 acres).

removal or reclamation of roads. Collaboration with other operators and BLM will be encouraged, consistent with the "all lands, all hands" approach.

Raw HQT Scores are already relatively low in the Cedar Creek Core Area and Elk Basin area within the Carbon Core Area due to a long history of oil and gas production and associated development. While compensatory mitigation obligations will be low, fulfilling them through affirmative restoration actions within these two areas will help decrease surface disturbance over the long-term. Further, this approach provides certainty and a streamlined process for individual operators and the oil and gas industry as a whole.

3.4 Four Montana Service Areas and Off-Site Preference

Service areas define the area within which an impact at a given location must be mitigated to ensure species-specific habitat needs are met. The geographic scale at which impacts are offset by mitigation has ecological relevance to sage grouse conservation at the landscape scale within Montana and regionally. Concurrent consideration should also be given to local scales to ensure that mitigation is spatially relevant and effective for locally-impacted leks and sub-populations.

At the landscape scale, there are four service areas in the Montana Mitigation System (Figure 3.5 and described in Appendix 7.3): North Central, Central, Southeastern, and Southwestern. Service area delineations are based on a combination of geographic boundaries, physiographic barriers, and studies of genetic connectivity and relatedness.[61],[62]

There is a clear, expressed preference and expectation that project developers obtain credits or implement permittee-responsible mitigation within the same service area. Upon the request of a project developer, MSGOT has discretion to approve use of credits from adjacent Montana service areas. For example, MSGOT could approve the following adjacent service areas:

- Impacts in the Southeastern Service Area could be offset by credits obtained in the Central Service Area.
- Impacts in the North Central Service Area could be offset by credits obtained in the Central Service Area.

However, MSGOT will more closely scrutinize situations where project developers seek to obtain credits in service areas that are not adjacent to the service area in which the impact occurs. For example, the Southeastern Service Area is not adjacent to either the North Central or the Southwestern service areas. A showing of a greater benefit to the species must be demonstrated by the project developer. MSGOT will make the final decision.

At any time when sufficient credits are not available within the same service area, the Program, with MSGOT's approval, may allow advance payments into the Stewardship Account. MSGOT and the Program will make all efforts to award Stewardship Grants that will create credits within the same service area as the impact. Additionally, MSGOT and the Program will strive to expend those funds within three years of receipt.

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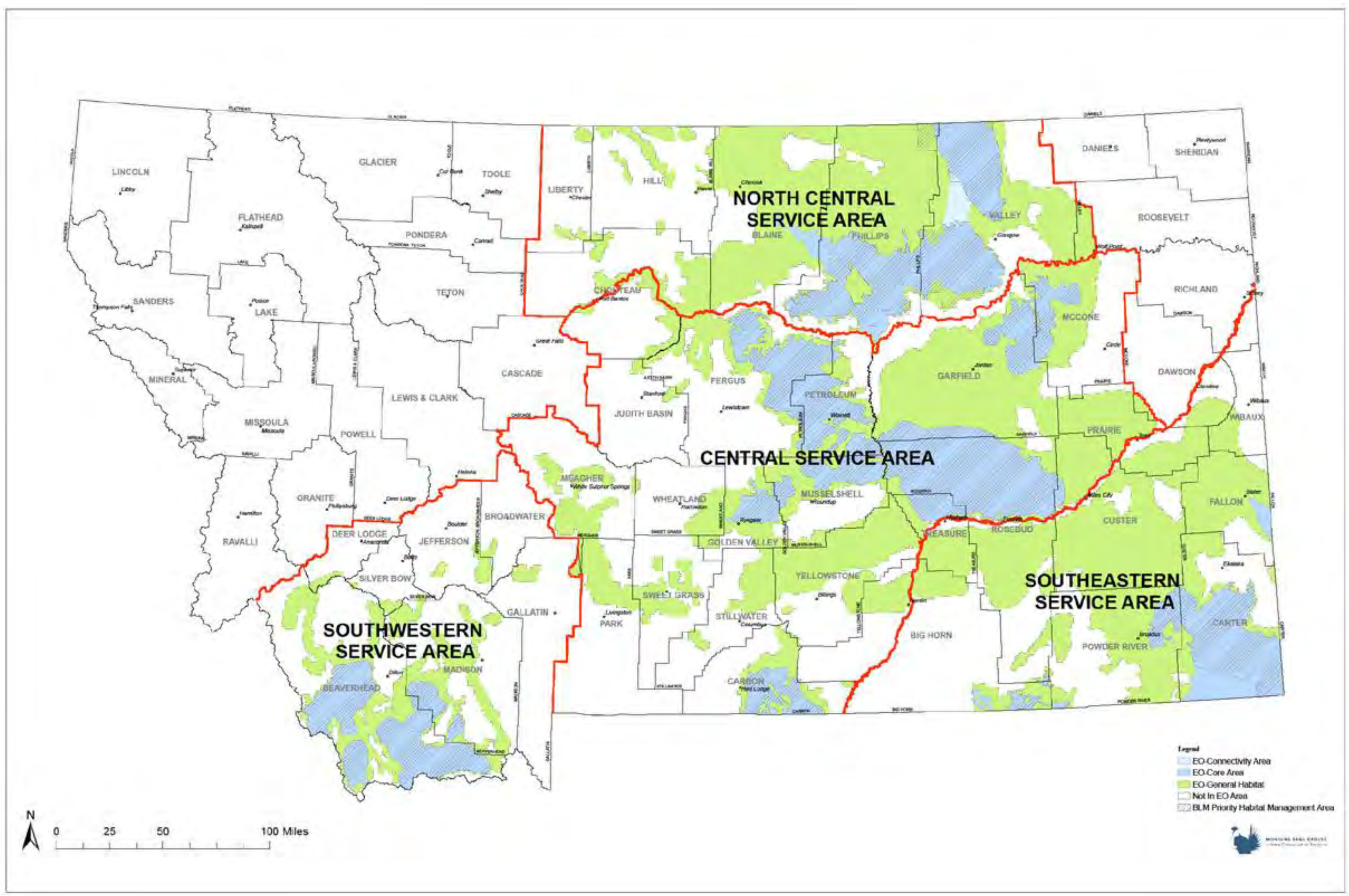
[61] Cross, T.B., D.E. Naugle, J.C. Carlson, and M.K. Swartz. 2016. Hierarchical population structure in greater sage-grouse provides insight into management boundary delineation. Conservation Genetics, v 17, no. 6, p 1417-1433. [Also available at https://doi.org/10.1007/s10592-016-0872-z].

[62] Cross, T.B., Naugle, D.E., Carlson, J.C., and Schwartz, M.K., 2017, Genetic recapture identifies long-distance breeding dispersal in greater sage-grouse (*Centrocercus urophasianus*): The Condor, v. 119, no. 1, p. 155–166. [Also available at https://doi.org/10.1650/CONDOR-16-178.1].

Figure 3.5. The Montana Mitigation System has four Montana Service Areas. See Appendix 7.3 for a narrative description of the boundaries.



At the site-specific scale, mitigation must also be ecologically relevant to be effective and timely. As a default, compensatory mitigation is preferred on sites that are not part of the site impacted by the development action (i.e., *off-site*) or within the zone of influence of the development project. This avoids the potential that mitigation efforts would be negated or overwhelmed by ongoing development activity. Off-site mitigation locations should also be large enough to support high-quality sage grouse habitat or be adjacent to large blocks of habitat given that sage grouse are a land-scape scale species.

Compensatory mitigation *on-site* (i.e., proximate to impacts) may be considered when habitat at the proposed compensatory mitigation site is identified as a priority area for protection or restoration/enhancement and the area proposed for a compensatory mitigation project will not be negatively affected by the development project impact. MSGOT will make the final decision.

3.5 Duration and In-Kind Definition

As described in Section 2, compensatory mitigation for impacts to sage grouse habitat must be durable – that is, the period of time that mitigation is effective must be equal or greater in duration to the impacts being offset.

Permanent credits are preferred, and are acceptable for offsetting impacts of any duration. Term credits may be used where development projects have a known fixed duration or term (e.g. permit duration). If a development project is renewed through a permit amendment and the nature and extent of the project changes, new mitigation obligations will be calculated using the HQT and the policy modifiers, as applicable.

For impacts lasting less than 15 years, the minimum acceptable duration of term credit projects is 15 years, to ensure that habitat benefits provided are actually meeting the needs of sage grouse, given site fidelity and other unique habitat needs of the species. All impacts lasting longer than 15 years can be offset by one static credit contract that is equal to (or greater than) the debit (e.g., a 35-year debit could be offset by a 35-year credit contract), or using dynamic credits (credits purchased in sequence over time to offset a longer-term impact, limited to minimum 30-year renewable term contracts.

Projects that have permanent impacts (and thus debits) will require permanent credits. However, the State's approach to demonstrating durability will allow dynamic permanent mitigation projects to offset up to 25% of permanent impacts at the individual Service Area level. This incorporates a degree of flexibility that allows developers to fulfill 25% of a total permanent credit requirement with sequential credits projects. The remaining 75% of the permanent credit requirement must be fulfilled using permanent credits. Use of dynamic mitigation will require MSGOT approval.

Dynamic permanent mitigation projects may be created by renewable term contracts of no less than 30 years, with an obligation in contract or permit to replace expired credits through the term of the impact. This approach creates more opportunities for the Program to respond to emerging threats and target mitigation actions to the areas in which they can be most effective, while ensuring that credit projects remain long enough in duration to provide expected benefits to the species.

Project developers using dynamic permanent credits will be responsible for demonstrating durability for the life of the impact by purchasing or creating additional credits as needed and having them in place and approved by the time term credits expire. The use of dynamic permanent mitigation will be evaluated through the adaptive management process and may need to be adapted in the future to ensure mitigation goals are being met, as new science emerges, and as local limiting factors for sage grouse become better understood.

In-kind mitigation is the replacement or substitution of resources or values that are of the same type and kind as those replaced. To be considered in-kind, crediting actions must be for the same species (Greater Sage-grouse), and evaluated using the Montana HQT. Replacement of seasonal habitat types is not specifically required (but can be considered and discussed between the developer, the Program, and a potential credit provider), because the function of different seasonal habitat types is assessed and combined within the HQT. A case-by-case approach will be taken.

3.6 Purchasing or Creating Credits

Based on the total credit requirement, project developers will identify the intended path and timeline for purchasing or creating credits or making a financial contribution to the Stewardship Account. A very simple mitigation plan could indicate a plan for credit purchase or payment to the Stewardship Account. Alternatively, or a more detailed plan may be needed for larger, more complicated projects having the potential for greater impacts, permittee-responsible creation of credits, including all associated credit-side requirements outlined in Section 2. The mitigation plan may also be developed for and incorporated within an environmental analysis document.[63]

The Program notifies state and/or federal permitting agencies and the project developer when a compensatory mitigation plan has been approved by MSGOT, after the Program has worked with the developer and preliminarily concluded that the plan meets the requirements outlined in this *Policy Guidance* document and other State policies, rules or law. The Program may also brief and request guidance from MSGOT while developing more complex mitigation plans. The project developer must then purchase or create the needed credits within the designated timeframe, usually prior to habitat impacts. Proposed projects may also be subject to other agency-specific permitting requirements.

Once project developers have secured credits, the Program should be provided with documentation to show the credit location, duration, and any other information required to update the credit registry. The price of credits secured from independent third parties (where Stewardship Account funds are not involved) need not be disclosed.

The Program or its designee will maintain a registry to track debiting (development) and crediting actions affecting sage grouse habitat, including all permittee-responsible and other mechanisms of compensatory mitigation projects. The Program and/or interagency review team may also be able resources.

Credits must be released before they are available to offset an impact, although some credits may be released in advance of a project being fully implemented, as described in Section 2.3.3.

3.7 Enforcement

Permitting agencies, in conjunction with MSGOT, are responsible for enforcing the mitigation obligations associated with debiting projects consistent with applicable law and regulations. If the debit project developer fails to comply with mitigation obligations, permitting agencies may,

[63] Federal agencies conduct environmental analyses pursuant to the National Environmental Policy Act. State agencies conduct environmental analyses pursuant to the Montana Environmental Policy Act. Both statutes allow for environmental assessments or environmental impact statements.

consistent with applicable law and regulations, suspend or terminate permit authorization. Additional information is available in agency-specific policy and guidance. Section 3.4 further describes how mitigation obligations are monitored through time.

3.8 Implementation, Verification and Tracking

The mitigation plan, once approved by the Program, MSGOT, and/or a federal agency, are not subject to change. The approved plan should be implemented.

It is possible that a project's activity or actual impact deviates from the activities that were planned, proposed, and approved in the mitigation plan documents and related permits. The project developer is responsible for notifying the Program of any changes in proposed activities or impacts, or of the completion of implementation or any phase of implementation (e.g., moving from a construction to operation or remediation phase) as soon as possible. The project developer is also responsible for providing the Program with any information needed to review and revise the mitigation plan accordingly. The new information must be timely provided to the Program in writing, within 45 days of a change in activities or outcomes. The project developer is encouraged to propose remedies and solutions.

In some cases, changes to a project would require a permit modification or amendment. Project developers initiate the permit modification or amendment process with the responsible permitting or authorization agency. Depending on the type of project or magnitude of change, impacts could be reassessed using the HQT. This decision would be made in collaboration with the state or federal permitting agency and the project developer.

The credit need defined and agreed to in the originally-approved mitigation plan (and any agreed-upon mitigation plan modifications) may not be later altered to reflect results of a new or more recent HQT version, unless the change is agreed to by the Program, the project developer, and all permitting agencies as a needed correction because either the project or the impacts have significantly changed. Similarly, the Program may not unilaterally change the credit requirement or require additional credit purchase as long as the debiting project is executed as originally approved, even if the *HQT Technical Manual* or this *Policy Guidance* is changed in the intervening time period.[64]

Purchase of credits from the Stewardship Account, as well as from approved private conservation banks, habitat exchanges, or in-lieu fee entities involves a transfer of credit responsibility from the debit project developer. Once credits are purchased, the project developer cannot then be held liable for the failure of any associated credit projects. Responsibility for the results of credit projects, and tools for managing that uncertainty, are described in Section 2.4.

Responsibility for the results of permittee-responsible mitigation remains with the project developer, unless it is contractually transferred to a third party responsible for implementing the project. Permittee-responsible mitigation projects must meet the standards and requirements outlined in Section 2 for all crediting projects, including ongoing protection, stewardship, monitoring, and verification.

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[64] This circumstance could arise for larger, more complicated projects with longer permitting timeframes, for example, when an environmental impact statement is required.

Credits created and purchased will be reported to and tracked in the statewide registry by the Program or a designee. The credit registry will be updated to ensure that, once used, they cannot be resold.

4. ADMINISTRATION AND ADAPTIVE MANAGEMENT

The Stewardship Act and EO 12-2015 outline duties and authorities of MSGOT and the Program. Within the broader Montana Mitigation System, participant responsibilities are summarized below.

4.1 Participant Responsibilities

This section provides additional detail on the specific responsibilities of participants in mitigation credit creation, purchase, and administration.

Montana Sage Grouse Habitat Conservation Program (Program) – or designee:

- Implementation and adaptive management of this *Policy Guidance* document, the *HQT Technical Manual*, website, and associated products;
- Creation and maintenance of the HQT and ensuring public access to the tool and its underlying data;
- Consult with and provide guidance to other state agencies and permitting agencies on how to meet state policy requirements related to sage grouse mitigation;
- Provide guidance to credit providers in planning and proposing mitigation projects;
- Provide guidance to project developers in meeting avoidance, minimization, reclamation, and compensatory mitigation requirements;
- Either run the HQT with information provided by credit providers and debit project developers to estimate habitat function gained or lost by individual proposed projects, or make it available to the public to run either on the Program's website as a centralized function and location or assure it is available on the website of that of any third-party administrators;
- Convene an interagency review team, as needed, to coordinate review of proposed debiting or crediting projects;
- Receive and disburse funds from the Stewardship Account in accordance with MSGOT authorizations;
- Develop and maintain a statewide credit registry, and register and track approved credits that are created, bought, sold, and used in the state;
- Track reserve account credits and approve release to replace failed credits as needed and as described in Section 2.4;
- Analyze and communicate program outcomes to MSGOT and the interested public; and
- Implement adaptive management outlined in Section 4.4 below.

Montana Sage Grouse Oversight Team (MSGOT):

- Provide oversight and direction to the Program in executing mitigation responsibilities;
- Evaluate and approve funding of grant applications for funding from the Stewardship Account;
- Review and approve mitigation credit projects and associated documentation;
- Review and approve debit project mitigation plans;
- Review and approve the results of credit project monitoring, reporting, and verification, and credit remediation plans associated with approved projects;
- Review annual reports of statewide mitigation outcomes prepared by the Program based on reports submitted by credit providers and developers;
- Review and approve Program proposals for adaptive management of this *Policy Guidance* and the *HQT Technical Manual*;
- Promulgate or amend administrative rules within authorities provided in the Stewardship Act; and
- Implement adaptive management outlined in Section 4.4 below.

Permitting Agencies:

- Refer project developers of new land uses or activities that may impact sage grouse habitat to the Program for consultation;
- Participate on an interagency review team, as requested by the Program to coordinate additional permit requirements;
- For federal permitting agencies, evaluate and clearly communicate the consistency of proposed debit and credit projects with federal land use plans and policies, and help ensure federal requirements for avoidance, minimization, reclamation, and minimization are met in a consistent, predictable, coordinated, and timely fashion by reviewing and approving mitigation plans and other documents as needed and/or requested;
- Coordinate with the Program in adaptive management of this *Policy Guidance* document and the *HQT Technical Manual*; and
- Issue permits consistent with applicable laws and regulations

Debit Project Developer:

- Notify and consult with the Program in a timely fashion on avoidance, minimization, reclamation, and compensatory mitigation requirements for new land uses and actions that may impact sage grouse habitat and fall within the ambit of Executive Orders 12-2015 and 21-2015 or subsequent orders;
- Work with federal land management agencies when seeking authorizations for newly proposed activities on federal lands;
- Provide geographic and site-level information needed to run the HQT on the Program's website and determine debit amount;
- Conduct voluntary Third Level Assessment to refine HQT results, if desired; see Montana Mitigation System HQT Technical Manual for Greater Sage-Grouse;
- Complete draft and final mitigation plan for review, if required;
- Purchase or produce mitigation credits, if needed, consistent with an approved mitigation plan; and
- Provide documentation to the Program and MSGOT that mitigation credits have been secured, where they are located etc.

Credit Project Provider:

- Propose mitigation crediting projects on a voluntary basis, consulting early in the project planning process with the Program on standards, requirement, and site-appropriate conservation actions;
- Provide geographic and site-level information needed to run the HQT on the Program's website and determine credit availability;
- Conduct mandatory Third Level Assessment to refine HQT results (see the *HQT Technical Manual*);
- Complete draft and final credit project proposals, and provide all needed documentation for final mitigation instrument;
- Execute legal protection and financial assurance requirements, or designate and contract with a third party to do so;
- Complete any short- and long-term management actions outlined in the site plan and needed to meet site-specific performance standards for the agreed project duration, or designate and contract with a third party to do so; and
- Conduct monitoring and provide monitoring reports to the Program as specified in the site plan, and allow access to property for Program or third-party verification as required in the mitigation instrument.

4.2 Pricing of Credits Created by MSGOT through Stewardship Account Grants and Determining the Average Credit Price for Financial Contributions when Sufficient Credits are Not Available

Several provisions of the Stewardship Act affect initiation of Montana's Mitigation System and establishment of the mitigation market place. First, the Stewardship Act provides a funding mechanism to create an initial supply of credits grants from the Stewardship Account grants.[65] MSGOT was authorized to issue grant funds for projects that would create credits prior to the designation of the HQT and adopting administrative rules, but required the HQT to be applied retroactively to any leases or conservation easements to determine how many credits were created as a result of the grant and could be made available to offset debits.[66]

Second, the framers of the Stewardship Act also anticipated that a third party would open a habitat exchange and allowed MSGOT to transfer the credits it created using Stewardship Account funds.[67] Proceeds from the sale of credits transferred to a third-party habitat exchange must be reimbursed back to the Stewardship Account.[68]

Third, the Stewardship also provides that project developers could make a financial contribution to the Stewardship Account "equal to the average cost of the credits that would otherwise be required."[69] The Stewardship Account is then used by MSGOT to create more credits through subsequent granting cycles in a competitive process. All funds MSGOT receives for credits it creates or through contributions must remain in the Stewardship Account.[70]

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[65] MCA §§ 76-22-108(4), 109-110 (2017).
[66] *See* MCA § 76-22-105(3) (2017).
[67] *See* MCA §§ 76-22-103(8), 76-22-105(2) (2017).
[68] MCA 76-22-110(1)(l)(ii) (2017).
[69] MCA § 76-22-111(1)(b)(ii) (2017).
[70] MCA §§ 76-22-109(2)(b), 109(7) (2017).

As of April 2018, no third party has opened or publicly signaled an intention to open a habitat exchange. Similarly, no conservation land banks or private in-lieu entities exist in Montana as of April 2018. Accordingly, there is no track record of credit-debit transactions in the Mitigation System, and no price signals for MSGOT or any other entity who may be interested in administering a habitat exchange or one of the other mitigation mechanisms.

Presently MSGOT is the only entity with credits available.[71] However, a project developer could opt to make a financial contribution to the Stewardship Account to fulfill a mitigation obligation at any time.

Pricing MSGOT's Credits: In the absence of any other source of price signals or history of credit-debit transactions in Montana, MSGOT will have to establish its own method for initially establishing the price of credits it creates through Stewardship Account grants.

MSGOT will take the following approach to pricing credits it creates until there is a third-party habitat exchange administrator to accept MSGOT's transferred credits and/or a track record of transactions develops to better inform a price structure. As the mitigation market gets underway and matures, MSGOT will re-evaluate the methodology.

Perpetual Conservation Easements: For perpetual conservation easements, the cost per credit will be the average of the cost of all perpetual easements funded with Stewardship Account funds divided by the average number of functional acre credits created by all perpetual easements that are available in the market (after adjusting for baseline) based on the neutral, third-party appraisal that determines the fair market value (and cost) of the purchased development rights. By averaging across all easements, MSGOT hopes to avoid weakness associated with looking at only a single appraisal or any unintended influences on the appraisal process itself.

Setting MSGOT's credit price based on an average of all appraisals so early in creation of the market place where there are no price signals offers the following advantages.

- Neutral, unbiased certified appraisers determine the fair market value of the development rights that are purchased through the easement, not MSGOT.
- The market-based dollar value of those purchased development rights are directly connected to the parcel of land that is generating the credits and providing habitat.
- The cost of the easement is directly related to the development risks that are removed by the easement.
- Removing development risks through a conservation easement is the equivalent of removing previously-identified threats like subdivision or agricultural conversion of native rangeland.
- MSGOT avoids setting artificial credit prices and minimizes its role as a "market actor" in the Mitigation System to the extent possible, while still fulfilling its statutory requirements.

Term Leases: For term leases, the cost per credit will be the average of the cost of all term leases funded with Stewardship Account funds divided by the average number of functional acre credits created by all term leases. Obtaining a market appraisal of the development rights that are the subject of the term lease would be prudent and strongly encouraged. In the absence of an appraisal,

[71] MSGOT executed grant agreements on a total of four perpetual conservation easements. One easement has closed and two additional easements are expected to close by the end of 2018.

term credits would be priced the same as credits created from perpetual easements. However, fewer credits would be created overall because the duration is shorter than a perpetual easement.

Restoration and Enhancement: For credits created through restoration or enhancement activities funded with Stewardship Account funds, the cost per credit will be the total cost of the project divided by the number of credits created.

Credits created by MSGOT through Stewardship Account fund grants will be assigned serial numbers and included in the statewide registry. As credits are utilized by project developers for specific projects, the credits will be withdrawn from the pool of available credits and the registry will be updated.

Determining Average Credit Price for Financial Contributions to the Account: MSGOT will follow the same approach to determine the amount of a financial contribution by a project developer when sufficient credits are unavailable. The total number of credits required will have already been determined through application of the *HQT Technical Manual* and this *Policy Guidance*. The cost per credit will be determined using the same methodology, as if MSGOT created the credits using Stewardship Account funds.

Recalibrating Credit Price through Time: In the early stages of creating a mitigation marketplace, there will be uncertainties around supply, demand, and appropriate pricing. As markets mature and more information becomes available, prices will recalibrate through time as the track record of transactions accumulates. For example, the methodology above is based on statewide averages. Through time, an average could be calculated for each of the four service areas.

Pricing methodologies for credits created through Stewardship Account grant awards will be reviewed annually. Every five years, a more substantive evaluation will be made. Implementation of adaptive management principles is further outlined below

4.3 Pricing of Credits Created by Third Parties Other than MSGOT

There is no requirement that credit providers utilize Stewardship Account funds to create credits. In fact, the Mitigation System expressly contemplates that independent third parties would create and market their own credits without utilizing Stewardship Account grant funds—all with a purpose and result to incentivize voluntary conservation. There are many ways this could happen, for example:

- private landowners (or a group of landowners) could work together to create and market a credit site directly to project developers;
- private landowners could work directly with a third-party exchange administrator instead of project developers;
- private landowners could work together to create a conservation land bank;
- project developers could work directly with private landowners to secure a location for permittee-responsible mitigation; or
- on federal lands, project developers could work directly with federal land managers or a third-party exchange administrator to find ways to offset impacts through a combination of purchasing credits and/or direct restoration on federal lands.

In these instances, Stewardship Account funds are not utilized to create credits. There are no obligations to reimburse the Stewardship Account. Credit providers and project developers freely negotiate credit prices. MSGOT is not a party to the transaction.

4.4 Adaptive Management

Adaptive management is a fundamental principle of the Montana Mitigation System. When it comes to conserving GRSG populations, much is known about the species' habitat preferences. However, less is known about how GRSG populations respond to anthropogenic disturbance. For this reason and others, it is necessary that the Montana Mitigation System implements an adaptive management approach to periodically evaluate whether mitigation effectively offsets impacts in space and through time and to assure Montana achieves the standard of no net loss of habitat.

This Section describes a process for transparent, science-based, and inclusive adaptive management of the *Policy Guidance*, *HQT Technical Manual*, and associated products. Adaptive management is fundamental to making sure that the Montana Mitigation System is effectively offsetting impacts in space and through time.

To ensure the sage grouse mitigation program is meeting the goals outlined in Section 1.1 of this document. Within 1 year of the finalization and approval of this *Policy Guidance* document and the *HQT Technical Manual*, or within 1 year of approval of the first mitigation credit, the Program will work with MSGOT and key stakeholders to identify measurable objectives and specific indicators of success or failure.

On an annual basis, the Program will provide MSGOT a brief adaptive management report, assessing whether the program is meeting goals and objectives, including, as a part of fulfilling its other reporting requirements:

- a report of program performance, including a synthesis of monitoring and tracking of pre-project and post-project conditions for both crediting and debiting projects based on its own experience and those of others engaged in the Mitigation System;
- identify any overarching lessons learned;
- a quantification of the total debit impacts and credit project benefits provided by mitigation projects in terms of functional habitat acres;
- a list of recommended changes to the *Policy Guidance* and *HQT Technical Manual* and associated documents, processes, and tools needed to meet (or continue to meet) program goals and objectives; and
- a prioritized list of monitoring and research needs to better guide mitigation efforts, developed in collaboration with MSGOT and stakeholders.

On an annual basis, the MSGOT will review the adaptive management report and assess whether major or minor changes to the approach are needed, and review and consider whether to approve any adaptive management actions recommended by the Program or other stakeholders. MSGOT must provide the public notice of any changes it is contemplating and provide the opportunity for written and oral comment prior to making final decisions.

MSGOT will periodically host an adaptive management meeting, open to the public, to share the results of the adaptive management review, describe suggested changes to the program, processes, or tools, and receive stakeholder feedback. Changes deemed to be necessary or beneficial should be considered for possible adoption at that meeting and released as part of a publicly-available report.

Within five years of finalizing measurable objectives and indicators, the Program and MSGOT will review them and determine whether that would indicate whether significant changes to the mitigation approach are needed. This review would be more thorough and recommendations for changes may emerge out of the review. Because changes at the five-year mark are likely to be more substantive and material, MSGOT will be required to undertake new administrative rulemaking to formally update the *Policy Guidance Document* and the *HQT Technical Manual* to subsequent versions.

Lastly, the Montana Mitigation System will focus on habitat outcomes, as described by the HQT, while monitoring sage grouse populations will remain the purview of MFWP. Periodically, the Program will collaborate with agency partners to evaluate population status and trend over time at localized and landscape scales. Specifically, MSGOT is to observe a performance standard of 6.9 – 18.78 males / active lek, based on the number of displaying males determined by a statistically-valid analysis over a 10 year-period. It is recognized that populations will vary naturally over time and across regions. Consideration of population trends at multiple scales and through time with respect to both conservation habitat efforts and development will enhance Montana's effectiveness with respect to mitigation and achieving our goal to maintain authority to manage sage grouse and its habitat.

5. GLOSSARY

Adaptive Management: A systematic approach for improving natural resource management, with an emphasis on learning from management outcomes and incorporating what is learned into ongoing management.[72]

Additionality: Conservation benefits of a conservation action or measure that improve upon the baseline condition of the impacted species or its habitat in a manner that is demonstrably new and would not have occurred without the prelisting conservation action.[73]

Assessment Area: The geographic area associated with a project's potential impact or credit project's benefit. This defines the boundaries of the calculation of debits or credits in the habitat quantification tool.

Avoidance: Avoiding an impact from a proposed debit project altogether by not taking a certain action or parts of an action.[74]

Baseline: The pre-existing condition of a resource, at all relevant scales, as quantified by application of the HQT.[75] For preservation credit sites, the baseline is set as 70% of the total functional acres protected by the perpetual conservation easement or term lease so that 30% of the functional acres becomes available as credits.

Compensatory Mitigation: Actions that provide compensation for unavoidable adverse residual impacts to species or their habitat[76] through activities that preserve, enhance, restore, and/or establish habitat.

Connectivity Area, State of Montana: An area that provides an important linkage among populations of sage grouse, particularly between core areas or priority populations in adjacent states and across international borders.[77]

Conservation Actions: Actions that preserve, enhance, restore, establish, and/or avoid the likely future loss of sage grouse habitat functionality by reducing or eliminating threats to that habitat.

Core Area, State of Montana: An area that has the highest conservation value for sage grouse and has the greatest number of displaying male sage grouse and associated sage grouse habitat, as presently delineated by Executive Order 21-2015.[78]

Credit: A defined unit of trade representing the accrual or attainment of resource functions or value at a proposed project site.[79]

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[72] U.S. Dep't of Interior, Adaptive Management: The U.S. Department of the Interior Technical Guide, 1 (2007, updated 2009), *available at* http://www.usgs.gov/sdc/doc/DOI-%20Adaptive%20ManagementTechGuide.pdf.
[73] US Fish and Wildlife Service. 2017. Director's Order No. 218: Policy Regarding Voluntary Prelisting Conservation Actions. Section 2.
[74] 40 CFR 1508.20(a).
[75] Bureau of Land Management. 2016. Manual Section 1794: Mitigation.
[76] US Fish and Wildlife Service. 2017. Director's Order No. 218: Policy Regarding Voluntary Prelisting Conservation Actions. Section 2.
[77] MCA § 76-22-103(1) (2017).
[78] MCA § 76-22-103(3) (2017).
[79] MCA § 76-22-103(4) (2017).

Credit Need: The number of credits needed to meet the compensatory mitigation requirements of a debit project, based on direct and indirect impacts assessed by the Montana HQT and any subsequent adjustments through multipliers.

Credit Project: Conservation actions, including enhancement, restoration, creation, or preservation taken by an entity on a mitigation credit project site.

Credit Provider: An entity generating credits as mitigation for impacts to sage grouse habitat.

Debit: A defined unit of trade representing the loss of resource functions or value at an impact or project site. The unit of measure is the same as that for a credit within a specific mitigation system.[80]

Debit Project: A development action proposed in sage grouse habitat that requires state or federal agency review, approval, or authorization and is required to avoid, minimize, reclaim, and/or compensate for impacts to sage grouse habitat.

Direct Impact: Effects that are caused by a development activity. Direct effects are the footprint of a project and usually occur from construction or operation activities, or project infrastructure.

Durability: The maintenance of the effectiveness of a mitigation measure and/or a compensatory mitigation site for the duration of the impacts from the associated development or land use, including resource, administrative, and financial considerations.[81]

Dynamic Permanent Mitigation: Mitigation achieved by the use of credits produced in a series of term agreements, such that the quantity and quality of the mitigation is permanent in duration.

Enhancement: An increase or improvement in quality, value, or extent (of a resource) that has been degraded or could be managed to increase the value of that habitat over its current value.[82]

Establishment: Introduction or re-introduction of a resource at a site.[83]

Exempt Use: Land uses and landowner activities identified in Executive Order 12-2015 Attachment F as exempt from compliance with state mitigation requirements. In some cases, MSGOT has granted exemptions which are not reflected in Attachment F. See Appendix 7.3 and consult with the Program or the respective federal land management agency.

Financial Assurance: A financial instrument, including but not limited to an endowment, bond, contingency fund, insurance policy, or other type of suitable guarantee, that helps ensure that mitigation projects are completed according to plan, that resources are available to correct or replace unsuccessful projects, and that long-term stewardship funds are available for the life of the project.

Financial Management Plan: Prepared for each mitigation project and includes initial costs (acquisition, field surveys, habitat restoration, capital equipment, etc.), on-going annual costs (monitoring, maintenance, management, reporting, contingency allocation, etc.), and required amount of financial assurances, accounting for inflation and investment strategy.

Functional Acre: The single unit of value that expresses the assessment of quantity (acreage) and quality (function) of habitat or projected habitat through the quantification of a set of local and landscape

[80] MCA § 76-22-103(5) (2017).
[81] Bureau of Land Management. 2016. Manual Section 1794: Mitigation.
[82] Bureau of Land Management. 2016. Manual Section 1794: Mitigation.
[83] Bureau of Land Management. 2016. Manual Section 1794: Mitigation.

conditions. A functional acre is the metric for outputs from the habitat quantification tool and forms the basis for quantifying, expressing, and exchanging credits and debits. One functional acre is equivalent to one credit or debit in the mitigation marketplace, respectively.

General Habitat, State of Montana: An area providing habitat for sage grouse but not identified as a core area or connectivity area.[84]

General Habitat, BLM and US Forest Service (GHMA): BLM or USFS-administered sage grouse habitat that is occupied seasonally or year-round and is outside of PHMAs, where some special management would apply to sustain sage grouse populations. The boundaries and management strategies for GHMAs are derived from and generally follow the preliminary general habitat (PGH) boundaries.

Habitat Exchange: A market-based system that facilitates the exchange of credits and debits between interested parties.[85]

Habitat Function: The degree of effectiveness of a sage grouse habitat component to provide services for sage grouse use and survival. The HQT measure increase or decrease in habitat function to quantify management or debit project impacts to habitat.

Habitat Quantification Tool (HQT): The scientific method used to evaluate vegetation and environmental conditions related to the quality and quantity of sage grouse habitat and to quantify and calculate the value of credits and debits.[86]

In-Kind Mitigation: Designed to replace lost resources with identical or very similar resources (i.e., sage grouse habitat).

Indirect Impacts: Effects that are caused by or will ultimately result from a development activity. Indirect effects usually occur later in time or are removed in distance compared to direct effects, but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.[87]

Legal Protection: The enforceable agreements to protect conservation benefits provided at a mitigation project site, which may include easements, deed restrictions, or other enforceable and durable contractual agreements, typically entered into by a property owner and/or third party holder and filed with the applicable county.

Lek: Traditional areas where male prairie grouse, e.g., sage grouse, gather during early spring to conduct a courtship display, attract females, and breed.[88]

MEPA: The Montana Environmental Policy Act.

Minimization: Minimizing impacts by limiting the degree or magnitude of the action and its implementation.[89]

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[84] MCA § 76-22-103(7) (2017).
[85] MCA § 76-22-103(8) (2017).
[86] MCA § 76-22-103(9) (2017).
[87] 40 CFR § 1508.8.
[88] Montana's Greater Sage-grouse Habitat Conservation Advisory Council. Greater Sage-Grouse Habitat Conservation Strategy (2014) (hereafter "2014 Recommendations"), available at http://governor.mt.gov/Portals/16/docs/GRSG%20strategy%2029Jan_final.pdf.
[89] 40 CFR 1508.20(b).

Mitigation Credit Project: Conservation actions, including enhancement, restoration, creation, or preservation, taken by an entity on a mitigation credit project site.

Mitigation Hierarchy: The process of first avoiding impacts to resources, then minimizing impacts, then restoring or reclaiming sites, and finally allowing for compensatory mitigation in the case of unavoidable or residual impacts. The purpose of sequencing is to analyze all reasonable options to first avoid and minimize or reclaim impacts before allowing impacts that require compensatory mitigation – especially for important ecological areas and functions.[90]

Mitigation Instrument: A formal agreement between credit providers and the entity approving generation and release of mitigation credits, establishing liability, performance standards, management and monitoring requirements, and the terms of credit approval. The mitigation instrument includes the required attachments, including the site plan, financial management plan, stewardship plan, legal protection documents, and verification report.

Monitoring: The process of observing and recording environmental conditions and changes in environmental conditions over space and time.

MSGOT or Oversight Team: Montana Sage Grouse Oversight Team[91]

Net Conservation Gain (or Benefit): The cumulative benefits of the mitigation or compensatory measures (i.e., beneficial actions taken under a voluntary prelisting conservation program) that provide for an increase in the population(s) of the species of interest directly or indirectly through the enhancement or restoration of its suitable habitat, or maintenance of currently suitable habitat, that reduces or eliminates current and future threats, taking into account the duration of the actions and all the adverse effects of the impact project.[92]

No Net Loss: Impacts caused by the development project are balanced or outweighed by measures taken to avoid and minimize the project's impacts and compensate for any residual impacts so that no loss remains.[93]

NEPA: The National Environmental Policy Act.

Offset: The act of fully compensating for environmental impacts; accomplished through observance of the mitigation hierarchy, including compensatory mitigation.

Off-site: Mitigation credit actions that occur outside the development project site or area.

On-site: Mitigation credit actions that occur on or proximate to the development project site.

Permittee-Responsible Mitigation: A compensatory mitigation site that provides ecological functions and services established as part of the conservation actions associated with a project developer's action. The project developer retains responsibility for ensuring that the required conservation actions are completed and successful. Each permittee-responsible mitigation site is linked to the specific activity that required the offset. Permittee-responsible compensatory mitigation approved for a specific action is not transferable and cannot be used for other mitigation needs.

[90] See 40 CFR 1508.20.
[91] MCA § 76-22-103(10) (2017).
[92] FWS Policy Regarding Voluntary Prelisting Actions.
[93] U.S. Fish and Wildlife Service. 2014. Greater Sage-Grouse Range-Wide Mitigation Framework. Version 1.0.

Permitting Agencies: Agencies that fund or issue permits for development projects that may impact sage grouse habitat, including the Montana state agencies, Montana State Trust Lands, US Forest Service, and the Bureau of Land Management.

Phased Release of Credits: Releasing a limited number of credits from mitigation credit site in stages prior to full completion of proposed actions to balance the time lag in realizing the ecological benefits of a project with the need for up-front funds to finance implementation actions.

Preservation: The removal of a threat to, or preventing the decline of, resources. Preservation may include the application of new protective designations on previously unprotected land or the relinquishment or restraint of a lawful use that adversely impacts resources.[94]

Priority Habitat Management Area, BLM and US Forest Service (PHMA): BLM or USFS-administered lands identified as having highest habitat value for maintaining sustainable sage grouse populations. The boundaries and management strategies for PHMAs are derived from and generally follow the preliminary priority habitat (PPH) boundaries. PHMAs largely coincide with areas identified as priority areas for conservation (PACs) in the Conservation Objectives Team (COT) Report.

Project Developer: An entity proposing an action that will result in a debit.[95]

Project Closure Date: Five years after the last credit from a mitigation agreement has been sold.

Program: The Montana Habitat Conservation Program.

Raw HQT (Habitat Quantification Tool) Score: Final project score produced from Montana HQT Basemap Score after adding all project related Anthropogenic Variables for existing anthropogenic features on the landscape in GRSG habitat. The score reflects the total Functional Acres lost for the project or gained for a credit project.

Reclamation: Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.[96]

Registration: The process of placing a verified and certified credit into the registry; includes the required documentation and assignment of a unique identifying number.

Registry: A service or software that provides a ledger function for tracking credit quantities and ownership. Credit registries may also act as a mechanism for public disclosure of trading project documentation.[97]

Reserve Account: A pool of issued credits, funded by a percentage of the credits transferred in each transaction, that are used to cover shortfalls when credits that have been generated and sold are invalidated for unavoidable reasons like wildfire.[98]

Restoration: The process of assisting the recovery of a resource (including its values, services, and/or functions) that has been degraded, damaged, or destroyed to the condition that would have existed if the resource had not been degraded, damaged, or destroyed.[99]

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[94] Bureau of Land Management. 2016. Manual Section 1794: Mitigation.
[95] MCA § 76-22-103(11) (2017).
[96] See 40 CFR § 1508.20 definition of mitigation hierarchy (avoid, minimize, rectify, reduce, compensate).
[97] MCA § 76-22-104(3) (2017).
[98] U.S. Fish and Wildlife Service. 2014. Greater Sage-Grouse Range-Wide Mitigation Framework. Version 1.0.
[99] Bureau of Land Management. 2016. Manual Section 1794: Mitigation.

Restoration Habitat Management Area, BLM (RHMA): BLM-administered lands where maintaining populations is a priority, a balance between ongoing and future resource use so that enough quality habitat is maintained to allow some residual population in impacted areas to persist and that emphasizes the restoration of habitat to reestablish or restore sustainable populations.

Service Area: The geographic area within which credits may be purchased and applied to offset debits associated with future development activities. Service areas are mapped geographies with unique ecological significance and sometimes political boundaries. The area should be based on the conservation needs of the species as outlined in a conservation strategy for that species.[100] See Figure 3.1 and Appendix 7.3.

Site Management Plan (Site Plan): A document provided prior to signing of the mitigation instrument or agreement which identifies the extent, type, and description of all proposed conservation actions associated with a credit project.

Stewardship Plan: Identifies a long-term person or entity (i.e., steward) of a credit project, stewardship goals and activities, the amount and source of funds needed for an endowment to maintain the site for the duration of the project life, and documentation of the time needed to implement the full stewardship plan.

Stipulations: Avoidance and minimization actions applicable to development activities proposed in sage grouse habitat, as outlined in Montana Executive Order 12-2015, Appendix D, or federal land use plans, respectively.

Surface Disturbance: any conversion of formerly suitable habitat to grasslands, croplands, mining, well pads, roads, or other physical disturbance that renders the habitat unusable for sage grouse.[101]

Uncertainty: Refers to the inability to obtain perfect knowledge about factors that may negatively impact mitigation projects or their magnitude. Types of uncertainty include ecological risk (e.g., wildfires and invasive species), management risk (e.g., bankruptcy and project implementation or maintenance failure), and regulatory risk (e.g., revised laws or regulations). Alternatively, refers to the inability to obtain knowledge about factors affecting the accuracy of the HQT result, measurement and sampling errors, predictions about reclamation successes, etc.

Unsuitable Habitat: land within the historic range of sage grouse that did not, does not, nor will not, provide sage grouse habitat due to natural ecological conditions such as badlands or canyons.

Verification: An independent, expert check on the credit estimate, processes, services, or documents provided by a project developer or credit provider. The purpose of verification is to provide confidence to all program participants that credit calculations and project documentation are a faithful, true, and fair account – free of material misstatement and conforming to credit generation and accounting standards, state and federal laws, and policies.

[100] US Fish and Wildlife Service. 2017. Director's Order No. 218: Policy Regarding Voluntary Prelisting Conservation Actions. Section 2.
[101] Executive Order 12-2015, Attachment H.

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7. APPENDICES

7.1 Activities Exempt from Mitigation Requirements Pursuant to Executive Order 12-2015

Executive Order 12-2015 exempts certain land uses and private landowner activities from compliance. Mitigation is not required for these activities.

- Existing animal husbandry practices (including branding, docking, herding, trailing, etc.).
- Existing farming practices (excluding conversion of sagebrush/native range to cropland agriculture).
- Existing grazing operations that meet rangeland health standards or utilize recognized range and management practices (for example, allotment management plans, Natural Resource and Conservation Service grazing plans, prescribed grazing plans, etc.).
- Construction of agricultural reservoirs and aquatic habitat improvements less than 10 surface acres and drilling of agriculture and residential water wells (including installation of tanks, water windmills, and solar water pumps) more than 0.6 miles from the perimeter of a lek in Core Areas and more than 0.25 miles from a lek in General Habitat or Connectivity Areas. Within 0.6 miles of a lek in Core Areas and within 0.25 miles of a lek in General Habitat or Connectivity Areas, no review is required if construction does not occur March 15 – July 15 and construction does not occur on the lek. All water tanks shall have bird escape ramps.
- Agricultural and residential electrical distribution lines more than 0.6 miles from a lek in Core Areas and 0.25 miles from a lek in General Habitat or Connectivity Areas. Within 0.6 miles of a lek in Core Areas and within 0.25 miles of a lek in General Habitat or Connectivity Areas, no review is required if construction does not occur between March 15 – July 15 and construction does not occur on the lek. Raptor perching deterrents shall be installed on all poles within 0.6 or 0.25 miles, respectively, from leks, if they are proven to be effective according to Avian Power Line Interaction Committee guidance. Other management practices, such as vegetation screening and anti-collision measures, should be applied to the extent possible. Routine maintenance of existing power lines conducted between July 16 – March 14 is also an exempt activity.
- Pole fences. Wire fences if fitted with visibility markers where high potential for sage grouse collisions has been documented.
- Irrigation (excluding the conversion of sagebrush/grassland to new irrigated lands). Tribal lands under existing and future state water compacts.
- Spring development if the spring is protected with fencing and enough water remains at the site to provide mesic (wet) vegetation.
- Herbicide and pesticide use except for in the control of sagebrush and associated native forbs. Grasshopper/Mormon cricket control following Reduced Agent-Area Treatments (RAATS) protocol.
- County road maintenance.
- Production and maintenance activities associated with existing oil, gas, communication tower, and power line facilities in compliance with approved authorizations.
- Low impact cultural resource surveys.
- Emergency response.

7.2 MSGOT Programmatic Exceptions

MSGOT may grant programmatic exceptions from the consultation requirements of Executive Order 12-2015 upon finding that development activity will not exacerbate threats to sage grouse and mitigation opportunities for preservation, restoration, or enhancement would not be foreclosed. If the development activity has been granted a programmatic exception for the consultation requirement, the activity may be implemented without any requirement to follow the mitigation hierarchy, including compensatory mitigation.

For additional information about these exceptions, please contact the Program as they are subject to change.

7.3 Description of Montana's Four Service Area Boundaries

<u>Southwestern Montana Service Area</u>:

- Beginning at the Idaho and Montana border and the boundary of Ravalli and Beaverhead counties
- Continuing northeast along boundary of Ravalli and Beaverhead counties
- Continuing northeast and east along the boundary of Granite and Deer Lodge counties
- Continuing east along the boundary of Powell and Deer Lodge counties
- Continuing northeast along the boundary of Powell and Jefferson counties
- Continuing northeast along the boundary of Lewis and Clark and Jefferson counties
- Continuing northeast along the boundary of Lewis and Clark and Broadwater counties
- Continuing South at the boundary of Broadwater, Lewis and Clark and Meagher counties
- Continuing south along the boundary of Broadwater and Meagher counties
- Continuing east along the boundary of Meagher and Gallatin counties to a point of intersection with General Habitat in northeast Gallatin County
- Continuing south along the western boundary of General Habitat in northeast Gallatin County
- Continuing south at the intersection of General Habitat along the boundary of Gallatin and Park county
- Continuing south along the boundary of Gallatin County and the Wyoming state border
- Continuing south along the boundary of the Montana and Wyoming border, and southern boundary of Gallatin County.
- Continuing west along the boundary of Madison and Beaverhead counties and the Montana and Idaho border
- Ending at the Idaho and Montana border of Ravalli and Beaverhead counties.

<u>North Central Service Area:</u>

- Beginning at the boundary of Toole and Liberty counties at the United States and Canada border
- Continuing south along the boundary of Toole and Liberty counties
- Continuing south along the boundary of Pondera and Liberty counties
- Continuing south along the boundary of Pondera and Choteau counties
- Continuing south along the boundary of Choteau and Teton counties
- Continuing east along the boundary of Choteau and Cascade counties

- Continuing east where the boundary of Choteau and Cascade county intersect with the Missouri River in central Chouteau County
- Continuing east along the Missouri River to a point that intersects with the boundary of Choteau and Fergus counties
- Continuing east along the boundary of Choteau and Fergus counties
- Continuing east along the boundary of Fergus and Blaine counties
- Continuing east along the boundary of Fergus and Phillips counties
- Continuing east along the boundary of Phillips and Petroleum counties
- Continuing east along the boundary of Phillips and Garfield counties
- Continuing east along the boundary of Garfield and Valley counties
- Continuing east along the boundary of Valley and McCone counties
- Continuing east along the boundary of McCone and Roosevelt counties
- Continuing north along the General Habitat boundary at a point where the Roosevelt and McCone counties meet the General Habitat boundary
- Continuing north to a point where the boundary of Valley and Roosevelt counties meet
- Continuing north along the boundary of Valley and Roosevelt counties
- Continuing west along the boundary of Valley and Daniels counties
- Continuing north along the boundary of Valley and Daniels counties to the United States and Canada border
- Continuing west along the United States and Canada border along the boundary of Valley, Phillips, Blaine, Hill and Liberty counties
- Ending at the boundary of Toole and Liberty counties at the United States and Canada border.

Central Service Area:

- Beginning where the boundary of Park and Gallatin counties intersect with the Montana and Wyoming border
- Continuing north along the boundary of Park and Gallatin counties to a point that intersects a boundary of General Habitat
- Continuing west along the boundary of General Habitat in northeast Gallatin County
- Continuing north to a point that intersects the boundary of Gallatin and Meagher counties
- Continuing west along the boundary of Gallatin and Meagher counties
- Continuing north along the boundary of Broadwater and Meagher counties
- Continuing north along the boundary of Broadwater, Lewis and Clark and Meagher counties
- Continuing east along the boundary of Cascade and Meagher counties
- Continuing north along the boundary of Cascade and Judith Basin counties
- Continuing north along the boundary of Cascade and Chouteau counties
- Continuing east at the boundary of Cascade and Choteau counties where the boundary of Choteau and Cascade county intersect the Missouri River in central Chouteau County
- Continuing east along the Missouri River to a point of the boundary of Choteau and Fergus counties
- Continuing east along the boundary of Choteau and Fergus counties
- Continuing east along the boundary of Fergus and Blaine counties
- Continuing east along the boundary of Fergus and Phillips counties
- Continuing east along the boundary of Phillips and Petroleum counties
- Continuing east along the boundary of Phillips and Garfield counties
- Continuing east along the boundary of Garfield and Valley counties
- Continuing east along the boundary of Valley and McCone counties

- Continuing east along the boundary of McCone and Roosevelt counties
- Continuing south along the boundary of McCone and Richland counties
- Continuing south along the boundary of McCone and Dawson counties
- Continuing south along the boundary of Dawson and Prairie counties to a point where the boundary intersects the General Habitat boundary
- Continuing south along the boundary of General Habitat within Dawson County to a point where the boundary intersects with the boundary of Dawson and Prairie counties
- Continuing south east along the boundary of Dawson and Prairie counties to the intersection of the Yellowstone River
- Continuing west along the Yellowstone River through Prairie, Custer, Rosebud and Treasure counties
- Continuing south along the boundary of Yellowstone and Treasure counties from a point where the Yellowstone and Treasure counties boundaries intersect the Yellowstone River
- Continuing south through Big Horn County along the Big Horn River to the Montana and Wyoming State border and the boundary of Carbon and Big Horn counties
- Continuing west along the Montana and Wyoming State border and boundary of Carbon and Park counties
- Ending at a point where the boundary of Park and Gallatin counties intersects with the Montana and Wyoming border.

<u>Southeastern Montana Service Area</u>:

- Beginning at the intersection of the Yellowstone River and the boundary of Richland County at the Montana and North Dakota border
- Continuing southwest along the Yellowstone River through Richland and Dawson counties
- Continuing south east along the boundary of Dawson and Prairie counties where the boundary of Dawson and Prairie counties intersects the Yellowstone River
- Continuing west along the Yellowstone River through Prairie, Custer, Rosebud and Treasure counties
- Continuing south along the boundary of Yellowstone and Treasure counties from a point where the boundary of Yellowstone and Treasure counties intersect with the Yellowstone River
- Continuing south through Big Horn County along the Big Horn River to the Montana and Wyoming State border and the boundary of Carbon and Big Horn counties
- Continuing east along the Montana and Wyoming border following the boundary of Big Horn, Powder River and Carter counties
- Continuing north along the Montana, South Dakota and North Dakota border along the boundary of Carter, Fallon, Wibaux and Richland counties
- Ending at a point that intersects the Yellowstone River and the boundary of Richland County at the Montana and North Dakota border.

Sage Grouse Mitigation:

Draft Habitat Quantification Tool
Technical Manual

and

Draft Policy Guidance Document

Montana Sage Grouse Oversight Team

May 4, 2018

Presentation and all meeting materials will be available on the MSGOT Meeting Archive webpage at: https://sagegrouse.mt.gov/Team

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Today's Roadmap:

- Part 1: Habitat Quantification Tool Technical Manual:
  - Review key concepts
  - Highlights and updates to Model & Manual
  - Calculating the Raw HQT Score (new vs. existing)
    - Hypotheticals: Solar Farm, Major Pipeline (buried)

[LUNCH]

- Part 2: Policy Guidance Document and HQT Together:
  - Review key concepts
  - Highlights and updates
  - Calculating mitigation obligation; potential cost (new vs. existing)
    - Revisit Hypotheticals: Solar Farm, Hypothetical Major Pipeline (buried)

- Part 3: Draft Proposed Administrative Rules

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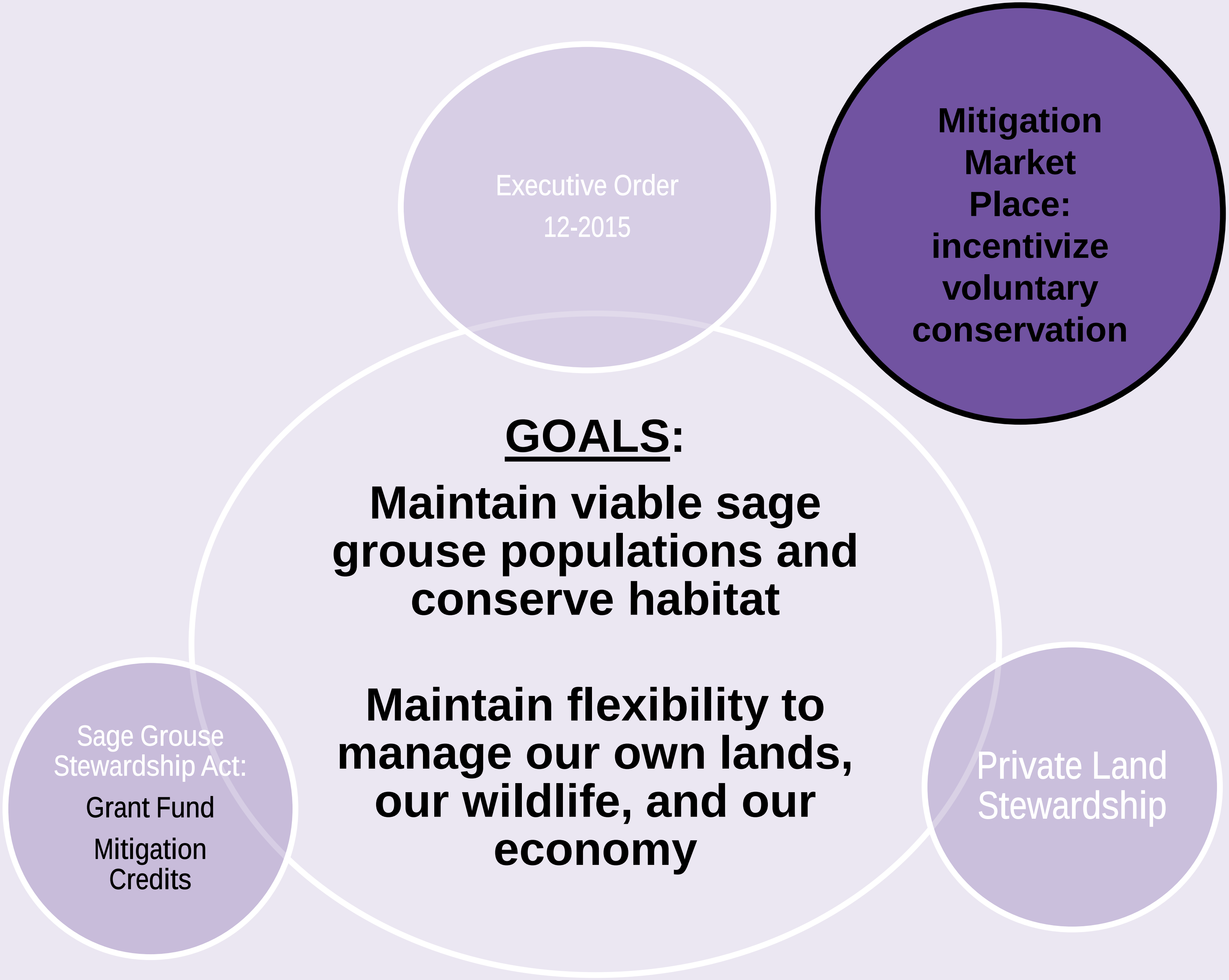
    - Revisit Hypotheticals: Solar Farm, Hypothetical Major Pipeline (buried)

- Part 3: Draft Proposed Administrative Rules

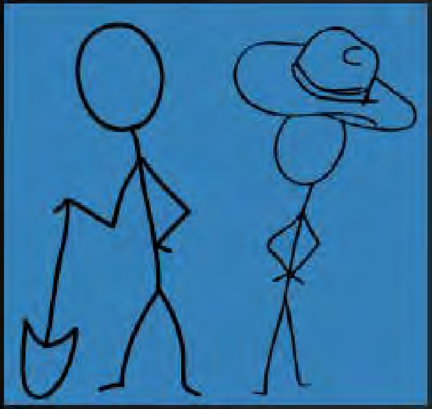

Executive Order
12-2015
Mitigation Market Place: incentivize voluntary conservation
GOALS:
Maintain viable sage grouse populations and conserve habitat
Maintain flexibility to manage our own lands, our wildlife, and our economy
Sage Grouse Stewardship Act:
Grant Fund
Mitigation Credits
Private Land Stewardship

Guiding Principles:

- **Mitigation is one tool among many**
- **Mitigation balances development and conservation**
- **Timely, effective mitigation is fundamental to sage grouse conservation**
- **Clear, transparent mechanisms incentivize voluntary conservation**
- **Outcomes should be objective, predictable, provide certainty**
- **Mitigation obligations should increase proportional to impacts and their duration**
- **Potential to develop credits should increase with habitat quality**
- **Most credits will come from private lands**

Basic Moving Parts

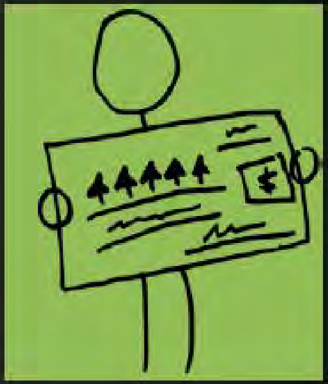
Credits



The HQT is the common currency used to balance the mitigation ledger

(equitable exchange)

Debits



Administration

Mitigation Market Place

Development Impacts Habitat

(Debits)

1. Avoid
2. Minimize
3. Restore
4. Compensate

Habitat Quantification Tool = GIS Method to Measure Habitat

Land Conservation Creates Credits:

Stewardship Fund Grants

Private Land Stewardship

Public Land Stewardship

(restoration, enhancement, preservation)

Conservation Actions (Credits)

HQT: the scientific method to evaluate vegetation and environmental conditions related to quality and quantity of habitat

76-22-103(9), MCA

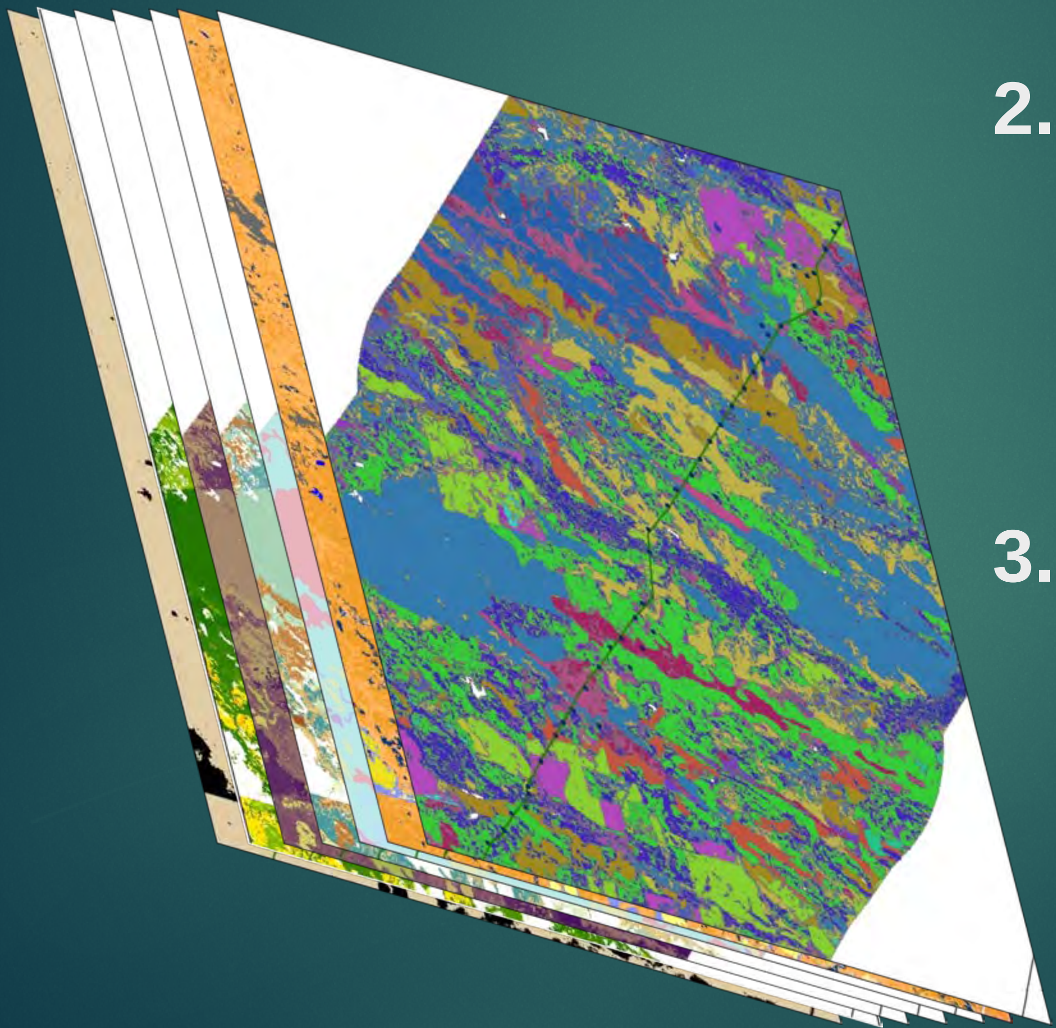
- A GIS model: used to calculate functional (Fx) acres
- Key variables:
  - vegetation & birds
  - existing disturbance
- Answers the questions:
  - How many functional acres are gained from conservation?
  - How many functional acres are lost due to a development project?

Three HQT Steps:

1. **Create a Basemap:** habitat & birds

2. **Implement Project:** conservation or development

3. **Quantify:** gains or losses in functional acres



SWCA ENVIRONMENTAL CONSULTANTS

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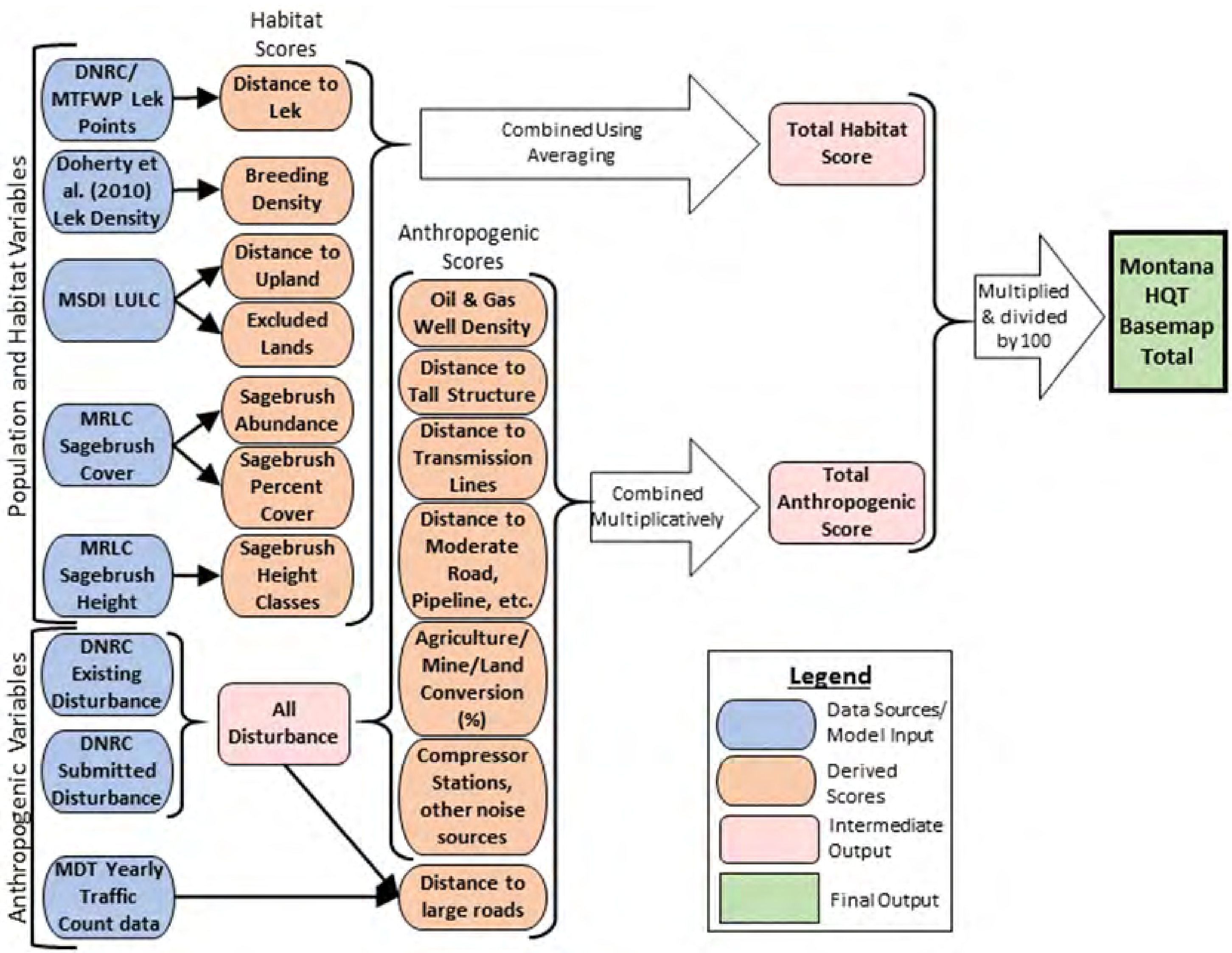
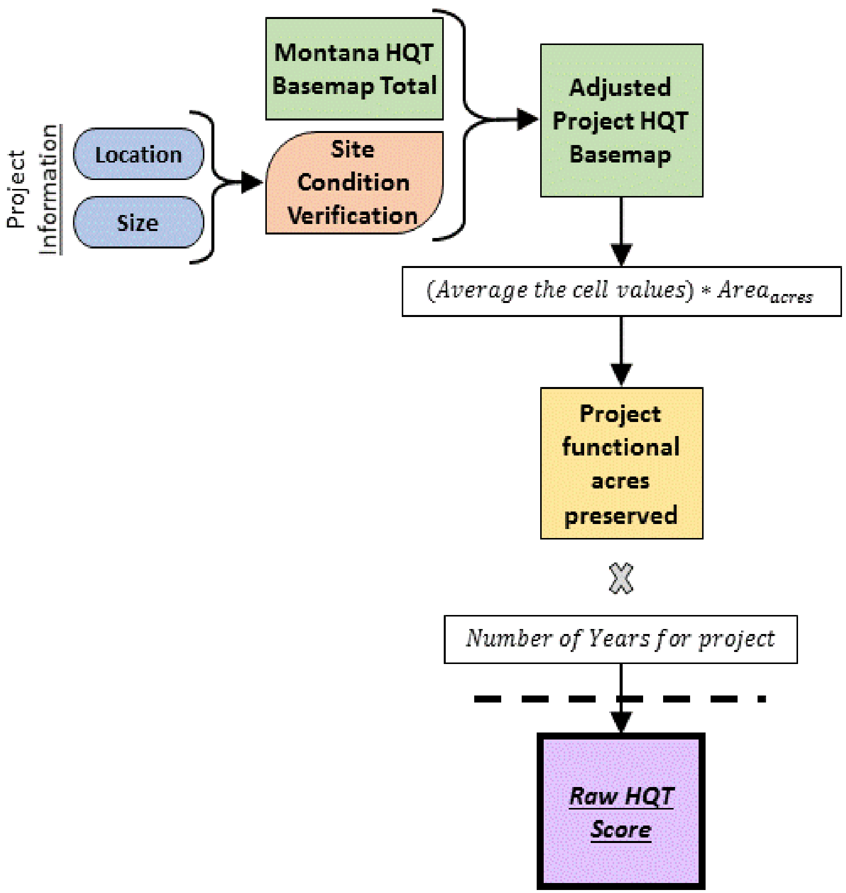
Step 1: Create a Basemap

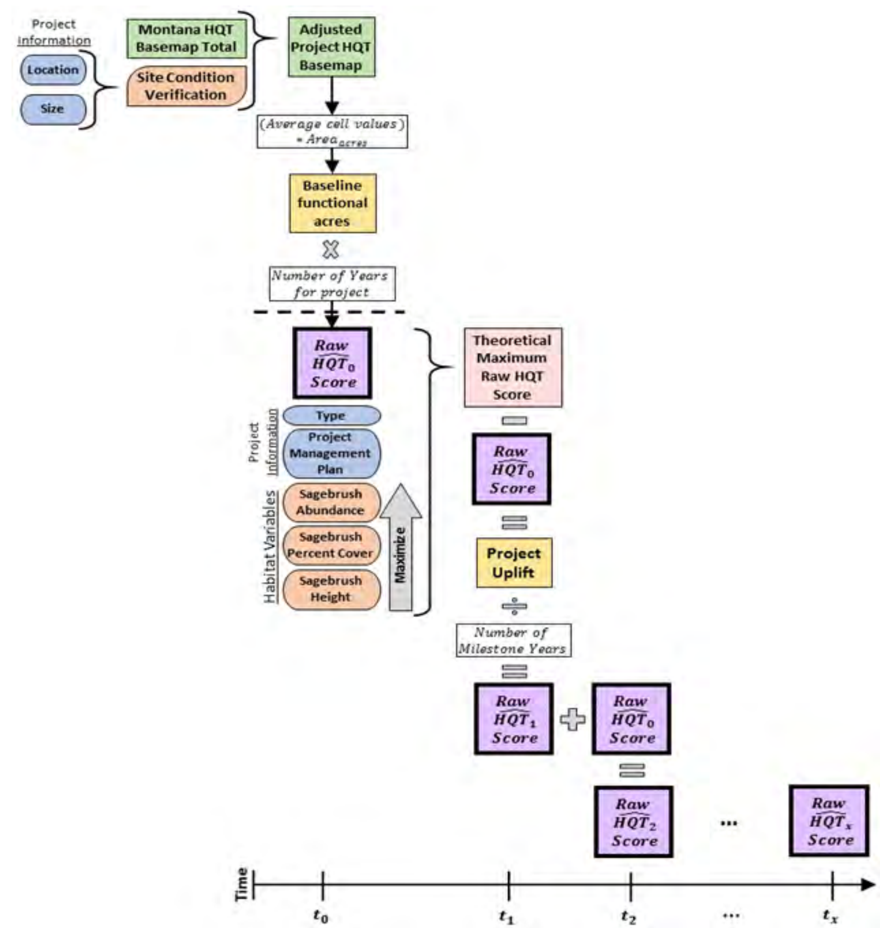


Step 2: Implement a Conservation Project

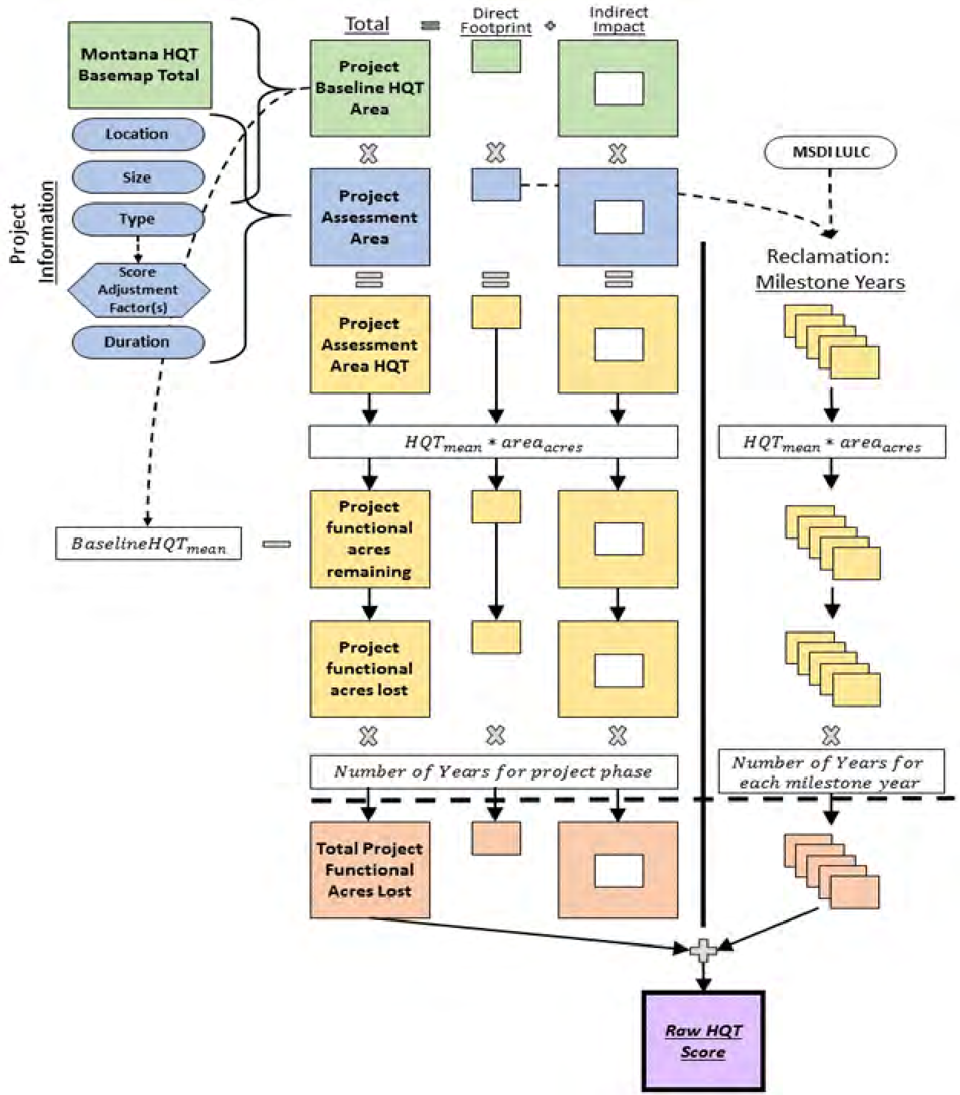
Preservation Projects



Restoration & Enhancement Projects



Step 2: Implement a Development Project



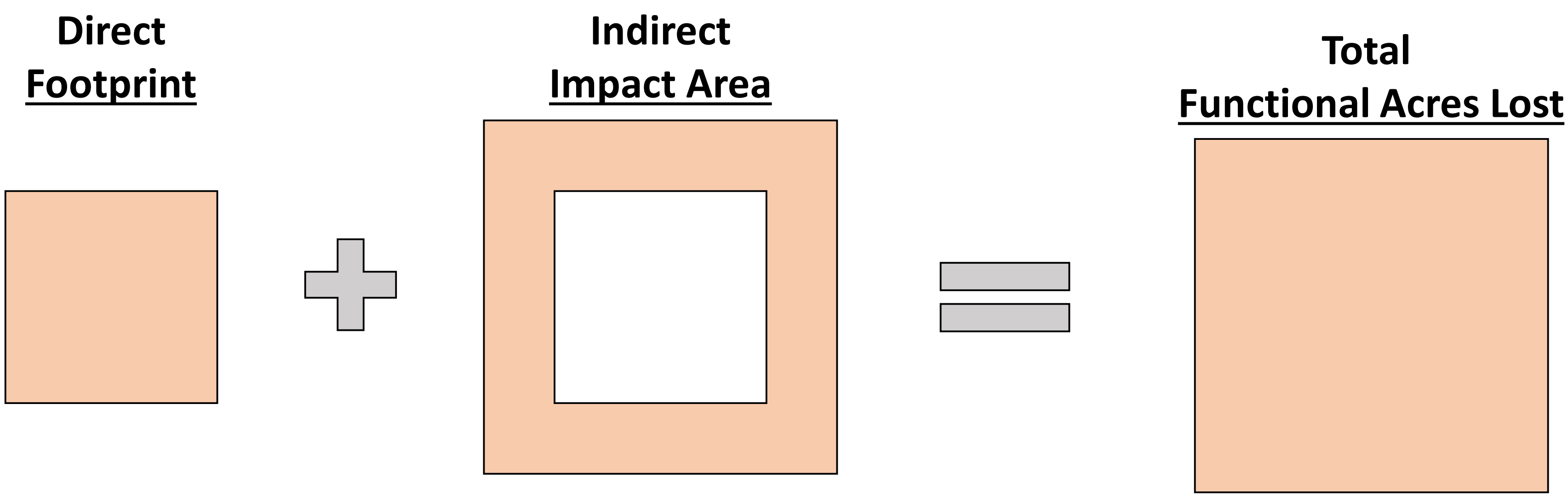
Step 3: Quantify Gains

Conservation Project

Total
Functional Acres Gained

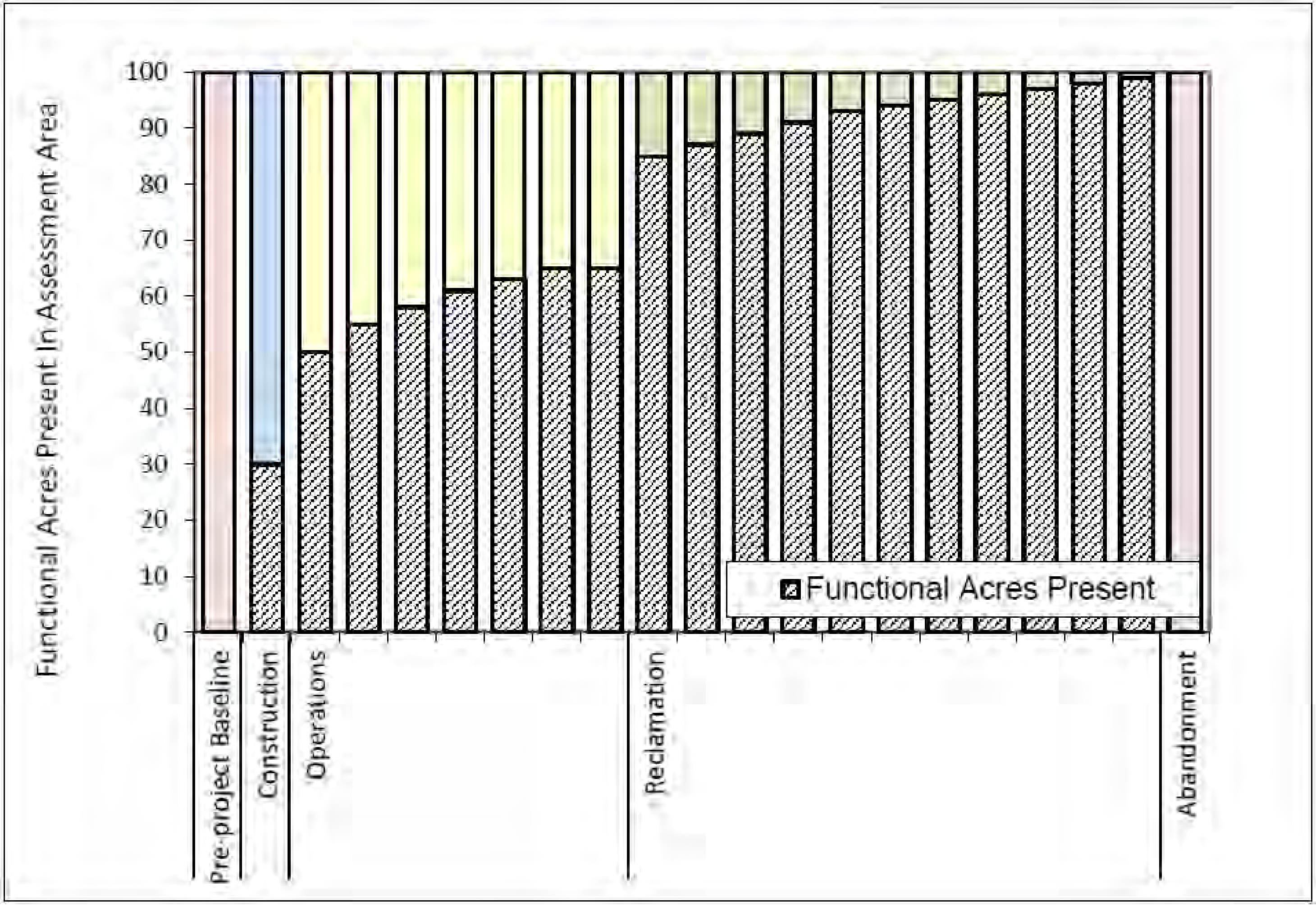
Step 3: Quantify Losses

Development Project



Project Phases: Construction, Operations, Reclamation

Step 3 Includes Time: Construction, Operations, Reclamation



Phases can be calculated individually.

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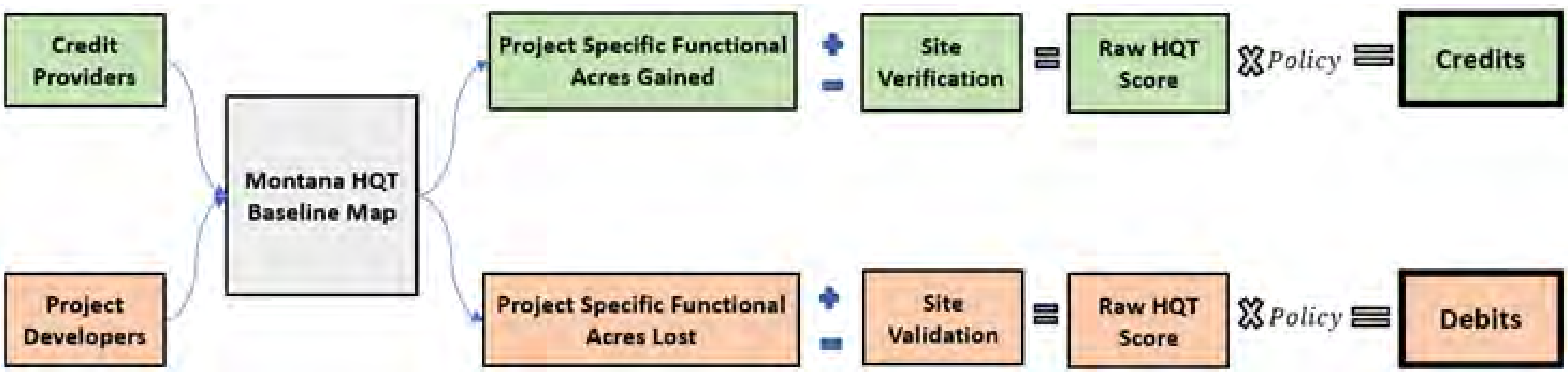
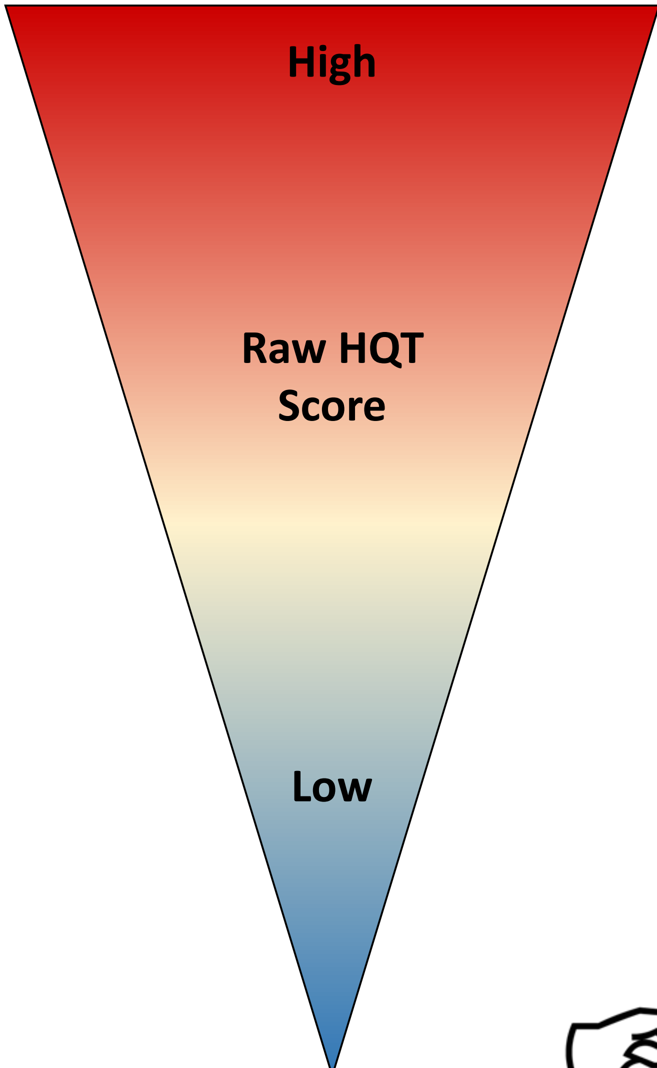
How HQT Functional Acres Turn into Credits



1 Functional Acre Gained = 1 Credit

1 Functional Acre Lost = 1 Debit

Continuum of HQT Results



HQT score depends on:

- underlying habitat quality
- project location
- project type
- project size
- project duration

It's policy neutral. Can be changed by moving to lower quality habitat or adjusting the project.

Highlights and Updates to HQT Model

(see handout for details)

- Automation
- Capability for all project types
- Used USGS land cover data for SW Montana area
- Smaller pixel size
- Digitized data for anthropogenic disturbance in General Habitat
- Buffer distance around direct footprints
  - What's the area of indirect effects ?

Highlights and Updates to HQT Technical Manual

(see handout for details)

- Reorganized
  - general info up front, highly technical moved to appendices
    - each development project type in separate appendix
    - Credit projects have own appendix
  - similar to Policy Guidance
  - specific sections for credit providers, developers
- Added more information for credit providers
- Added figures and flow charts
- Added examples of credit and debit HQT calculations

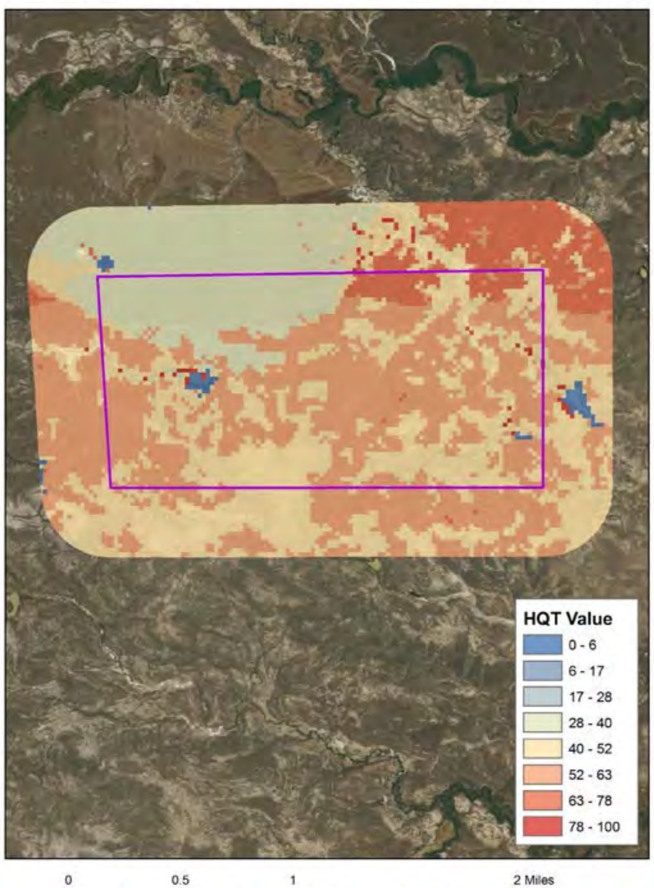
Examples: Calculating and Refining the Raw HQT Score

- Two Core Area Projects
- Used Sept. 2017 base map provided by SWCA
- Refined HQT scores applied
  - total HQT = direct + indirect
  - project phase
- Key Principles
  - o project location influences multipliers
    - o new surface disturbance = ↑ Fx acres lost
    - o existing surface disturbance = ↓ Fx acres lost

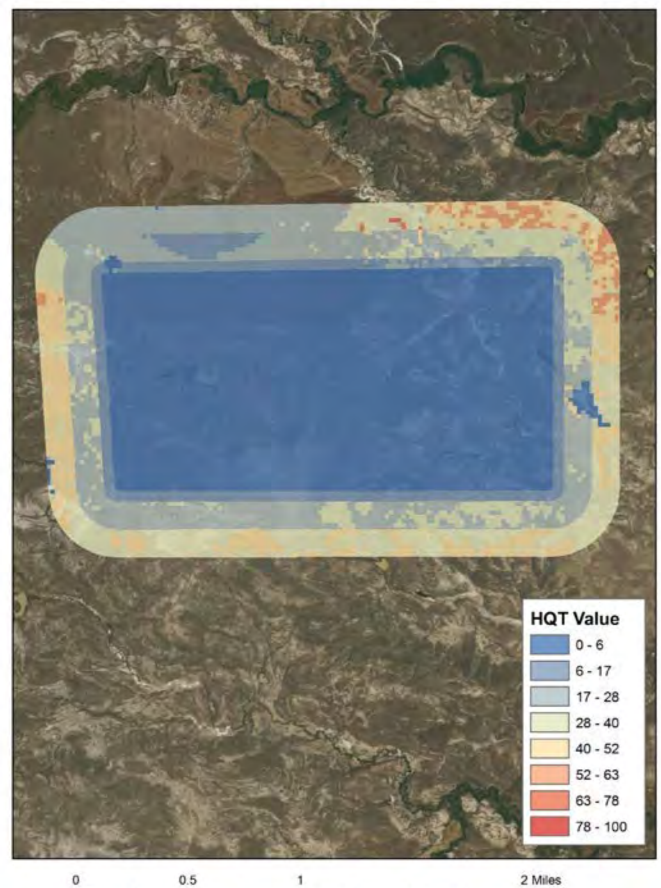
Solar Farm Hypothetical Project: Core Area

Project: 1,000-acre Direct Footprint, 50-years Construction & Operation, 75-years Reclamation

BaselineHQT - Solar Farm - Core Habitat

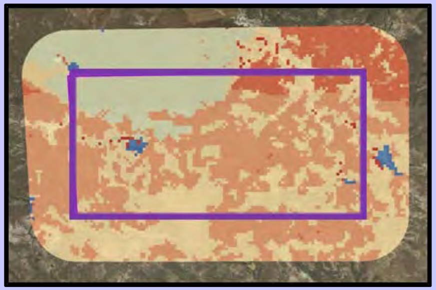


Operations Phase - Solar Farm - Core Habitat



Solar Farm Raw HQT Scores

New Disturbance

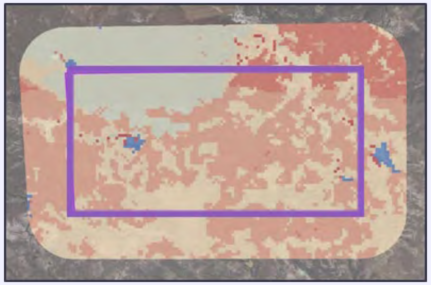
Project HQT Basemap	Direct Footprint		Indirect Impact Area		Total Functional Acres Lost
	**52,871** ***(C&O: 29,706)***	+	**14,050** ***(C&O)***	=	**66,921** ***(COR)***

High Habitat Quality

Low Habitat Quality

Apply Multipliers

Solar Farm Raw HQT Scores

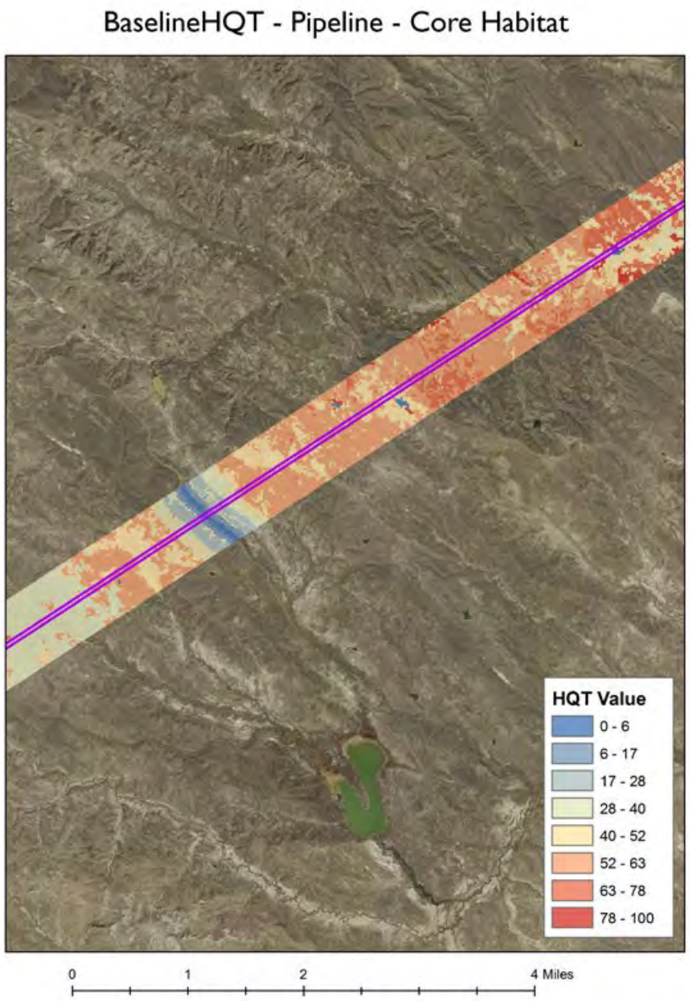
	Project HQT Basemap	Direct Footprint		Indirect Impact Area		Total Functional Acres Lost
New Disturbance		52,871 *(C&O: 29,706)*	+	14,050 *(C&O)*	=	66,921 *(COR)* → *Apply Multipliers*
Existing Disturbance		**2,150** ***(C&O: 1,501)***	+	**1,150** ***(C&O)***	=	**3,300** ***(COR)*** → ***Apply Multipliers***

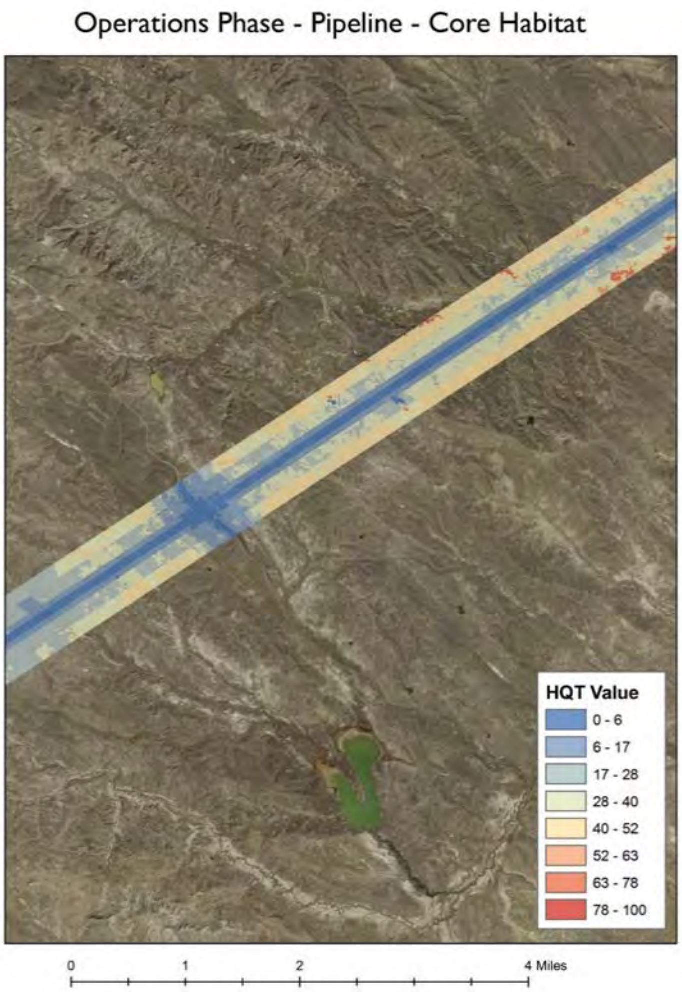
High Habitat Quality

Low Habitat Quality

Major Pipeline Hypothetical Project: Core Area

Project: 30-miles long, 200-feet wide, 1-year construction, buried feature, 75-years Reclamation

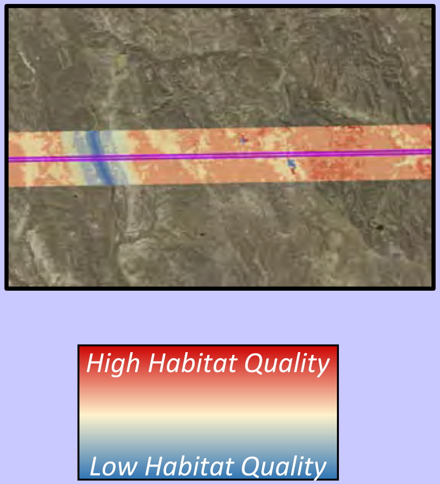




Major Pipeline Raw HQT Scores

Project HQT Basemap	Direct Footprint		Indirect Impact Area		Total Functional Acres Lost

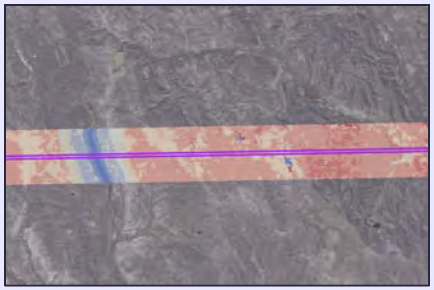
New Disturbance



12,065 (*C&O: 378*) + **2,864** (*C&O*) = **14,926** (*COR*)

Apply Multipliers

Major Pipeline Raw HQT Scores

	Project HQT Basemap	Direct Footprint		Indirect Impact Area		Total Functional Acres Lost
New Disturbance		12,065 (C&O: 378)	+	2,864 (C&O)	=	14,926 (COR)
Existing Disturbance		**2,106** ***(C&O: 72)***	+	**540** ***(C&O)***	=	**2,646** ***(COR)***

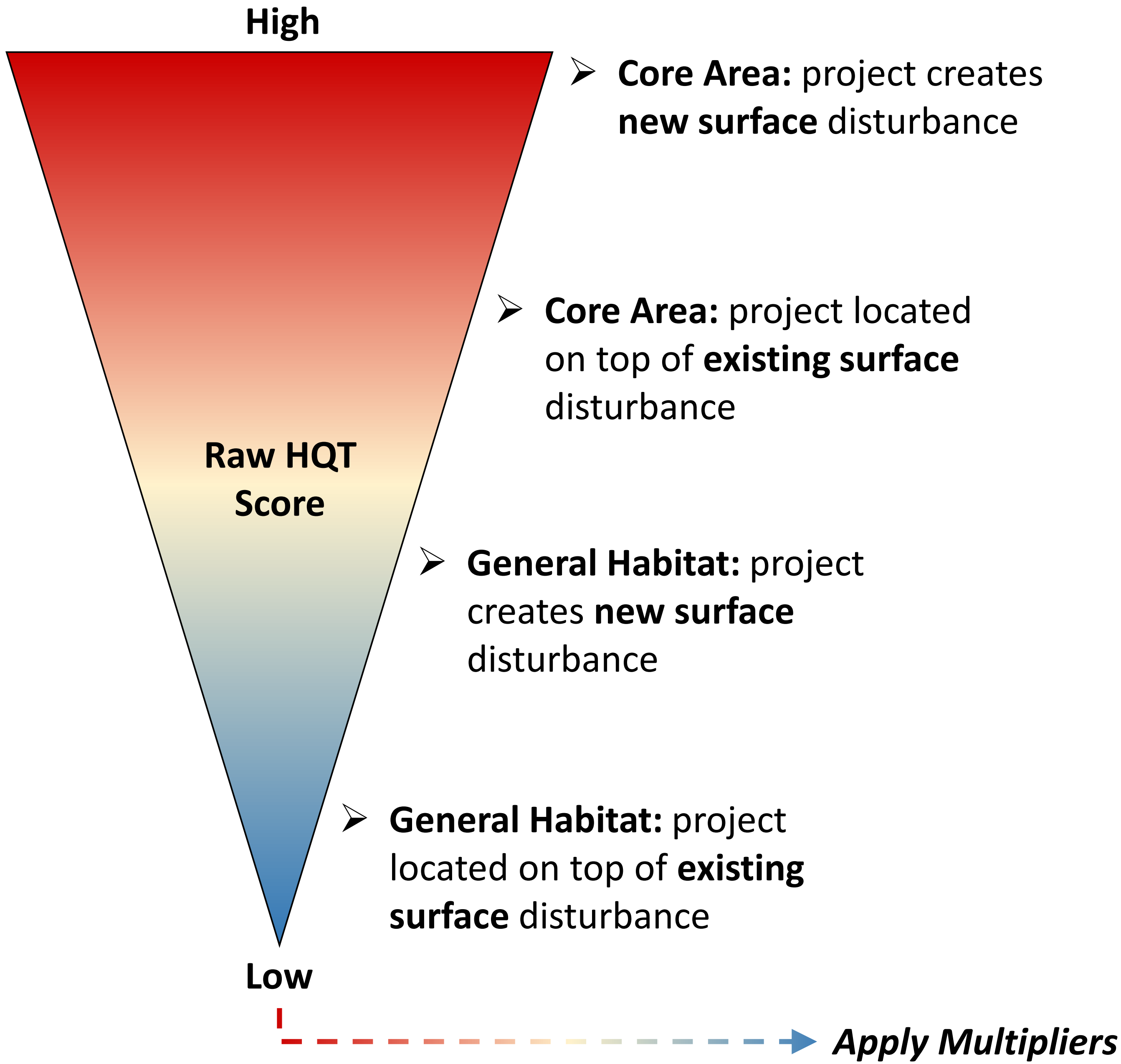
High Habitat Quality

Low Habitat Quality

New Disturbance: *Apply Multipliers*

Existing Disturbance: ***Apply Multipliers***

Continuum of HQT Results



HQT and Technical Manual in a Nutshell

- HQT results scale to the project; scores are proportional
- HQT scores now more refined:
  - area of direct footprint vs. area indirectly affected
  - project phase
  - refinements carried forward into *Policy Guidance*
- Updates to the HQT Model improve performance, repeatability, accuracy
- Updates to the HQT Technical Manual better describe methods
- Updates based on scientific literature

Discussion and Comment

Today's Roadmap:

- Part 1: Habitat Quantification Tool Technical Manual:
  - o Review key concepts
  - o Highlights and updates to Model & Manual
  - o Calculating the Raw HQT Score (new vs. existing)
    - Hypotheticals: Solar Farm, Major Pipeline (buried)

- Part 2: Policy Guidance Document and HQT Together
  - o Review key concepts
  - o Highlights and updates
  - o Calculating mitigation obligation; potential cost (new vs. existing)
    - Revisit Hypotheticals: Solar Farm, Hypothetical Major Pipeline (buried)

- Part 3: Draft Proposed Administrative Rules

Debits

Mitigation Market Place: incentivize voluntary conservation

Mitigation Hierarchy:

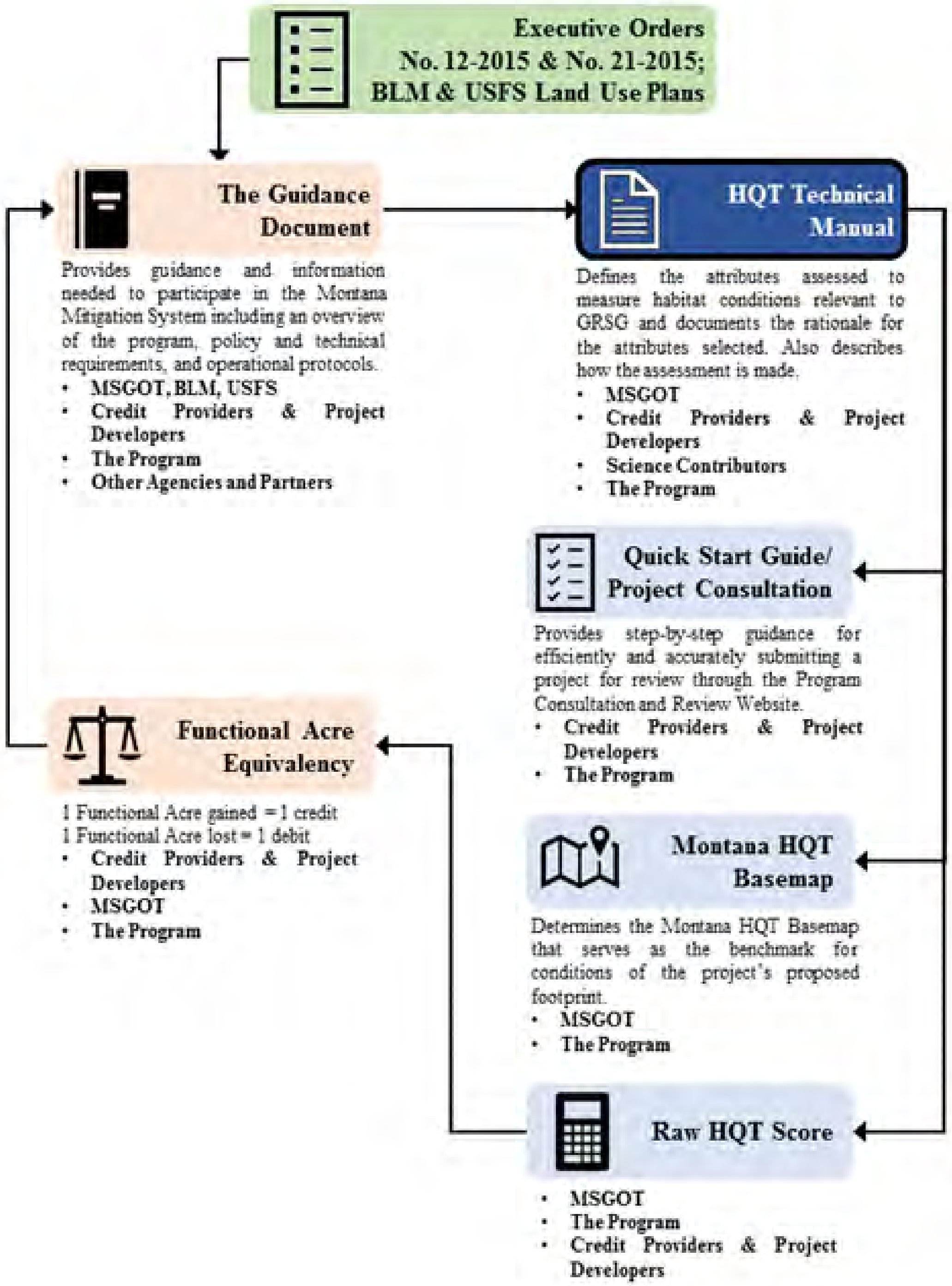
1. Avoid
2. Minimize
3. Restore
4. Compensate

<u>GOALS</u>:

Maintain viable sage grouse populations and conserve habitat

Maintain flexibility to manage our own lands, our wildlife, and our economy

Credits


Executive Orders
No. 12-2015 & No. 21-2015;
BLM & USFS Land Use Plans
The Guidance Document
Provides guidance and information needed to participate in the Montana Mitigation System including an overview of the program, policy and technical requirements, and operational protocols.
• MSGOT, BLM, USFS
• Credit Providers & Project Developers
• The Program
• Other Agencies and Partners
HQT Technical Manual
Defines the attributes assessed to measure habitat conditions relevant to GRSG and documents the rationale for the attributes selected. Also describes how the assessment is made.
• MSGOT
• Credit Providers & Project Developers
• Science Contributors
• The Program
Quick Start Guide/ Project Consultation
Provides step-by-step guidance for efficiently and accurately submitting a project for review through the Program Consultation and Review Website.
• Credit Providers & Project Developers
• The Program
Functional Acre Equivalency
1 Functional Acre gained = 1 credit
1 Functional Acre lost = 1 debit
• Credit Providers & Project Developers
• MSGOT
• The Program
Montana HQT Basemap
Determines the Montana HQT Basemap that serves as the benchmark for conditions of the project's proposed footprint.
• MSGOT
• The Program
Raw HQT Score
• MSGOT
• The Program
• Credit Providers & Project Developers

Policy Guidance Document:
a document describing how everyone applies the HQT model results to make informed decisions

- Sets forth how voluntary conservation will be incentivized: conservation and development

- Key Components:
  - o roles, protocols, procedures
    - – MSGOT, credit site providers, developers, others
  - o multipliers = policy signals to encourage / discourage
  - o participants can informed business decisions
  - o transparent, predictable

Highlights and Updates to Policy Guidance

(see handout for details)

Generally:

- editorial updates to improve clarity
- added additional details
- added figures and tables
- more inclusive language referencing BLM and USFS
    - consistent with “all hands, all lands”

Highlights and Updates to Policy Guidance

(see handout for details)

Section 2: For Credit Providers

- more explicit treatment of different credit project types

- adopted appraisal method to set baseline for easements
  - o averaged 3 currently available
  - o baseline for easements is 65% of the Raw HQT Score
    - 35% of Fx acre credits available in the market

- address split estate using Remoteness Review Report and Reserve account

- new multiplier to incentivize creation of *new* functional acres
  - 10% Core Areas
  - 5% General Habitat
  - 5% Connectivity Area

Highlights and Updates to Policy Guidance

(see handout for details)

Section 3: For Project Developers

- Apply HQT to all projects to determine residual impacts after avoidance, minimization, reclamation
- Apply multipliers to newly refined HQT results
  - direct vs. indirect buffer area affected by project
  - project phase: construction / operations vs. life of project
- Standard: no net loss, net gain preferred
- Modified Approach in Cedar Creek Core Area, Elk Basin

Section 3.3.1 [Multipliers]

- Reserve Account
  - increased to 15%
  - all projects, all phases, total Raw HQT Score
  - address split estate scenarios
  - risk and uncertainty

- Landscape Scale: to incentivize avoiding habitat altogether
  - no change
  - all projects, all phases, total Raw HQT Score
  - 10% Core; 5% General; 5% Connectivity

Section 3.3.1 [Multipliers]

- Site specific scale: to incentivize consistency with EO 12-2015
  - new: apply refined HQT scores (not total score)
  - all projects; construction and operations phases only
  - applicable for each deviation from EO 12-2015 and for as long as deviation exists
  - Percent depends on whether project creates new disturbance or is located on top of existing disturbance
    - if project creates new: multipliers applied to direct + indirect
    - if project on existing: multipliers only applied to indirect
  - 10% Core; 5% General Habitat; 5% Connectivity

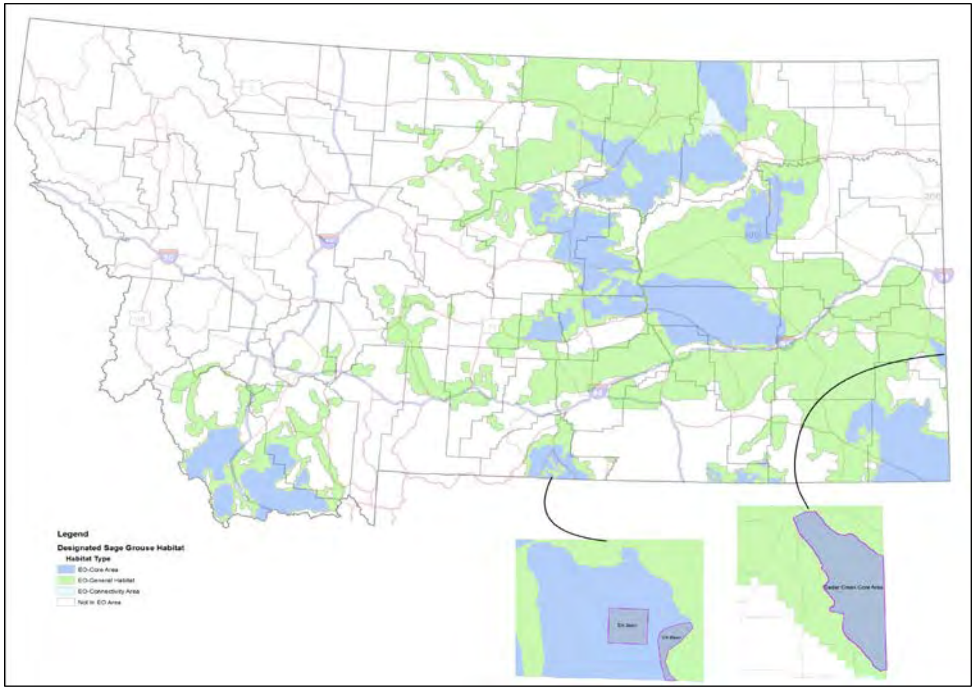
Section 3.3.1 [Multipliers]

- Advance Payment: to incentivize having mitigation in place prior to construction
  - no change
  - any project where payment to Account
  - 10%, regardless of location
  - Applied to total HQT score (direct + indirect)

Section 3.3.2: Modified Approach

Cedar Creek Core Area   ~ Elk Basin, Carbon County Core Area

- New
- Why?
    - high levels of existing disturbance
    - unlikely can ever be consistent with EO 12-2015
    - residual populations exist, still important
- Incentivize locating on existing disturbance
- Emphasize restoration



Section 3.3.2: Modified Approach

Cedar Creek Core Area ~ Elk Basin, Carbon County Core Area

Project on top of existing disturbance

- POD; avoid, minimize, reclaim
- Restoration commensurate with disturbance, w/in same core area
- No HQT, no compensatory mitigation
- Expected to be consistent with:
  - NSO within 0.6 mile of active lek
  - Avoid active drilling within 2 miles: March 15-July 15

Section 3.3.2: Modified Approach

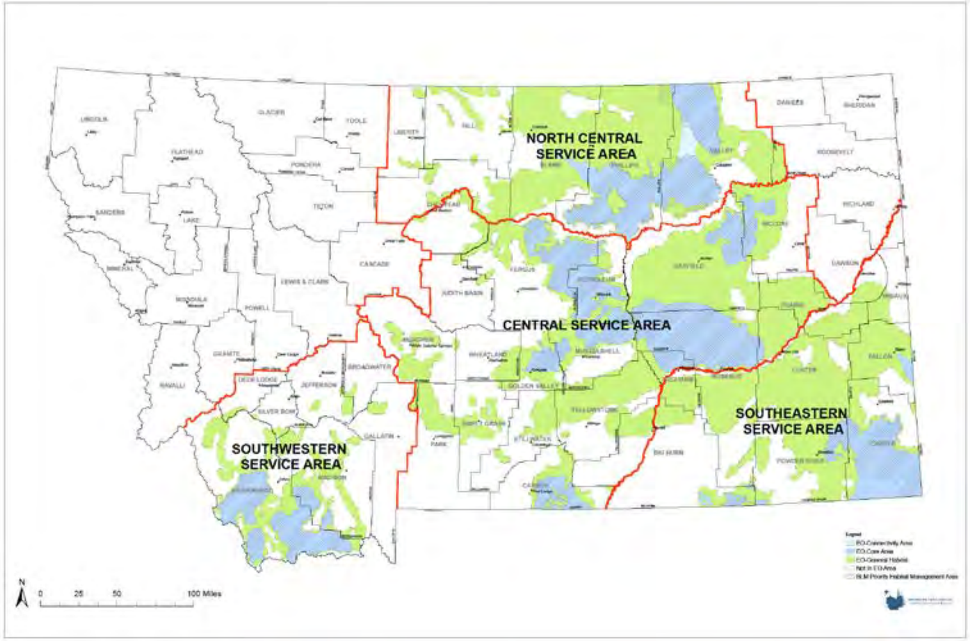
Cedar Creek Core Area ~ Elk Basin, Carbon County Core Area

Project Creates New Disturbance:

- POD; avoid, minimize, reclaim
- HQT, compensatory mitigation required; multipliers
  - 15% reserve
  - 10% landscape
  - 10% for deviations from 2 EO 12-2015 stipulations if applicable:
    - NSO 0.6 miles from active leks
    - Avoid active drilling within 2 miles: March 15 – July 15
- HQT scores expected to be low, but restoration still valued
- Restoration strongly encouraged w/in same core area

Section 3.4 Four Service Areas

- Change: increase to 4 areas
- Same service area expected
- No multiplier for adjacency when:
  - Southeastern / Central
  - North Central / Central
- MSGOT discretion whether to approve outside service area
  - show greater benefit



Section 4: Administration and Adaptive Management

Pricing MSGOT Credits: new section, greater transparency

- no third party yet, but need to move forward
- Easements: use market appraisal (3)
  - average cost of all easements / average number of Fx acre credits after adjusting for new baseline
- Term Leases:
  - average cost of all term leases / average number of Fx acre credits
  - if no term leases, use easement methodology
- Restoration / Enhancement:
  - total cost of the project / number of Fx acre credits

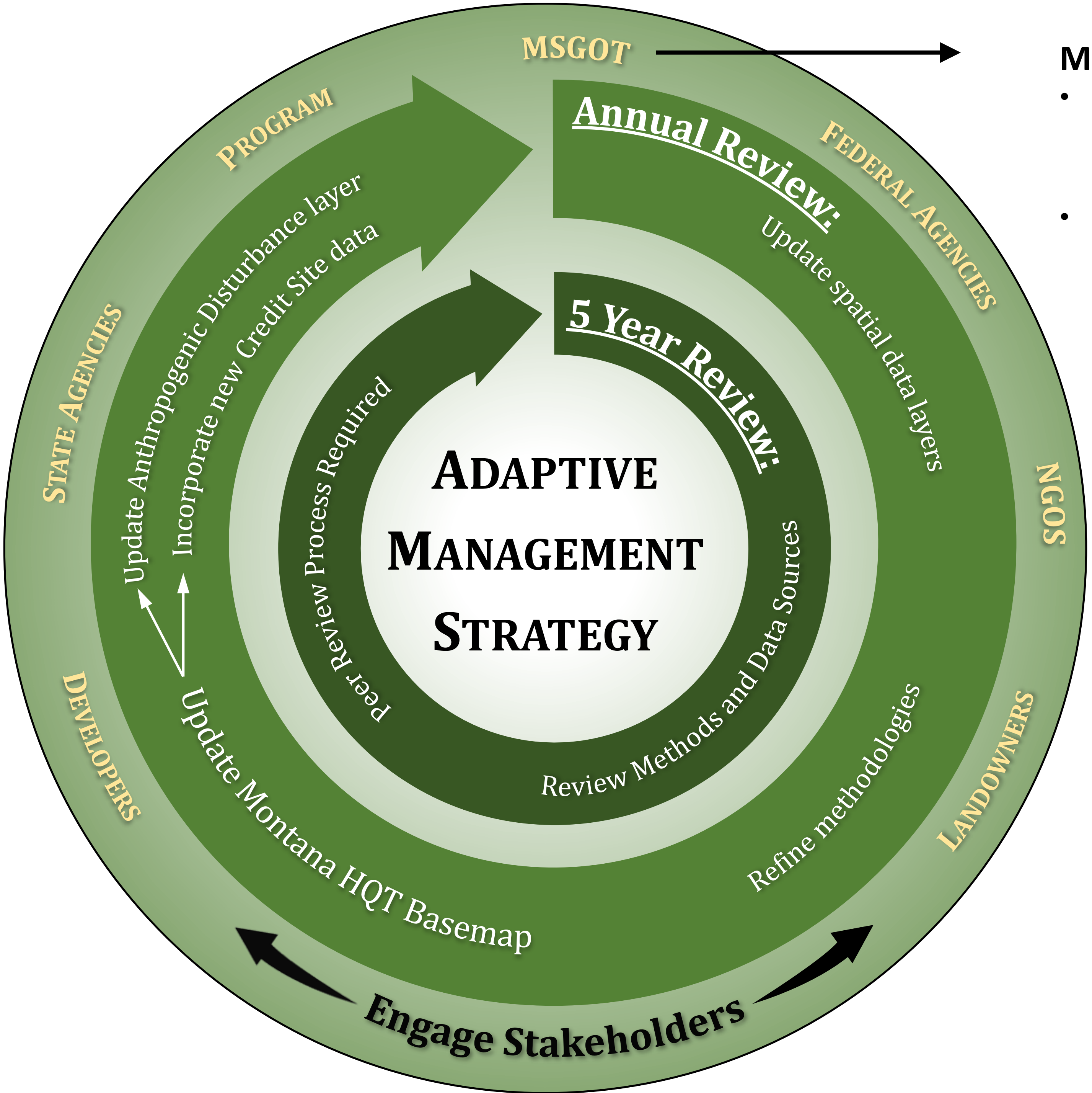
Section 4: Administration and Adaptive Management

If No Stewardship Account Funding:

- new section, greater transparency
- parties freely negotiate; MSGOT not a party

Price of Credits when Sufficient Credits Not Available:

- new section, greater transparency
- same methodology as if using credits created by MSGOT



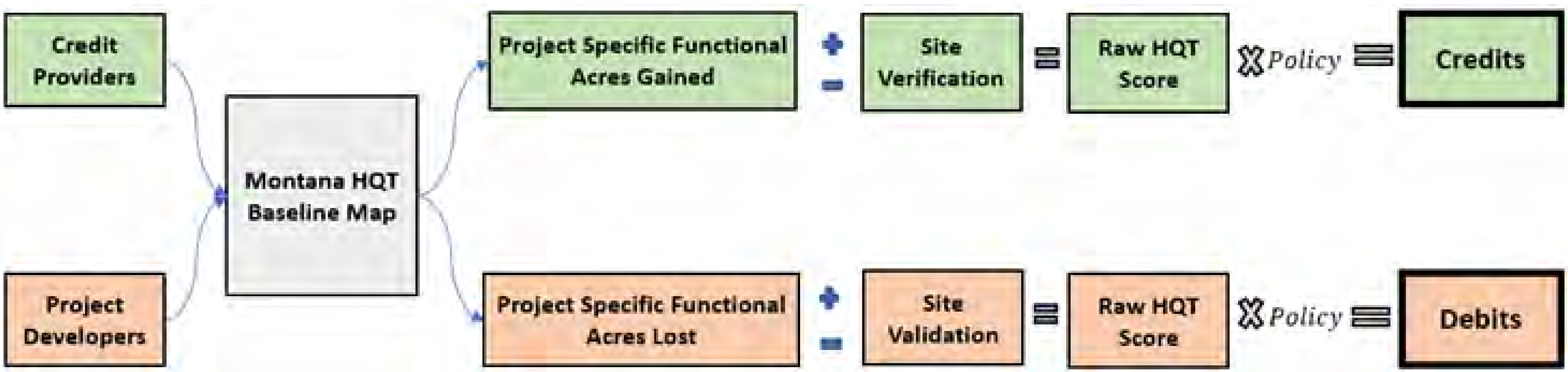
MSGOT:

- Notice and comment always!
- Can initiate rulemaking anytime BUT will every 5 years

Examples: HQT and Guidance Together

- Two Core Area Projects
- Used Sept. 2017 base map provided by SWCA
- Apply refined HQT scores
  - total HQT = direct + indirect
  - project phase
- Apply appraisal methods: baseline and cost
- Key Principles
  - o project location influences multipliers
    - o new surface disturbance = ↑ Fx acres lost
    - o existing surface disturbance = ↓ Fx acres lost
  - o multipliers illustrate incentives for voluntary conservation

How HQT Functional Acres are Converted and Traded



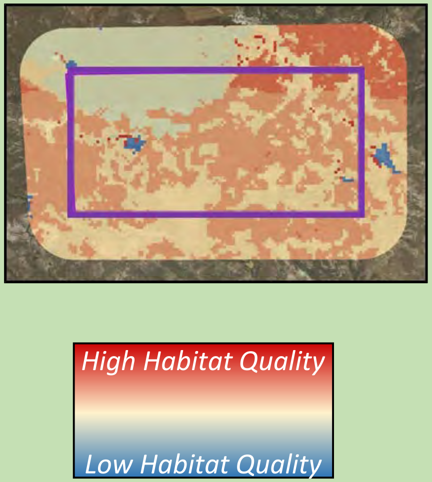
1 Functional Acre Gained = 1 Credit (a unit of trade)

1 Functional Acre Lost = 1 Debit (a unit of trade)

Solar Farm Hypothetical Project: Core Area

New Disturbance

Project HQT Basemap



Total Functional Acres Lost

66,921
(COR)

Apply Multipliers to Total HQT Score

Total Debits

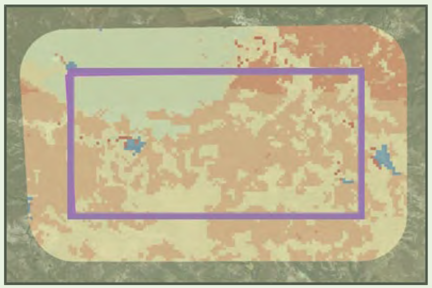
153,661

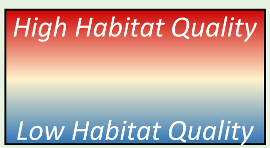
Total Cost: $1,946,883

Solar Farm Hypothetical Project

Project HQT Basemap | **Total Functional Acres Lost** | **Total Debits**

New Disturbance





66,921
(COR)

Apply Multipliers to Total HQT Score

153,661

Total Cost: $1,946,883

Existing Disturbance

3,300
(COR)

Apply Multipliers to HQT Indirect ONLY

8,367

Total Cost: $106,005

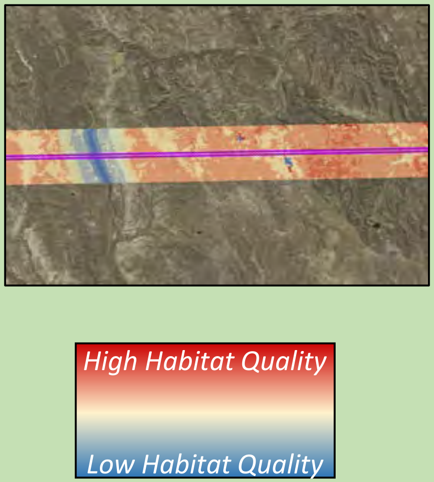
Solar Farm Hypothetical Project

HQT and Guidance	Core Area <u>New</u> Surface Disturbance	Core Area <u>Existing</u> Surface Disturbance
Raw HQT Score • Construction, Operations and Reclamation	66,921.00	3,300.00
Reserve Account: Risk and Uncertainty 15% • Construction, Operations and Reclamation	10,038.15	495.00
Landscape signal: 10% core • Construction, Operations and Reclamation	6,692.10	330.00
RAW HQT + Reserve + Landscape	**83,651.25**	**4,125.00**
Raw HQT Score Applied to Construction, Operations Only • 43,756 if on New Disturbance • 2,651 if on Existing Disturbance Site-specific EO signals: 10% for each departure from EO • n=16 departures	(43,756: direct + indirect)	(2651: indirect only)
Total Site-Specific EO Stipulations	**70,019.60**	**4,241.60**
TOTAL DEBITS (Raw HQT + Reserve + Landscape + Site-specific)	**153,660.85**	**8,366.60**
Appraisal Method Average: $12.67/credit	**$1,946,882.97**	**$106,004.82**
OTHER POLICY ELEMENTS		
Service Area (assume within Area of impact)		
Advance Payment (assume offsets done before impacts)		

Major Pipeline Hypothetical Project: Core Area

New Disturbance

Project HQT Basemap



Total Functional Acres Lost

14,926

(COR)

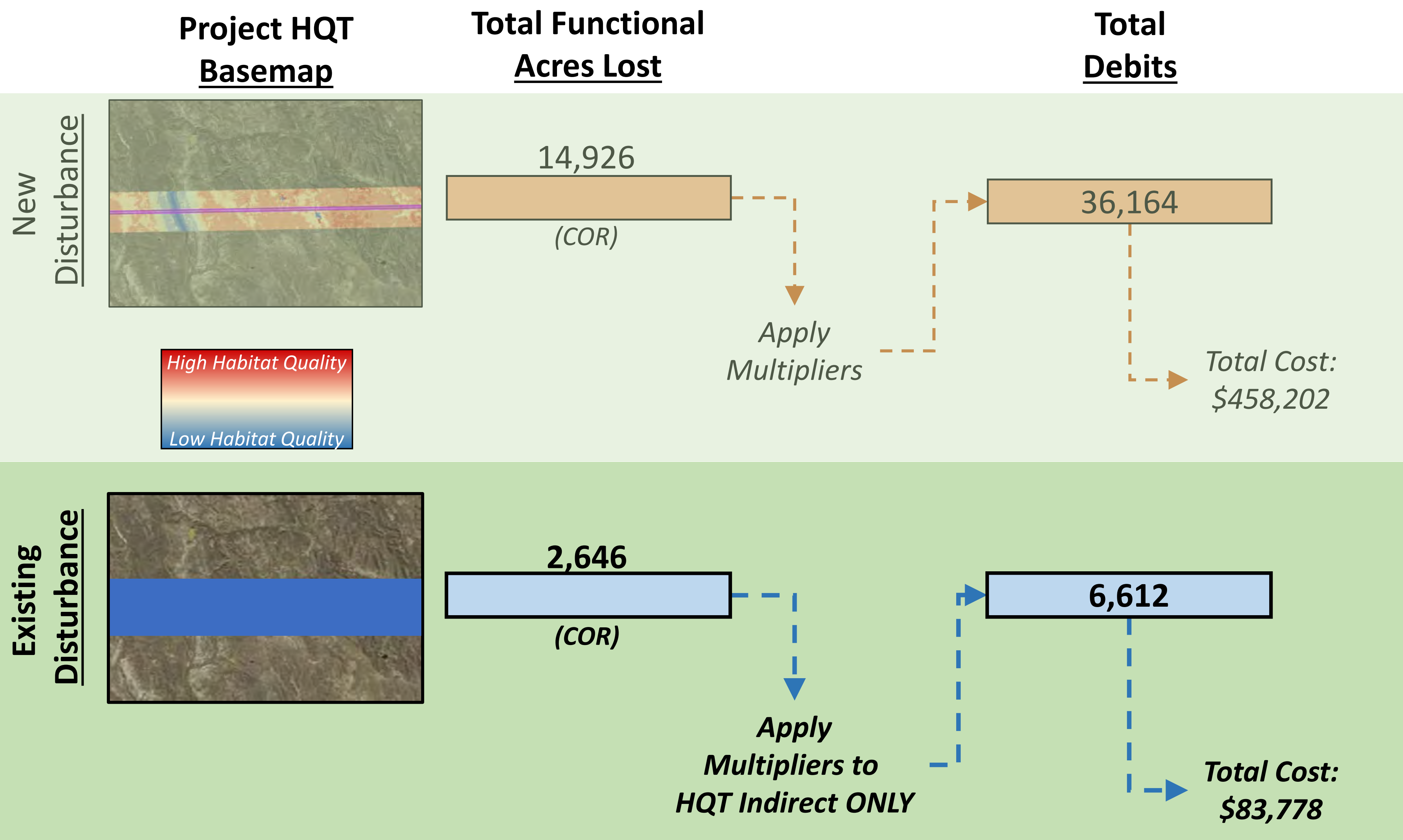
Apply Multipliers to Total HQT Score

Total Debits

36,164

Total Cost: $458,202

Major Pipeline Hypothetical Project:



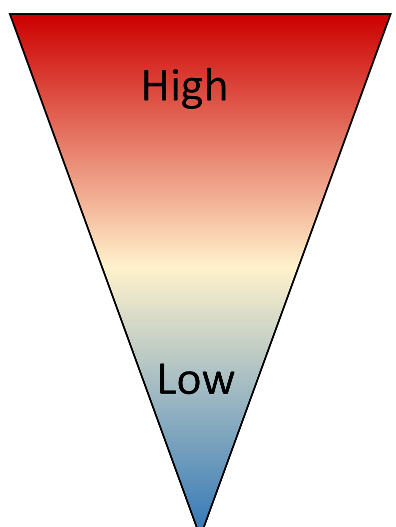
Major Pipeline Hypothetical Project

HQT and Guidance - components of the total score	Core Area New Surface Disturbance	Core Area Existing Surface Disturbance
Raw HQT Score • Construction, Operations and Reclamation	14,926.00	2,646.00
Reserve: Risk and Uncertainty 15% • Construction, Operations and Reclamation	2,238.90	396.90
Landscape signal: 10% core • Construction, Operations and Reclamation	1,492.60	264.60
Total Raw HQT + Reserve + Landscape	**18,657.50**	**3,307.50**
Raw HQT Score Applied to Construction, Operations Only • 3,242 if on New Disturbance • 612 if on Existing Disturbance Site-specific EO signals: 10% for each departure from EO • n=54 departures	(3242: direct + indirect)	(612: indirect only)
Total Site-Specific EO Stipulations	**17,506.80**	**3,304.80**
TOTAL DEBITS (Raw HQT + Reserve + Landscape + Site-specific)	**36,164.30**	**6,612.30**
Appraisal Method Average: $12.67/credit	**$458,201.68**	**$83,777.84**
OTHER POLICY ELEMENTS		
Service Area (assume within Area of impact)		
Advance Payment (assume offsets done before impacts)		

Key Takeaways from the Examples

- Fewer Fx acres lost if project in General Habitat AND located on top of existing disturbance
  - Incentivize locating projects in existing disturbance by applying some multipliers only to the indirect area

- Fewer debits added through multipliers when observe hierarchy and consistent with EO 12-2015



What Drives the Total Number of Debits?

A. Raw HQT Score (policy neutral)*

- *habitat quality, project attributes (type, size, duration)*
- *Refined HQT Scores based on location (on existing disturbance or new surface?*

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B. **Landscape scale policy signal**
   - *Where are you in SG habitat: core vs. general vs. outside?*
   - *proportional to raw HQT score*

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C. Site-specific scale policy signal*

- *What are you doing once you get there? Hierarchy?*
- *Consistent with EO stipulations?*
- *proportional to raw HQT score based on location*
  - *Creating new surface disturbance or located on existing disturbance?*

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D. Reserve Account (Risk & Uncertainty)

- *credit site not as good as predicted*
- *reclamation not as successful as planned*
- *HQT scores not perfectly estimated; no confidence intervals – error unknown; underlying GIS data not very precise*
- *proportional to raw HQT score*

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C. **Site-specific scale policy signal***
   - *What are you doing once you get there? Hierarchy?*
   - *consistency with EO stipulations?*
   - *proportional to raw HQT score*
   - *Creating new surface disturbance or located on existing disturbance?*

D. **Reserve account Risk & Uncertainty (modifier)**
   - *credit site not as good as predicted*
   - *reclamation not as successful as planned*
   - *HQT scores not perfectly estimated; no confidence intervals – error unknown; underlying GIS data not very precise*
   - *proportional to raw HQT score*

E. Other policy elements

What Drives the Total Number of Debits?

A. **Raw HQT Score (policy neutral)***
   - *habitat quality, project attributes (type, size, duration)*
   - *Refined HQT Scores based on location (on existing disturbance or new surface?*

B. **Landscape scale policy signal**
   - *Where are you in SG habitat: core area vs. general habitat vs. outside?*
   - *proportional to raw HQT score*

C. **Site-specific scale policy signal***
   - *What are you doing once you get there? Hierarchy?*
   - *consistency with EO stipulations?*
   - *proportional to raw HQT score*
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D. **Reserve Account (Risk & Uncertainty)**
   - *credit site not as good as predicted*
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   - *HQT scores not perfectly estimated; no confidence intervals – error unknown; underlying GIS data not very precise*
   - *proportional to raw HQT score*

E. **Other policy elements**

A* + B + C*+ D + E = total debits

<u>Nutshell</u>: What Drives Total Cost?

- Total cost based on total mitigation obligation (Fx acres lost)
  - total Raw HQT Score
  - multipliers based on Raw HQT Score, as refined
    - total score or just indirects because project sited on top of existing disturbance?
  - results proportional, commensurate with location & impacts

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- Project Attributes: some will be inherently more costly
  - large projects above ground in core
  - long duration
  - do not follow hierarchy
  - depart from EO stipulations

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- Project Attributes: some will be inherently more costly
  - large projects above ground in core
  - long duration
  - do not follow hierarchy
  - depart from EO stipulations

- Underlying habitat quality: the base map (red vs. blue)
  - core areas have higher HQT baseline scores
  - undisturbed sites have higher HQT baseline score

Coming Full Circle:

- Be proactive and plan strategically
- Location, location, location!
- HQT: estimates gains or losses in functional habitat
  - o scale of measurement (important to be accurate)
  - o if not accurate, could overestimate / underestimate:
    - – impacts of development
    - – benefits of conservation actions

- Guidance: policy, protocols, & roles
  - o multipliers encourage / discourage actions
  - o fosters proactive planning, informed decisions by all

- Market sets price
  - o 1 Fx acre gained = 1 credit
  - o 1 Fx acre lost = 1 debit

Next Steps:

- MSGOT consider draft proposed administrative rules

- General public comment

- Peer Review

- [Stakeholder Workshop, if desired]
  - goals:
    - deepen understanding of HQT and Policy Guidance
    - more informed comments
    - MSGOT and agency staff welcome!

- RFP: add Mitigation and HQT to website

- Sept. 14 MSGOT Meeting:
  - consider whether to adopt final rules

Discussion and Comment:

HQT Technical Manual
and
Policy Guidance

Today's Roadmap:

- Part 1: Habitat Quantification Tool Technical Manual:
  - Review key concepts
  - Highlights and updates to Model & Manual
  - Calculating the Raw HQT Score (new vs. existing)
    - Hypotheticals: Solar Farm, Major Pipeline (buried)

- Part 2: Policy Guidance Document and HQT Together:
  - Review key concepts
  - Highlights and updates
  - Calculating mitigation obligation; potential cost (new vs. existing)
    - Revisit Hypotheticals: Solar Farm, Hypothetical Major Pipeline (buried)

- Part 3: Draft Proposed Administrative Rules

HIGHLIGHTS AND UPDATES TO THE HQT MODEL AND THE TECHNICAL MANUAL VERSION 1.0 ~ MAY 2018

This document provides the key highlights to the Montana Mitigation System Habitat Quantification Tool Technical Manual. Where applicable, updates and changes between the September 2017 draft prepared by SWCA and the May, 2018 draft being considered by MSGOT are specifically mentioned.

EVOLUTION AND UPDATES MADE TO THE HQT MODEL ITSELF

The HQT Model was originally created using ESRI's ArcGIS Model Builder with final outputs requiring Excel calculations to be done manually every time the HQT model was run. At this stage of development, the user would follow a multi-step process (including manually iterating calculations in Excel for final outputs) for each project, leading to inconsistent results arising from user errors and an inefficient process requiring significant input and time from the user. The Program automated the HQT Model by using Python, in connection with the Program's SQL database, to develop an automated ArcGIS Tool that minimized the inputs and time required to run the model and obtain results. The ultimate goal is to add the HQT Model to the Program's website for use by all mitigation system participants.

Applicability - The original multi-step HQT Model was developed for only two different project types, both using the same distance buffer of 500-meters to account for Indirect Impacts. Building upon the original multi-step HQT Model, the Program expanded the project types the HQT Model could work with to the project types the Program has reviewed. There are now eight categories of project types within the model that allow it to analyze the combined direct and indirect impacts using distance buffers that are specific to the project category.

Sensitivity - The original multi-step HQT Model was developed using a spatial resolution of 30-meters (a 900-m^2 pixel) to measure habitat quality. This resolution is not sensitive enough to represent the details associated with some projects. The HQT Model is raster based, meaning it assigns a numeric value to a pixel. Converting common vector data, which most maps are based upon, to "numeric" raster data causes areas of a given project (primarily along the boundaries) to be eliminated due to the rather large 900 m^2 pixel. This resulted in chunky project footprints that introduce bias by under representing the physical acres of the project. The bias associated with 30-meter resolution was greatest for linear or narrow project features resulting in inaccurate Raw HQT Scores. To resolve, the Program tested several resampling schemes and found resampling pixels at a spatial resolution of 7.5-meters (a 56.25-m^2 pixel) was best to minimize bias for linear or narrow features without significantly increasing run-time of the automated HQT Model.

Basemap Accuracy - There are gaps in land cover data for southwestern Montana. The original multi-step HQT Model used a combination of datasets from other parts of the state to extrapolate a continuous land cover dataset for southwestern Montana's HQT basemap. The automated HQT

MONTANA SAGE GROUSE
Habitat Conservation Program

Model will use the recently released USGS land cover data since it provides a more accurate representation of habitat variables for the HQT Model basemap.

TIGER data was used in the original multi-step HQT Model basemap to account for existing road disturbance within General Habitat areas. The TIGER road layer includes linear features such as small two-track roads and trails. However, GRSG do not avoid such features on the landscape. The inclusion of small two-track roads and trails resulted in undervaluing habitat (bias low) on or near these features. The Program has contracted for development of an existing disturbance layer for General Habitat (existing disturbance has been completed for Core Area). The Program will incorporate the new existing disturbance layer into the automated HQT Model.

Evolution and Updates to the Anthropogenic Variables

In the September Draft, all of the technical information about Anthropogenic Variables for specific project types was contained in the main body of the document. In the May 2018 Technical Manual, all of the technical information was moved to individual appendices to make the document easier to use so that project developers could more easily find the technical information specific to their project type.

In the September HQT draft document, anthropogenic disturbances were categorized by project type. However, distance buffers to account for several project specific impacts were not fully developed. The distance buffers and anthropogenic scores for these anthropogenic variables were adjusted to reflect the cited literature. Following are details of the changes made to the appendices.

Appendix B. Anthropogenic Variable: Oil & Gas
Changes made in response to stakeholder comments to the September HQT draft document. Literature citations were reviewed and updated accordingly.

- Added a second metric consistent with the literature to capture winter use and nesting/breeding near a lek. The metric evaluates well pad densities across a large landscape measured as well pad density in all core habitat surrounding the development.
- Expanded the buffer area for the Well Pad Density calculation from 1-km to 3.2-kmdistance from the lek to remain consistent with Doherty 2008.
- The number of wells in the categories identified by Doherty 2008 were used to adjust the Well Pad Density bins and the associated anthropogenic scores. Where the original multi-step HQT Model contained 6 bins for Well Pad Density, the automated HQT Model contains 4 bins.

Appendix C. Anthropogenic Variable: Tall Structures
The Tall Structures section is a new addition to the HQT manual. In the original multi-step HQT Model, Tall Structures were grouped with other generic disturbance types using a default distance buffer of 500-meters and with anthropogenic scores the same as those used for Moderate Roads, Pipelines, and Active Construction Sites.

- The Program conducted a thorough literature review of impacts of Tall Structures on GRSG and found that impacts of Tall Structures extend much further than 500-meters. The literature presented a variety of distances for detection of impacts out to 27km. The Program avoided the extreme values and selected the maximum distance buffer of 14.5-kilometers and adjusted the curve used to determine anthropogenic score accordingly.

Appendix D. Anthropogenic Variable: Transmission Lines
The Program made no changes to the distance buffers for Transmission Lines because the originally defined distance buffers remained valid according to current literature. Editorial changes were made to the section description to better reflect literature findings.

Appendix E. Anthropogenic Variable: Wind Facilities
The Program made no changes to the distance buffers for Wind Facilities because the originally defined distance buffers remained valid according to current literature. No changes were made to the section description.

Appendix F. Anthropogenic Variable: Roads, Railways, and Active Construction Sites
The original multi-step HQT Model combined included Pipelines with the Roads, Railways, and Active Construction Sites disturbance types. Current literature suggests the impacts from Pipelines on GRSG are different from the impacts of Roads, Railways, and Active Construction Sites.

Therefore, the Program excluded Pipelines from this appendix and developed Appendix G to address pipelines, fiber optic cable, and buried utilities.

- Distance buffers and associated Anthropogenic scores remained the same for Roads, Railways, and Active Construction Sites because the originally defined distance buffers remained valid according to current literature. Minimal changes were made to the description for this section.

Appendix G. Anthropogenic Variable: Pipelines, Fiber Optic Cable, and Buried Utilities
The separate Pipelines, Fiber Optic Cable and Buried Utilities section is a new addition to the HQT manual.

The original multi-step HQT Model defined the distance buffers and associated Anthropogenic Scores for Pipelines as the same as for Roads, Railways, and Active Construction Sites. Pipelines, Fiber Optic Cables, and Buried Utilities are temporary linear features so the Program separated these features into their own appendix to allow for greater emphasis on the temporary nature of these disturbance types (there is only a construction phase for these features and no operations phase).

Appendix H. Anthropogenic Variable: Agriculture, Mines and other Large-scale Land Conversion Processes
The distance buffers and associated Anthropogenic Scores were adjusted for Agriculture, Mines, and Other Large-scale Land Conversion Processes to better reflect current literature. Editorial changes were made to the section description to better reflect literature findings.

- Impacts from these features are likely result in lek extirpation when there is greater than 25% land conversion. The number of distance buffer bins was reduced and the Anthropogenic Score for >25% land conversion was changed to 0.

Appendix I. Anthropogenic Variable: Compressor Stations & Other Noise Producing Sources
The distance buffers and associated Anthropogenic scores for Compressor Stations and Other Noise Producing Sources were minimally updated to reflect current research. Editorial changes were made to the description for this section to better reflect literature findings.

- The Anthropogenic Score for the first bin of 0.0 – 0.05-km was updated from 25 to 0. The last distance bin of >450-m was updated to >0.4-km; literature suggests there is no further decline in habitat value beyond 400-m.

UPDATES TO THE HQT TECHNICAL MANUAL

The Program reorganized sections within the HQT manual to make the manual more user friendly. Sections were arranged for quick reference to:

- Montana HQT Basemap: Variable and Methods
- HQT Calculation Process for Credit Providers (new)
- HQT Calculation Process for Developers
- Adaptive Management (new), and
- Limitations of Montana HQT (new).

A summary of method or content changes follows below.

Section 4: HQT Calculation Process for Credit Providers
The September HQT draft did not address how the HQT is used to calculate credits for credit sites. This section was added to the Technical Manual to describe how the HQT model can be used to calculate Functional Acres for preservation, restoration or enhancement projects.

Section 5: HQT Calculation Process for Developers
This section further developed concepts for direct and indirect impacts.

- The section was revised to describe how the HQT calculates Functional Acres lost for a development project and how the HQT basemap is incorporated into the calculations.
- Section 5.3 Hypothetical Development
    - Created hypothetical project examples to represent a diversity of project types. The examples are detailed in Appendix L.

Section 6: Adaptive Management
The September HQT draft did not address how or when data would be updated in the HQT model. This new section describes the adaptive management approach for the Montana HQT and how the HQT components may be revised, replaced and updated.

- Once MSGOT designates the HQT, the Program and entities engaged in the Montana Mitigation System will undertake an annual review. The review will focus on the HQT model's function based on experience from users and questions such as whether new data and science is available that warrants revision of mathematical formulas within the model.
- The HQT model will be updated for website or data maintenance functionality. The HQT Basemap will be updated with the most recent anthropogenic disturbance layer and

incorporating any new credit site data. Other data layers making up the HQT Basemap will be reviewed to determine if they can be upgraded to improve accuracy.

- Once every five years, MSGOT and the Program will undertake a more thorough review. HQT methods and data sources will be thoroughly scrutinized. Because these changes are likely to be more substantive and material, MSGOT will be required to undertake rulemaking to formally designate the new HQT. Independent peer review is required for this major version change. MSGOT may only designate the new HQT after a publicly announced MSGOT meeting and after accepting written and oral comment.

Section 7: Limitations of the Montana HQT
This section is new. It describes the limitations of the HQT model and explains that the HQT is policy neutral and based on continued incorporation of the best available science for sage grouse ecology and habitat.

Section 8: Glossary
A glossary was added to aid the reader with definitions of terms used within the document.

Appendix J, Anthropogenic Variable: Credit Project Habitat Improvement Through Reservation, Restoration or Enhancement.
This appendix is new. It is devoted to restoration and enhancement describing how the model could be used to capture increases in functionality.

Appendix K, Debit Project Habitat Recovery Through Reclamation.
This appendix is new. It is devoted to development project reclamation describing how the HQT model can be used to capture habitat recovery at various stages.

Appendix L, Hypothetical Montana HQT Credit and Debit Project Scenarios
Six hypothetical examples were added to the HQT manual to illustrate how a projects location (General Habitat vs Core Area) can impact the Functional Acre score.

Appendix M: Unsuitable/Excluded Land Cover Types That Are Removed from The Montana HQT Basemap
Appendix A of the September HQT draft included land cover types associated with surface disturbance already accounted for in the existing disturbance layers used for the Second Level Assessment. The table was revised and provided clarification of lands excluded by the EO.

HIGHLIGHTS AND UPDATES TO THE *MITIGATION POLICY GUIDANCE* DOCUMENT VERSION 1.0 ~ MAY 2018

This document provides the key highlights to the *Policy Guidance* document. Where applicable, updates and changes between the July 2017 draft prepared by Willamette Partnership and the May, 2018 draft being considered by MSGOT are specifically mentioned.

SECTION 1: INTRODUCTION AND OVERVIEW OF THE MONTANA MITIGATION SYSTEM

This Section provides a general road map of Montana's mitigation system, including: goals, definition of key terms, participant roles and responsibilities, available mechanisms that can be used to fulfill mitigation obligations, and where mitigation is applicable.

Section 1.0 is largely unchanged from the prior draft. Minor editorial changes were made, and additional information was included to more fully explain concepts. Figures 1.2, 1.3, 1.4 and 1.5 are new additions to the *Policy Guidance* document and will also assist the reader.

Greater emphasis was placed in Section 1.0 and throughout the *Policy Guidance* to use more inclusive language with respect to the U.S. Bureau of Land Management and the U.S Forest Service. The State of Montana and the federal land management agencies take an "all lands, all hands" approach to sage grouse conservation and implementation of mitigation will follow suit.

SECTION 2: FOR CREDIT PROVIDERS: GENERATING CREDITS FOR COMPENSATORY MITIGATION

Section 2 provides all the information necessary for those engaged in developing and marketing credits. Figure 2.1 provides a schematic overview of the life of a credit, from creation to sale and ultimate recording in a registry. Figure 2.1 is a new addition.

Generally, throughout all of Section 2.0, the prior draft did not specifically address the three different types of credit projects: preservation, restoration, and enhancement. These are now described and treated separately, where appropriate, throughout all of Section 2.0. Examples are also provided. Discerning between different types of credit projects is important because the HQT is applied differently, credit providers may have different requirements depending on the type of credit project, credit duration varies with the type of credit project, different policy elements are applicable to preservation vs. restoration / enhancement projects, and because developers need only secure credits for the duration of their impact.

Section 2.1: Proposing a Crediting Project. Describes the process of creating a credit project and basic eligibility requirements. Some additional detail is included specific to the Stewardship Account, but is otherwise unchanged.

Section 2.1.1: Project Additionality and Baseline. This section explains how the principle of additionality (regulatory and financial) is satisfied. It also explains how baseline is determined. This section now more explicitly discusses requirements for each of the three types of credit projects, as follows:

- Preservation credit projects - perpetual conservation easements
  - Credit duration for perpetuity is defined as 100 years
  - Baseline is 65% of the HQT Raw Score when there are no other restoration or enhancement actions undertaken simultaneously because easements preserve remove threats and preserve the status quo but do not create new functional acres.
    - Total credits available in the market is: 35% of the Raw HQT Score x 100 years.
    - Baseline is determined by taking the average percent diminution of value stated in the certified market appraisals of three properties placed under a perpetual easement where the easement was partially funded from the Stewardship Account.

- Preservation Credit Projects - term leases
  - Credit duration is the number of years stated in the term lease agreement.
  - Term leases should be ≥ 15 years, corresponding to the minimum term credit duration
  - Baseline is 65% of the HQT Raw Score when there are no other restoration or enhancement actions undertaken simultaneously because term leases remove threats and preserve the status quo for a shorter, finite period of time, but do not create new functional acres.
    - Total credits available in the market is: .35% of the Raw HQT score x the number of years stated in the lease agreement.
    - Baseline is determined by taking the average percent diminution of value stated in the certified market appraisals of three properties placed under a perpetual easement where the easement was partially funded from the Stewardship Account.

- Restoration and Enhancement Credit Projects
  - Credit duration is the number of years stated in the site projection instrument
  - The site protection instrument should be ≥ 15 years, corresponding to the minimum term credit duration.
  - Baseline is the pre-project Raw HQT Score. The HQT will be re-run at milestone years to predict the functional acre credits created. Site monitoring will determine whether efforts are successful and a phased credit release schedule will follow suit.

2.1.2: Project Duration and Durability

- Minor editorial changes were made.
- Minimum credit duration is defined as 15 years.

2.1.3: Site Selection and Conservation Actions Updates

- All credit sites must be within designated habitats defined as a core area, general habitat, or a connectivity area as defined in 76-22-103 MCA and shown on the map in Executive Order 21-2015 or habitats designated in the U.S. Bureau of Land Management or U.S. Forest Service land use plans. See Figures 1.1 and 1.2.
- Previous drafts of the Policy Guidance did not explicitly address split mineral estates. This draft clarifies that in split estate situations, the mineral estate is dominant. However, habitat

conservation is not mutually exclusive of mineral development, and the two activities can coexist. A Remoteness Review Report is one consideration, among many, as to the appropriateness of developing credits at a particular site. A remoteness review is a matter of due diligence for perpetual conservation easements and will be required for credit sites with Stewardship Account funds. A remoteness report is recommended for third parties who may seek to develop credit sites without funds from the Stewardship Account.

- Other guidance and considerations are largely unchanged from the prior drafts.

2.1.4: Calculating the Functional Acres Gained and Converting to Credits

- This section is new. It provides an important cross walk between the *Habitat Quantification Tool (HQT) Technical Manual* and the *Policy Guidance*. The HQT model determines: (1) the number of functional acres gained as a result of a preservation, restoration, or enhancement action; or (2) the number of functional acres lost as a result of a development project, respectively. A functional acre is a unit of habitat gained or lost, respectively, and which is becomes a credit or debit (e.g. a unit of trade) in a mitigation marketplace. See Figure 2.2, which is also new.
- One functional acre is the equivalent of one credit or one debit, respectively.

2.1.5: Adjustments to Credit Amounts to Incentivize Conservation

- This section is new. It outlines an approach to further incentivize creation of *new* functional acres by increasing the number of credits available from a credit site through the use of a multiplier. Multipliers are included in the Policy Guidance to encourage or discourage activities.
- A multiplier will be applied for *newly-created* functional acres to incentivize conservation actions to restore or enhance habitats, rather than simply preserving the status quo. See Table 2.2. The multiplier varies with the habitat classification, mirroring multipliers in Section 3.0 applied to development projects. Multipliers are as follows:
  - 10% of the new functional acres created in core areas or federal habitat management areas;
  - 5% of the new functional acres created in general habitat or federal general habitat management areas; or
  - 5% of the new functional acres created in connectivity areas.

Sections 2.2 and 2.3: Credit Project Approval and Credit Release

- These sections are largely unchanged from the prior draft.

Section 2.4: Verification, Tracking, and Adaptive Management

- Subsections are largely unchanged from the prior draft.
- This draft includes new language in **Subsection 2.4.3** (What Happens When Performance Standards are Not Being Met). There is new language to clarify that when a land use conflict arises on a credit site due to development of the mineral estate, the reserve account may be used to replace lost or impaired credits, alongside any required reclamation or mitigation required of the mineral estate developer.

SECTION 3: FOR PROJECT DEVELOPERS APPLYING THE MITIGATION SEQUENCE, DETERMINING THE NUMBER OF DEBITS AND ACQUIRING CREDITS.

Section 3 contains all the information necessary for developers. Figure 3.1 provides a schematic overview of the process a project developer would follow to determine a mitigation obligation and obtain the appropriate number of credits. Figure 3.1 is a new addition.

Section 3.1: Proposing a Development Project that will Impact Habitat and Create Debits

- This section contains minor editorial changes for clarify.
- Table 3.1 was revised to provide more explicit information about the types of development projects and typical disturbances that are likely to create a mitigation obligation and for which adherence to the mitigation sequence is required.

Section 3.2: Application of the Mitigation Sequence and Consultation under Executive Order 12-2015

- This section contains a few new introductory paragraphs for context. Montana observes the mitigation hierarchy. Developers are encouraged to be proactive and strategically plan projects to keep mitigation obligations as low as possible.
- Montana is taking a similar approach as Wyoming and incentivizes developers to locate projects on top of existing surface disturbance. Montana also incentivizes consistency with EO 12-2015.
- The general approach will be to apply the HQT to all development projects to determine residual impacts after application of avoidance, minimization, and reclamation. Importantly, by taking advantage of the incentives, developers can make business decisions to keep the number of debits as low as possible.

Section 3.3: Calculating Functional Acres Lost and Converting to Debits

- This section is new, although the concepts here had previously been incorporated into the *HQT Technical Manual*. Key points follow below.
- It provides an important cross walk between the *Habitat Quantification Tool (HQT) Technical Manual* and the *Policy Guidance*. The HQT model determines the number of functional acres lost as a result of a development project, respectively. A functional acre is a unit of habitat (gained or lost, respectively) and which is becomes a credit or debit in a mitigation marketplace (i.e. a unit of trade). See Figure 3.2, which is also new.
- One functional acre is the equivalent of one credit or one debit, respectively. See Figure 3.3
- The HQT results—or the total functional acres lost—can be broken down by direct footprint and the area of indirect effects. See Figure 3.2.
- The HQT results can be further broken down into project phases: construction, operations (usually the permit duration), and reclamation.
- The total number of functional acres lost will depend on the: (1) project location; (2) underlying habitat quality at the site location (direct footprint) and the surrounding area (i.e. the area of indirect effects); (3) project type; (4) project size; (5) project complexity or number of additional disturbances and their characteristics; and (6) project duration.

- HQT results (the Raw Score) will be adjusted through the use of policy multipliers to provide clear, transparent incentives for voluntary conservation. Multipliers will be applied to either the direct footprint and the indirect area or just the indirect area, depending on whether the project is located within existing disturbance.
- If the project is located on top of existing disturbance and does not create new surface disturbance, multipliers are only applied to the indirectly affected area (buffer area around direct footprint).
- If the project creates new surface disturbance, multipliers are applied to the direct footprint plus the indirect area.
- The HQT is policy neutral. However, the multipliers provide transparent policy signals to encourage smart project design and location and incentivize voluntary conservation.

Section 3.3.1: Adjustments to Credit Requirements to Incentivize Voluntary Conservation, Consistency with Executive Order 12-2015, and Ensure Mitigation is Timely and Effective

- This section contains new information. Key points follow below.
- Multipliers are used to adjust the HQT results to incentivize voluntary conservation, encourage consistency with EO 12-2015 and ensure mitigation is timely and effective. Use of multipliers provides a transparent approach to encouraging developers to implement projects with the fewest functional acres lost (or debits) and thus pose the least amount of impact.
- Multipliers are implemented by increasing the number of credits required to offset the number of debits by multiplying the HQT results by a fixed percentage. Developers can consider alternative scenarios during pre-project planning.
- Specific Multipliers are as follows. See Table 3.2.
    - Reserve account to risk and uncertainty: 15% - mandatory, all projects; applied to all project phases.
        - This was increased from 10% to 15% due to address comments about split estate scenarios, the long regeneration time for sage brush, impacts may have been under estimated, or reclamation will not be as successful.
    - Landscape scale to incentivize avoiding sage grouse habitat altogether or locating projects in General Habitat and not a Core Area: mandatory, all projects; applied to all project phases.
        - These did not change: 10% Core Area; 5% General Habitat; 5% Connectivity Habitat.
    - Site specific scale to incentivize consistency with EO 12-2015: mandatory, all projects; approach has been modified.
        - Multiplier only applied to the project's construction and operations phases, not the passive reclamation phase after all infrastructure is removed.
        - Percentage depends on whether the project is located on top of exiting disturbance or creates new surface disturbance.
        - Multiplier is applicable for each deviation from the stipulations in EO 12-2015 and for as long as the project or a project feature deviates.
        - If the project on top of existing disturbance, the multiplier is only applied to the area of indirect effects.

        - If the project creates new disturbance, the multiplier is applied to the direct footprint and the indirect effect area. This incentivizes locating new projects on top of existing disturbance.
        - Percentages are the same: 10% Core Areas; 5% General Habitat; 5% Connectivity Area.
    - No net loss, net gain preferred is the mitigation standard. No multiplier.
        - This is changed from the previous draft which had set the standard as net conservation gain and applied a multiplier to achieve it.
        - A development project must provide at least the same number of functional acre gains as what was lost to obtain a state permit; additional gain is preferred.
        - Federal agencies may require net conservation gain.
    - Advance payment to incentivize developers to try to first obtain credits before making a financial contribution to the Stewardship Account so that mitigation is in place before implementation of the project and impacts occur.
        - Mandatory for any developer who chooses to make a contribution to the Stewardship Account.
        - 10%, regardless of location; applied to the direct footprint area plus the indirect area; applied to all project phases.

Section 3.3.2: Modified Approach to Mitigation Requirements for New Oil and Gas Development in the Cedar Creek Core Area and Elk Basin within the Carbon County Core Area

- This section is new and developed in partial response to comments that mitigation would be cost prohibitive, especially in areas where there is already a lot of existing disturbance and consistency with EO 12-2015 is likely not possible.
- These two areas already had levels of existing disturbance high enough that they could never be consistent with EO.
- There are local residual sage grouse populations in and adjacent to both areas. These local populations are still important for connectivity with birds in North Dakota and Wyoming.
- Mitigation goal in these two areas is to reduce surface disturbance over the long term and maintain residual populations. The approach emphasizes avoidance, minimization, short-term reclamation, and long-term restoration.
- The modified approach similarly provides incentives to locate new projects on top of existing disturbance as follows.
- For new projects located on top of existing disturbance, the HQT will not be applied and there is no compensatory mitigation. However, there are still some requirements and expectations:
    - Developers should provide a plan of development which outlines avoidance/minimization and immediate site reclamation after drilling.
    - Restoration activities should be commensurate with the disturbance and undertaken within the same Core Area (i.e. broader effort than just at the site scale). The intent is to provide developers with flexibility to be creative and effective.
    - Developers are expected to be consistent with the following EO 12-2015 stipulations:
        - Avoid the 0.6 mile no surface occupancy buffer around active leks.
        - Avoid drilling within 2 miles of active leks between March 15-July 15.

        - Avoid discretionary maintenance and production activities 4:00 am – 8:00 am and 7:00 pm – 10:00 pm.
- For projects which create *new* surface disturbance, the HQT will be applied and there is a compensatory mitigation obligation.
    - Developers should provide a plan of development which outlines avoidance/minimization and immediate site reclamation after drilling.

    - The HQT is applied to calculate functional acres lost from the direct footprint and the indirect area. Multipliers are applied as follows:
        - 15% reserve account (risk and uncertainty)
        - 10% landscape scale
        - 10% for deviations from two specific EO 12-2015 stipulations, if applicable:
            - 0.6 mile no surface occupancy area around active leks
            - seasonal restriction March 15-July 15 if the project is located within two miles of active leks
    - Developers will be encouraged to fulfill compensatory mitigation through restoration activities within the same Core Area.

Section 3.4: Four Montana Service Areas and Off-Site Preference

- The prior draft identified three service areas. This draft identifies four service areas. See Figure 3.5. Credits must be obtained from within these four service areas, not from outside the State of Montana.
- There is an expectation that project developers obtain credits or implement permittee-responsible mitigation within the same service area.
- Upon request, MSGOT has discretion to approve use of credits from certain adjacent service areas, as follows:
    - Impacts in the Southeastern Service Area could be offset by credits obtained in the Central Service Area;
    - Impacts in the North Central Service Area could be offset by credits obtained in the Central Service Area.
- MSGOT will more closely scrutinize requests for approval to obtain credits in non-adjacent service areas and a showing of a greater benefit to the species must be demonstrated.
- When insufficient credits are available and a project developer seeks to make a financial contribution to the Stewardship Account, this draft now makes clear that MSGOT will make all efforts to award Stewardship Account grants within the same service area as the impact and within three years of receipt.
- There is no change to the previous draft in stating a preference for off-site mitigation (i.e. credits will be obtained from a location outside the zone of influence of the development project). MSGOT has discretion to approve on-site mitigation when the benefits of actions to preserve, restore, or enhance a site will not be negated by the development project.

Section 3.5: Duration and In-Kind Definition

- This section is largely unchanged from the prior draft.
- Permanent credits are preferred, but term credits may be used so long as the term of the credit is equal to or longer than the duration of impact.
- The minimum duration for a term credit is 15 years.
- Impacts lasting longer than 15 years can be offset by dynamic credits where credits are obtained sequentially over time and for shorter time intervals than the total duration of the project to offset longer term impacts. Dynamic credit (renewable) contracts must be at least 30 years.
- Projects with permanent impacts require permanent credits. Renewable dynamic term credit contracts may be used, but a up to a maximum of 25% of the total permanent credits required. MSGOT approval is required.
- Explicit in-kind mitigation is not required. The HQT already accounts for seasonal habitats.

Sections 3.6, 3.7 and 3.8: Purchasing or Creating Credits, Enforcement, and Implementation, Verification and Tracking

- These sections are largely unchanged from the prior draft.

Section 4: Administration and Adaptive Management

This section lists the responsibilities of various participants in Montana's mitigation system. As of April 2018, MSGOT is the only entity creating credits as no other credit providers have emerged as was anticipated in 2015 when the Stewardship Act was first passed. Therefore, new information is included to provide transparency as to how MSGOT will approach pricing its credits.

Section 4.1: Participant Responsibilities

- This section is largely unchanged from the prior draft.

Section 4.2: Pricing of Credits Created by MSGOT through Stewardship Account Grants and Determining the Average Credit Price for Financial Contributions when Sufficient Credits are Not Available

- This section is new. There is no independent third party who can accept a transfer of credits created by MSGOT using Stewardship Account funds.
- This section is included to provide greater transparency for how the cost of credits created by MSGOT through the Stewardship Account will be determined.
- The same methodology will be used to determine the average price of a credit when developers chose to make financial contributions to the Account.
- For perpetual conservation easements, the price per credit will be the average of the cost of all perpetual easements funded with Stewardship Account funds divided by the average number of functional acre credits created by all perpetual easements that are available after adjusting for baseline. Neutral third-party appraisals will be used to determine the fair market value (and cost) of the development rights purchased.
- For term leases, the price per credit will be the average of the cost of all term leases funded with Stewardship Account funds divided by the average number of functional acre credits created by all

term leases. Credit providers are encouraged to obtain market appraisals of the terms of the lease. In the absence of an appraisal, term credits are priced the same as perpetual easement credits.
- For restoration and enhancement credits, the price will be the total cost of the project divided by the number of credits created.
- Prices will be recalibrated through time.

Section 4.3: Pricing of Credits Created by Third Parties Other than MSGOT
- When Stewardship Account funds are not used to create credits, credit providers and project developers freely negotiate credit prices. MSGOT and the Program are not parties to the transaction and have no say.

Section 4.4: Adaptive Management
- This section is largely unchanged.
- An annual review would be undertaken with stakeholders, agency partners, and interested parties who are participating in the mitigation system. After notice and public comment, MSGOT may make adaptive management updates to Version 1.0 of the *Policy Guidance* document (i.e. Version 1.1).
- A five year, more substantive review would be similarly undertaken. This is likely to result in a new version of the *Policy Guidance* document (i.e. 2.0) and new rulemaking.

SECTION 5: GLOSSARY

This section contains a more complete glossary of terms used in the Policy Guidance document than the prior draft. Terms used in both the *Policy Guidance* and the *HQT Technical Manual* are defined identically. Footnotes are now included to provide a citation to the source of the definition where applicable.

The Glossary also lists and defines acronyms.

SECTION 6: REFERENCES

Section 6 lists references that were reviewed and consulted by the mitigation stakeholders and the Program while specifically developing the *Policy Guidance*. Any changes in this section reflect corrections to the previous draft or inclusion of additional references to make the list more complete. A more exhaustive list of references and peer reviewed scientific literature is included in the *HQT Technical Manual*.

SECTION 7: APPENDICES

Appendix 7.1 lists the activities that are exempt from the consultation requirement of Executive Order 12-2015 and thus exempt from mitigation requirements.

Appendix 7.2 identifies that MSGOT has also granted programmatic exceptions to the consultation requirement at their own discretion. Participants in the mitigation system, particularly developers, should consult with the Program to determine whether an MSGOT programmatic exception applies to their proposed activity.

Appendix 7.3 is a new addition. It provides a narrative description of the boundaries of Montana's Four Service Areas.

PEER REVIEW OF THE *HABITAT QUANTIFICATION TOOL TECHNICAL MANUAL* AND THE *POLICY GUIDANCE* DOCUMENT

Upon the urging and agreement of both the mitigation stakeholders and the Montana Sage Grouse Oversight Team, the Program will solicit independent peer review on the *Habitat Quantification Tool Technical Manual* and the *Policy Guidance* document. Peer review will run concurrent with public comment.

Peer reviewers were solicited in recent weeks. Criteria were developed prior to solicitation. Peer reviewers are identified in the list below. Peer reviewers will be provided with copies of the proposed administrative rules approved by MSGOT, the *Habitat Quantification Tool Technical Manual*, and the *Policy Guidance*. They will not be asked to focus on any particular aspect, but rather to rather confine their reviews within their given area of professional experience and qualifications.

CRITERIA FOR SELECTING PEER REVIEWERS

Reviewers were selected based on the following criteria:

- the individual was not involved in the mitigation stakeholder process which led to these drafts;
- the individual does not have a known vested interest in the outcome or conflict of interest (i.e. poised to become a participant in Montana's mitigation marketplace as an actor who creates credits or debits);
- the individual has a scientific background specific to sage grouse or similar species and sage grouse habitat needs;
- the individual has experience with universal principles of mitigation, and specifically compensatory mitigation;
- the individual has direct experience implementing a mitigation program; and/or
- the individual has direct experience with implementing a state-led sage grouse conservation strategy that includes mitigation.

LIST OF PEER REVIEWERS

1. **Mr. Roger Wolfe and Staff**, of the Western Association of Fish and Wildlife Agencies who work with the Lesser Prairie Chicken Initiative and the Lesser Prairie Chicken Range-wide Conservation Plan. Mr. Wolfe is the Program Manager. The Initiative is a partnership between five states, industry (oil, gas, wind, electricity, and telecommunications), private landowners (farmers and ranchers), NRCS, FSA, Pheasants Forever, and The Nature Conservancy. The Plan brings together the different voluntary conservation programs in the high plains into a common approach to provide for both minimization and mitigation of impacts and conservation of Lesser Prairie Chicken habitat.

   Mr. Wolfe and his staff are responsible for implementing and administering the mitigation framework and metrics system of the Plan. To learn more, visit: https://www.wafwa.org/initiatives/grasslands/lesser_prairie_chicken/.

2. **<u>Ms. Angi Bruce and Staff</u>**, from the Habitat Protection Program, Wyoming Game and Fish Department. Ms. Bruce is the Program's supervisor. The Habitat Protection Program works with the Wyoming Sage Grouse Implementation Team to implement Governor Mead's Executive Order 2015-4. The Wyoming Implementation Team is similar to the Montana Sage Grouse Oversight Team. Ms. Bruce and her staff review proposed development projects in Wyoming's designated sage grouse habitat and also implement Wyoming's Compensatory Mitigation Framework. To learn more, visit: https://wgfd.wyo.gov/Habitat/Sage-Grouse-Management.

3. **<u>Mr. Kelly McGowan</u>**, Program Manager for the Nevada Sagebrush Ecosystem Program / Technical Team. The Team assists the Nevada Sagebrush Ecosystem Council in implementing Nevada's sage grouse conservation and the broader Sagebrush Ecosystem Program. The Council's role is similar to the Montana Sage Grouse Oversight Team. The Council consists of nine members and six ex-officio members first appointed by Governor Sandoval through Executive Order 2012-19 and later formalized in statute.

   In his capacity, Mr. McGowan is the lead staffer for the Council and manages the Technical Team. He integrally involved in implementation of the Nevada Conservation Credit System (CSS). The CSS works to create new incentives to 1) to avoid and minimize impacts to important habitat for species; and, 2) for private landowners and public land managers to preserve, enhance, and restore the ecosystem, while reducing the threat of wildfire to important habitat for species in the ecosystem. It is a market-based mechanism that quantifies conservation outcomes (credits) and impacts from human activities (debits), as market transactions. To learn more, visit: http://sagebrusheco.nv.gov/CCS/ConservationCreditSystem/.

4. **<u>Mr. James Lawrence</u>**, Deputy Director of the Nevada Department of Conservation and Natural Resources. The Department of Conservation and Natural Resources is home to the Sagebrush Ecosystem Program and the Sagebrush Ecosystem Technical Team, and provides staff support for the Council. Mr. Lawrence is also integrally involved in overseeing the Nevada Conservation Credit System for sage grouse and works closely with Mr. McGowan.

5. **<u>Dr. Christian Hagen</u>**, Senior Researcher and Associate Professor in the Fisheries and Wildlife Department at Oregon State University. In addition to his research and university duties, Dr. Hagen serves on the Oregon Sage Grouse and Sagebrush Habitat Conservation Team with the Oregon Department of Fish and Wildlife. He has served on the Western Association of Fish and Wildlife subcommittee focused on developing a multi-tiered approach to monitoring sage grouse populations.

   His research interests focus on evaluating population level responses of species like sage grouse to large-sale conservation efforts and/or habitat perturbations, whether they are natural or anthropogenic. He is presently collaborating in a study of how sage grouse populations have responded to wildfire in the Trout Creek Mountains (northern Nevada / southeastern Oregon) and how sage grouse populations respond to removal of encroaching juniper in the Warner Mountains (northeast California / southcentral Oregon).

6. **<u>Dr. Lance McNew</u>**, Assistant Professor, Department of Animal and Range Sciences, Montana State University. Dr. McNew is the Principal Investigator of the Wildlife Habitat Ecology Lab in the Department of Animal and Range Sciences. The Lab's mission is to prove science-based

research, instruction, and extension that supports ecologically and economically sustainable wildlife conservation and management in working landscapes.

Dr. McNew's research interests include wildlife ecology in agricultural systems, habitat use and spatial ecology, wildlife habitat management, and quantitative approaches to improve resource management. One of his current research projects is investigating seasonal space use, movements, and demography of Greater Sage-grouse in northcentral Montana.

7. **Mr. Pat Byorth**, Director of the Montana Water Project for Trout Unlimited. Mr. Byorth was the founding Board Chairman of Montana Aquatic Resources Services (MARS) and remains active on the Board as a representative of the Executive Committee. MARS is a non-profit organization originally formed for the purpose of sponsoring a statewide in-lieu mitigation program for impacts to streams and wetlands. MARS works with entities needing permits from the Army Corps of Engineers to help them fulfill mitigation obligations through restoration, enhancement, establishment or preservation of wetlands to offset losses. Mr. Byorth is both a scientist and a licensed attorney with extensive experience in aquatic habitat restoration projects, restoration projects, public policy, and compensatory mitigation.

8. **Ms. Lynda Saul**, retired, State Wetland Program Coordinator for Montana Department of Environmental Quality (DEQ). Ms. Saul is a professional wetland scientist and certified floodplain manager. While at DEQ, Ms. Saul was responsible for developing and implementing a statewide wetland protection program involving restoration, mapping, monitoring and assessment, education and outreach, and mitigation tracking. She was also a founding board member of Montana Aquatic Resources Services.

9. **U.S. Geological Survey.** The U.S. Geological Survey (USGS) has a number of experts who have worked extensively on the Greater Sage-grouse and specifically in sagebrush ecosystems. The Program has confirmed that USGS will provide at least one peer reviewer and possibly two from the following three individuals. Mr. Steve Hanser is a Sagebrush Ecosystem Specialist with the USGS Ecosystems Mission Area. Mr. Hanser has been with USGS since 2002 and focuses on coordination and communication of USGS-science related to sage grouse and the sagebrush ecosystem. Dr. Cameron Aldridge is a professor at Colorado State University who works closely with USGS researching the conservation and management of Greater and Gunnison Sage-grouse, with a particular emphasis on population dynamics. Dr. Peter Coates is a biologist with the USGS Western Ecological Research Center. Dr. Coates has been with USGS since 2008 and focuses on studying links between nesting habitat, predator composition, the effects of anthropogenic-resource predator subsidies on the survival and reproduction of predators and how that influences prey population demographics. Dr. Coates most recent research has specifically focused on Greater sage-grouse.

10. **Mr. San Stiver**, Sagebrush Initiative Coordinator, Western Association of Fish and Wildlife Agencies (WAFWA). Mr. Stiver leads WAFWA's efforts to collaborate on Greater Sage-grouse conservation across the eleven western states. The Initiative includes state and federal agencies, as well as other conservation partners. Mr. Stiver has been a lead author of several pivotal reports and assessments of the status of sage grouse populations. He retired from Nevada Division of Wildlife after 30 years of service working on sage grouse as both a field biologist and researcher.

MONTANA SAGE GROUSE OVERSIGHT TEAM AGENDA ITEM BRIEF SHEET
MAY XX, 2018

AGENDA ITEM: PROPOSED ADMINISTRATIVE RULES TO ADOPT THE *DRAFT MITIGATION HQT TECHNICAL MANUAL* AND THE *DRAFT MITIGATION GUIDANCE DOCUMENT*

ACTION NEEDED: TAKE EXECUTIVE ACTION TO INITIATE ADMINISTRATIVE RULEMAKING TO DESIGNATE THE HABITAT QUANTIFICATION TOOL (HQT), ADOPT THE *DRAFT HQT TECHNICAL MANUAL,* ADOPT THE *DRAFT POLICY GUIDANCE DOCUMENT*, AND TO PROMULGATE OTHER MISCELLANEOUS RULES NECESSARY TO FULFILL OTHER STATUTORY DUTIES RELATED TO THE STEWARDSHIP ACCOUNT AND MITIGATION

SUMMARY:

The 2015 Montana Legislature passed the Montana Greater Sage Grouse Stewardship Act (Act). Executive Order 12-2015 complements the Act. Taken together, they establish that Montana will observe the mitigation hierarchy or sequence (avoidance, minimization, reclamation, and compensation) with respect to activities subject to agency review, approval, or authorization in habitats designated as core areas, general habitat, and connectivity areas for sage grouse conservation.

The Act specifically sets forth that: (1) project developers can offset the loss of resource functions or values at an impact or project site through compensatory mitigation to incentivize voluntary conservation measures for sage grouse habitat and populations; (2) a habitat quantification tool will be designated to evaluate vegetation and environmental conditions related to the quality and quantity of sage grouse habitat and to calculate the value of credits and debits when compensatory mitigation is required; (3) there shall be a method to track and maintain the number of credits and debits available and used; and (4) there shall be a method to administer review and monitoring of projects funded through the Stewardship Account. MSGOT has authority to adopt administrative rules to implement these statutory provisions.

MITIGATION: *HQT TECHNICAL MANUAL*, HQT DESIGNATION, AND *POLICY GUIDANCE DOCUMENT*

The proposed rules would have MSGOT and the Program implement the *Mitigation Habitat Quantification Tool Technical Manual* and the *Mitigation Policy Guidance* documents. The *Technical Manual* describes the methods and processes used to evaluate the quality and quantity of habitat affected by development or conservation actions, respectively. If ultimately adopted, rules pertaining to the *Technical Manual* would have the same effect as designating the Habitat Quantification Tool (HQT).

The proposed rules would also direct MSGOT to implement the *Policy Guidance* document. The *Policy Guidance* document describes the methods and processes for how the HQT results are applied by MSGOT, the Program, developers, private landowners, and others participating in Montana's mitigation market place.

More specifically, the proposed rules describe the process that MSGOT and the Program will use to administer the mitigation system through time. Adaptive management is a core principle for continuous improvement. Both the proposed rules and the documents contain specific sections about how MSGOT will adaptively manage the review and update of the HQT, the *Habitat Quantification Tool Technical Manual* and the *Mitigation System Policy Guidance*. Both the proposed rules and the documents have sections specifically devoted to adaptive management.

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The *HQT Technical Manual* and the *Policy Guidance* document will each undergo an annual review involving stakeholders, agency partners, and others participating in the mitigation system. After the annual review, MSGOT could make changes to the documents, but only after notice and public comment and during a publicly-announced MSGOT meeting. Changes anticipated on an annual basis include: updating spatial data layers, refining methodologies, and the HQT base map (update anthropogenic disturbance layer and incorporate new credit site data). MSGOT and the Program may also consider updates to incorporate new science. Mitigation would also be addressed in the Program's annual reports.

Every five years, a more substantive review will occur. Methods and data sources will be thoroughly evaluated. The five-year review could yield significant changes. If so, the outcome would be development of a new, subsequent version of the *HQT Technical Manual* and *Policy Guidance*, which in turn triggers new rulemaking. Changes would only be undertaken after notice and comment through publicly-announced MSGOT meetings and in a collaborative spirit with participants engaged in mitigation.

MSGOT is free to initiate rulemaking at intervals shorter than five years

Both the *Technical Manual* and the *Policy Guidance* draw heavily from outcomes of a diverse stakeholder process that included many meetings, conference calls and webinars between September 2016 and October of 2017. Multiple drafts of each document were provided to stakeholders for review and comment over the course of a year. A copy of each document was provided to MSGOT for an initial review during the June 2, 2017 MSGOT meeting. Additionally, MSGOT was provided with copies of stakeholder comments and a summary table identifying the remaining key, unresolved stakeholder issues related to the *Policy Guidance* document and the spectrum of opinion.

The stakeholders recognize that MSGOT will ultimately have to decide issues on which they could not agree. Unresolved issues are primarily found in the *Policy Guidance*. The Program conducted additional individual outreach with stakeholders to solicit ideas after the PowerPoint presentations during MSGOT meetings on December 15, 2017 and January 30, 2018.

The stakeholder process benefited greatly by the involvement of professional collaborators who worked directly with mitigation stakeholders who had initially drafted both the *HQT Technical Manual* and the *Policy Guidance* document. Final stakeholder drafts were provided to the Program in July and October 2017, respectively. Between October and December 2017, the DNRC Office of Information Technology (OIT) staff worked with the Program to write the actual computer code to run the HQT model, which heretofore had only been described in an earlier draft of the *Technical Manual*.

Both the Program and mitigation stakeholders believed and agreed that it would be prudent to test the HQT using a variety of hypothetical projects. The results were shown to MSGOT and others during MSGOT meetings held on December 15, 2017 (HQT focused) and January 30, 2018 (how HQT and the *Guidance* document work together).

Stakeholders and the public were afforded another opportunity to provide written comment on meeting materials and the PowerPoint presentations shown during the December 15, 2017 and January 30, 2018 MSGOT meetings. Those comments were due by February 9, 2018, and provided to MSGOT by separate postal mailing. They were also included in the Meeting Notes archive on MSGOT's webpage.

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Testing the HQT using hypothetical projects proved valuable. DNRC OIT staff could more clearly understand what the HQT is supposed to do, determine about how best to write the computer code, incorporate automation to avoid human error, and suggest improvements. Additionally, the Program was spurred to think more deeply about the unresolved issues by studying the results. Some suggestions were presented and discussed during the January 30, 2018 meeting.

The draft documents being considered by MSGOT for proposed rulemaking not only reflect the stakeholders' discussion, they also reflect the work of DNRC OIT and the Program since October 2017. After working through the hypotheticals, considering stakeholders' diverse viewpoints, reviewing the scientific peer reviewed literature, MSGOT's discussions, and much thought, today's documents are put forth by the Program and represent a reasonable path forward. As importantly, the documents reflect a clear, transparent, consistent and predictable approach to mitigation for everyone, including MSGOT and the Program.

If MSGOT approves the proposed rules and accompanying documents for rulemaking, they will be available for wider public scrutiny and comment. To date, only the mitigation stakeholders and agency partners have done so. Wider public comment will help identify strengths, weaknesses, and new ideas that eluded stakeholders, MSGOT, and the Program to date.

Concurrent with public comment, the documents would be provided to a pre-determined list of peer reviewers. Reviewers were selected based on the following criteria:

- the individual was not involved in the stakeholder process which led to these drafts;
- the individual does not have a known vested interest in the outcome or conflict of interest (e.g. poised to become a participant in Montana's mitigation marketplace as an actor who creates credits or debits);
- the individual has a scientific background specific to sage grouse or similar species and sage grouse habitat needs;
- the individual has experience with universal principles of mitigation, and specifically compensatory mitigation; and/or
- the individual has direct experience implementing a mitigation program; and/or
- the individual has direct experience with implementing a state-led sage grouse conservation strategy that includes mitigation.

OTHER MISCELLANEOUS PROPOSED RULES OR AMENDMENTS

MSGOT has previously promulgated some administrative rules for oversight and administration of the Stewardship Account. Some definitions have also been adopted. Amendments are proposed to incorporate new definitions and to amend Rule 14.6.102 to clarify that MSGOT shall give greater priority for funding to applications for conservation activities that would be implemented in core areas, which the Legislature has already defined in the Act as having "the highest conservation value for sage grouse." MCA 76-22-104(3).

Under the proposed amendment, MSGOT could still consider funding conservation activities in general habitat where high sage grouse values exist and credits could be generated. MSGOT is already statutorily directed to prioritize proposals that maximize the amount of credits generated per dollars of funds awarded and that the majority of the Stewardship Account must be awarded to proposals that generate credits available for compensatory mitigation. The proposed amendments clarify and implement statutory direction.

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A new rule is proposed that addresses the statutory requirement to track and maintain the number of credits and debits available from projects funded with Stewardship Account funds and that are available for purchase. 76-22-104(3), MCA.

Lastly, a new rule is proposed that addresses methods to administer the review and monitoring of MSGOT-funded projects. 76-11-104(5), MCA.

PROCEDURES AND NEXT STEPS

If MSGOT approves the proposed rule amendments and new rules presented in draft narrative form today, the Program, with assistance from the DNRC Legal Unit, would file them with the Montana Secretary of State's Office at the next available filing opportunity. Publication in the Montana Administrative Register would occur two weeks later. The public comment process would begin upon publication in the Montana Administrative Register.

If desired, the Program would be happy to organize and host a workshop to provide interested parties an opportunity to develop a deeper understanding of the *HQT Technical Manual* and the *Policy Guidance*. This would allow interested parties to provide more meaningful comments.

The Program scheduled three public hearings: June 28 in Roundup, June 29 in Malta, and July 9 in Dillon. Public comment will be accepted orally and in writing during the hearings. Public comment will also be accepted in writing through the postal mail or by fax. The public can also submit comments through the public comment web application tool located on the MSGOT webpage at https://sagegrouse.mt.gov/msgot.html. The public comment period would close July 10, 2018 at 11:59 p.m.

Depending on public and peer review comments, the Program would potentially make changes to both the documents and proposed rules. MSGOT would be poised to consider whether to adopt final administrative rules during the September 14, 2018 meeting.

PROGRAM RECOMMENDATION:

The Program Manager recommends MSGOT take executive action to initiate administrative rulemaking. Proposed rules would designate the Habitat Quantification Tool (HQT), adopt the *Draft HQT Technical Manual,* adopt the *Draft Policy Guidance* document, describe the process and methods MSGOT would use to adaptively manage the mitigation system, and address other miscellaneous statutory duties related to the Stewardship Account grants and mitigation.

BEFORE THE GOVERNOR'S OFFICE
OF THE STATE OF MONTANA

In the matter of the amendment of ARM 14.6.101 and 14.6.102 and adoption of New Rules I, II, III, and IV, pertaining to implementation of the Greater Sage-Grouse Stewardship Act	)))))	NOTICE OF PUBLIC HEARINGS ON PROPOSED AMENDMENT AND ADOPTION

TO: All Concerned Persons

1. The Sage Grouse Habitat Conservation Program will hold three public hearings at the following dates and times to consider the proposed amendment and adoption of the above-stated rules:

1:00 p.m. on June 28, 2018, Ambulance Barn, 34 3rd Avenue West, Roundup, MT 59072;

1:00 p.m. on June 29, 2018, 1st State Bank Conference Room, 1 south 1st Street East, Malta, MT, 59538;

1:00 p.m. on July 9, 2018, Bureau of Land Management Dillon Field Office, 1005 Selway Drive, Dillon, MT 59725-9431.

2. The Governor's Office will make reasonable accommodations for persons with disabilities who wish to participate in this rulemaking process or need an alternative accessible format of this notice. If you require an accommodation, contact the Governor's Office no later than 5:00 p.m. on June 1, 2018, to advise us of the nature of the accommodation that you need. Please contact Carolyn Sime, Sage Grouse Habitat Conservation Program Manager, Montana Sage Grouse Oversight Team, c/o Department of Natural Resources and Conservation, P.O. Box 201601, Helena, MT 59620-1601; telephone (406) 444-0554; fax (406) 444-6721.

3. The rules proposed to be amended are as follows, stricken matter interlined, new matter underlined:

14.6.101 DEFINITIONS Unless the context clearly requires otherwise, to aid in the implementation of the Montana Greater Sage-Grouse Stewardship Act and as used in these rules:

(1) "Adaptive Management" means the structured dynamic process of addressing uncertainty of management outcomes through the incorporation of procedures that seek to periodically review, revise, and update tools, strategies, and approaches in response to changes, conditions, or new information. Adaptive management also includes a commitment to change approaches and processes when appropriate and necessary.

(2) "Additionality" means that the conservation benefits of a conservation action or measure that improve upon the baseline condition of the impacted species or its habitat in a manner that is demonstrably new and would not have occurred without the pre-listing conservation action.

(1) and (2) remain the same but are renumbered (3) and (4)

(5) "Durability" means the maintenance of the effectiveness of a mitigation measure and/or a compensatory mitigation site for the duration of the impacts from the associated development or land use, including resource, administrative, and financial considerations

(6) "HQT" means Habitat Quantification Tool, a geo-spatial based application designed to implement 76-22-103(9), MCA, as documented in the Montana Mitigation System Habitat Qualification Tool Technical Manual for Greater Sage-Grouse.

(3) remains the same but is remembered (7)

(8) "Mitigation Sequence" means taking steps to:

(a) avoid impacts by not taking a certain action or parts of an action;

(b) minimize impacts by limiting the degree or magnitude of the action and its implementation;

(c) rectify impact by repairing, rehabilitating, or restoring the affected environment;

(d) reduce or eliminate the impact over time by preservation and maintenance operations during the life of the action; and

(e) compensate for impact by replacing or providing substitute resources or environments.

(9) "Mitigation System" is step (9)(e) in the mitigation sequence.

(10) "Montana Mitigation System Habitat Qualification Tool Technical Manual for Greater Sage-Grouse" describes the scientific methods used to evaluate vegetation and environmental conditions related to the quality and quantity of sage grouse habitat.

(11) "Montana Mitigation System Policy Guidance for Greater Sage-Grouse" describes the policies, procedures, and methods of the Mitigation System to quantify and calculate the value of credits and debits.

(4) and (5) remain the same but are renumbered (12) and (13)

(14) "Program" means Montana Sage Grouse Habitat Conservation Program.

(15) "Version" is a means to track revisions to the Montana Mitigation System Habitat Quantification Tool Technical Manual for Greater Sage-Grouse or Montana Mitigation System Policy Guidance for Greater Sage-Grouse.

AUTH: 76-22-104, MCA
IMP: 76-22-105, 76-22-109, 76-22-110, 76-22-112, 76-22-118, MCA

REASONABLE NECCESITY: Compliance with the requirements of SB 261 (Session Laws of Montana 2015, Chapter No. 445, Section 2, codified at 76-22-101, et seq. MCA) required MSGOT to adopt additional rules regarding compensatory mitigation. Additional definitions are needed to clarify terms in these additional rules.

14.6.102 GRANTS (1) through (8) remain the same.

(9) MSGOT will give greater priority to applications for conservation activities eligible for funding under 76-22-110, MCA, which would be implemented in core areas. MSGOT may still consider funding conservation activities in general habitat and connectivity areas where high resource values for sage grouse exist and credits could be generated consistent with 76-22-109, MCA.

AUTH: 76-22-104, MCA
IMP: 76-22-105, 76-22-109, 76-22-110, 76-22-112, 76-22-118, MCA

REASONABLE NECCESITY: Compliance with the requirements of SB 261 (Session Laws of Montana 2015, Chapter No. 445, Section 2, codified at 76-22-101, et seq. MCA) required MSGOT to adopt rules to "administer . . . the eligibility and evaluation criteria for grants distributed pursuant to 76-22-110." This amendment also provides flexibility for MSGOT by allowing MSGOT to consider funding projects in areas outside of core if high resource values for sage grouse can be protected.

4. The rules proposed to be adopted provide as follows:

NEW RULE I HABITAT QUANTIFICATION TOOL DESIGNATION

(1) MSGOT shall designate the initial version of the Montana Mitigation System Habitat Quantification Tool Technical Manual for Greater Sage-Grouse "Version 1.0" at a publicly announced MSGOT meeting, and after accepting written and oral public comment.

(2) MSGOT shall re-designate the Montana Mitigation System Habitat Quantification Tool Technical Manual for Greater Sage-Grouse every five years to ensure it is consistent with the best available science. Versions of the Montana Mitigation System Habitat Quantification Tool Technical Manual for Greater Sage-Grouse designated after five-year reviews will increase incrementally in whole numbers, e.g.,"1.0, 2.0, etc."

(a) The first review of the Montana Mitigation System Habitat Quantification Tool Technical Manual for Greater Sage-Grouse will take place within five years after the date of its designation by MSGOT, concurrent with review of the Policy Guidance.

(b) MSGOT may only make changes to the designated Montana Mitigation System Habitat Quantification Tool Technical Manual for Greater Sage-Grouse after a publicly announced MSGOT meeting, and after accepting written and oral public comment.

(c) MSGOT may review and change its designated Montana Mitigation System Habitat Quantification Tool Technical Manual for Greater Sage-Grouse more frequently than once every five years if MSGOT believes the HQT's methodology requires revision so as to be consistent with the best available science, or MSGOT and the Program believe improved methodologies or new data are available for incorporation into the Montana Mitigation System Habitat Quantification Tool Technical Manual for Greater Sage-Grouse based on an annual adaptive management review. Versions of the Montana Mitigation System Habitat Quantification Tool Technical Manual for Greater Sage-Grouse designated between the required five-year review will be increased in tenths of whole numbers, e.g., "1.1, 1.2, etc."

(3) Once the HQT has been applied to calculate the credits of a proposed mitigation site, or the debits of a proposed development site; the Program has completed its review; and the Project developer obtains the necessary state or federal permits, any subsequent version of the HQT will not apply.

(a) Once the HQT has been applied to calculate credits or debits, the number of calculated credits or debits will not be changed without written approval from all affected parties, including, but not limited to:

(i) MSGOT;

(ii) the project developer;

(iii) the credit provider; and

(iv) any affected third parties.

(b) Permit amendments will be subject to the HQT version applied to calculate debits at the development site at the time of the original permit.

(4) The current version of the MSGOT designated Montana Mitigation System Habitat Quantification Tool Technical Manual for Greater Sage-Grouse will be made available to the public on the Program's web site as soon as possible after designation by MSGOT. Past versions of HQT will be blocked from further use except as allowed in (3)(b) and preserved in archive by the Program.

(5) Any other entities engaged in sage grouse compensatory mitigation in Montana, including a U.S. Fish and Wildlife Service-approved habitat exchange that receives credits transferred by MSGOT, or funding from the Greater Sage-Grouse Stewardship special revenue account, must apply the most recent HQT version described in the Montana Mitigation System Habitat Quantification Tool Technical Manual for Greater Sage-Grouse designated by MSGOT.

AUTH: 76-22-104, MCA
IMP: 76-22-105, 76-22-109, 76-22-110, 76-22-111, 76-22-112, 76-22-113, 76-22-114, 76-22-118, MCA

REASONABLE NECESSITY: This rule is reasonably necessary for MSGOT to comply with the requirements of SB 261 (Session Laws of Montana 2015, Chapter No. 445, Section 2, codified at 76-22-101, et seq. MCA) which requires MSGOT to: "adopt rules to administer…the designation of a habitat quantification HQT." This rule partially implements the requirements of that bill. This rule does not expressly dictate the outcome of Adaptive Management.

NEW RULE II Compensatory Mitigation System (1) The mitigation sequence is applicable to all activities within sage grouse core areas, general habitat and connectivity habitat subject to agency review, approval, or authorization including temporal impacts that are later rectified through reclamation and restoration activities, unless exempted by MSGOT.

(2) MSGOT shall designate Montana's compensatory mitigation system in a document titled Montana Mitigation System Policy Guidance for Greater Sage-Grouse. MSGOT shall designate the initial version of the Montana Mitigation System Policy Guidance for Greater Sage-Grouse "Version 1.0" at a publicly announced MSGOT meeting and after accepting written and oral public comment.

(3) The first review of the Montana Mitigation System Policy Guidance for Greater Sage-Grouse will take place within five years after the date of its designation by MSGOT, concurrent with the five-year review of the Montana Mitigation System Habitat Quantification Tool Technical Manual for Greater Sage-Grouse. Versions of the Montana Mitigation System Policy Guidance for Greater Sage-Grouse designated after five-year reviews will increase incrementally in whole numbers, e.g., "1.0, 2.0, etc."

(4) MSGOT may only make changes to the Montana Mitigation System Policy Guidance for Greater Sage-Grouse after a publicly announced MSGOT meeting and after accepting written and oral public comment.

(5) MSGOT may make changes to its Montana Mitigation System Policy Guidance for Greater Sage-Grouse more frequently than once every five years if MSGOT believes the document requires revision to incorporate changes to the Montana Mitigation System Habitat Quantification Tool Technical Manual for Greater Sage-Grouse, to be consistent with the best available science, or when improved methodologies or data are available based on an annual adaptive management

review. Versions of the Montana Mitigation System Policy Guidance for Greater Sage-Grouse designated between the required five year review will be increased in tenths of whole numbers, e.g., "1.1, 1.2, etc."

(6) Once the Montana Mitigation System Policy Guidance for Greater Sage-Grouse has been applied to calculate the credits of a proposed mitigation site, or the debits of a proposed development site; the Program has completed its review; and the Project developer obtains the necessary state or federal permits, any subsequent version of the Montana Mitigation System Policy Guidance for Greater Sage-Grouse will not apply.

(7) Once the Montana Mitigation System Policy Guidance for Greater Sage-Grouse has been applied to calculate credits or debits:

(a) the number of calculated credits or debits will not be changed without written approval from all affected parties, including, but not limited to:

(i) MSGOT;

(ii) the project developer;

(iii) the credit provider; or

(iv) any affected third parties; and

(b) permit amendments will be subject to the Montana Mitigation System Policy Guidance for Greater Sage-Grouse applied to calculate debits at the development site at the time of the original permit.

(8) MSGOT or any other third party shall use the Montana Mitigation System Policy Guidance for Greater Sage-Grouse for the following:

(a) a conservation bank;

(b) participation in a habitat credit exchange approved by USFWS;

(c) making a financial contribution to the Sage Grouse Stewardship Account if sufficient credits are not available; or

(d) implementing stand-alone mitigation actions to offset impacts to sage grouse habitat.

(9) Through the Montana Mitigation System Policy Guidance for Greater Sage-Grouse described in (2), (3), or (5), MSGOT may incentivize or discourage specific practices in particular locations by adjusting the value of credits or debits generated by those practices. Some variables that may drive adjustments include, but are not limited to:

(a) a transparent method to adjust credits or debits to ensure no net loss of habitat;

(b) incorporating ratios or multipliers that are intended to incentivize avoidance of important areas, incentivize voluntary conservation and landowner stewardship;

(c) durability of habitat benefits to match or exceed the duration of habitat impacts; and

(d) ensuring additionality.

(10) MSGOT will authorize and approve compensatory mitigation plans that involve sage grouse habitat restoration, habitat enhancement, or habitat preservation through participation in one or more of the following:

(a) a conservation bank;

(b) participation in a habitat credit exchange;

(c) making a financial contribution to the sage grouse stewardship account if sufficient credits are not available; or

(d) funding stand-alone mitigation actions to offset impacts to sage grouse habitat.

(11) All compensatory mitigation plans involving habitat restoration, enhancement, or preservation, and approved by MSGOT, must:

(a) meet the same standards provided in Montana Mitigation System Policy Guidance for Greater Sage-Grouse;

(b) be consistent with applicable U.S. Fish and Wildlife Service Greater Sage-Grouse policies; and

(c) apply the most recent version of the HQT that implements the Montana Mitigation System Habitat Quantification Tool Technical Manual for Greater Sage-Grouse designated by MSGOT.

(12) The current version of Montana Mitigation System Policy Guidance for Greater Sage-Grouse will be made available to the public on the Program's website following designation by MSGOT. Past versions of designated Montana Mitigation System Policy Guidance for Greater Sage-Grouse will be preserved by the Program.

(13) Research or education shall not be used to fulfill mitigation sequence obligations.

AUTH: 76-22-104, MCA
IMP: 76-22-105, 76-22-109, 76-22-110, 76-22-111, 76-22-112, 76-22-113, 76-22-114, 76-22-118, MCA

REASONABLE NECESSITY: This rule is reasonably necessary for MSGOT to comply with the requirements of SB 261 (Session Laws of Montana 2015, Chapter No. 445, Section 2, codified at 76-22-101, et seq. MCA) which requires MSGOT to: "adopt rules to administer…methods of compensatory mitigation available…". This rule partially implements the requirements of that bill. This rule does not expressly dictate the outcome of Adaptive Management.

NEW RULE III METHOD TO TRACK AND MAINTAIN THE NUMBER OF CREDITS AND DEBITS AVAILABLE AND USED (1) MSGOT or its designee shall assign a unique identifier for each credit created through funds disbursed from the Sage Grouse Stewardship special revenue account.

(2) MSGOT or its designee shall assign a unique identifier for each credit created through conservation activities funded or implemented independently from the Sage Grouse Stewardship special revenue account.

(3) MSGOT or its designee shall assign a unique identifier for each debit created by a project developer.

(4) MSGOT or its designee shall establish a database and tracking system that contains, but is not limited to:

(a) the number of credits generated by conservation activities funded, at least in part, by funds disbursed from the Sage Grouse Stewardship special revenue account;

(b) the number of credits generated by conservation activities not funded through the Sage Grouse Stewardship special revenue account and approved by MSGOT for use as compensatory mitigation by project developers;

(c) the number of debits attributed to a development project;

(d) the location of all credits generated and debits generated; and

(e) credit transactions between parties.

(5) The information within the tracking system will be available to the public on the Program's web site.

AUTH: 76-22-104, MCA
IMP: 76-22-104, 76-22-105, 76-22-109, 76-22-110, 76-22-111, 76-22-112, 76-22-118, MCA

REASONABLE NECESSITY: This rule is reasonably necessary for MSGOT to comply with the requirements of SB 261 (Session Laws of Montana 2015, Chapter No. 445, Section 2, codified at 76-22-101, et seq. MCA) which requires MSGOT to: (1) "adopt rules to administer…a method to track and maintain the number of credits attributable to projects funded . . . that are available to a project developer to purchase for compensatory mitigation to offset debits under 67-22-111;" (2) "adopt rules to administer . . . review and monitoring or projects funded pursuant to [Part 1]; (3) "review compensatory mitigation plans proposed under 76-22-111. If the plan includes a financial contribution to the sage grouse stewardship account established in 76-22-109, the oversight team will, using the HQT, determine how to secure enough credits with the financial contribution to offset the debits of a project." This rule partially implements the requirements of that bill.

NEW RULE IV METHOD TO ADMINISTER THE REVIEW AND MONITORING OF MSGOT FUNDED PROJECTS (1) MSGOT through the Program will establish a database and tracking system to review and monitor projects funded by MSGOT using the Sage Grouse Stewardship special revenue account.

(2) The database and tracking system shall contain information including, but not limited to:
(a) the name of the Stewardship Fund grant recipient(s);
(b) the amount awarded;
(c) the date the state funds were transferred to the grant recipient(s) if a one-time lump sum grant, or
(d) the dates state funds were transferred to the grant recipient(s) if the award was a reimbursable grant;
(e) a description of characteristics of the project including, but not limited to:
(i) type of project;
(ii) number of acres; and
(iii) land ownership;
(f) the duration of the project;
(g) any expected conservation benefits of the project;
(h) the geospatial location where the project was implemented;
(i) the number of credits generated, and their characteristics;
(j) the unique identifier assigned to each of those credits;
(k) transactions of credits created;
(l) progress and final reports submitted by the grant recipient(s);
(m) annual monitoring reports in the case of conservation easements or leases;
(n) sage grouse leks on and in the vicinity of the project area, and trend data on the number of breeding males on those leks; and
(o) the grant agreement number assigned by the Program.

AUTH: 76-22-104, MCA
IMP: 76-22-104, 76-22-105, 76-22-109, MCA

REASONABLE NECESSITY: This rule is reasonably necessary for MSGOT to comply with the requirements of SB 261 (Session Laws of Montana 2015, Chapter No. 445, Section 2, codified at 76-22-101, et seq. MCA) which requires MSGOT to: (1) "adopt rules to administer…the review and monitoring of projects funded." This rule partially implements the requirements of that bill.

5. Concerned persons may submit their data, views, or arguments either orally or in writing at the hearing. Written data, views, or arguments may also be submitted to: Carolyn Sime, Sage Grouse Habitat Conservation Program Manager, Montana Sage Grouse Oversight Team, c/o Department of Natural Resources and Conservation, P.O. Box 201601, Helena, MT 59620-1601; telephone (406) 444-0554; fax (406) 444-6721; or through the public comment web application HQT located on the MSGOT web page at https://sagegrouse.mt.gov/msgot.html. All comments must be received no later than 11:59 p.m. July 10, 2018.

6. Carolyn Sime, Sage Grouse Habitat Conservation Program Manager, Montana Sage Grouse Oversight Team, has been designated to preside over and conduct these hearings.

7. The Governor's Office maintains a list of interested persons who wish to receive notices of rulemaking actions proposed by this agency. Persons who wish to have their name added to the list must make a written request that includes the name, e-mail, and mailing address of the person to receive notices and specifies for which program the person wishes to receive notices. Notices will be sent by e-mail. Such written request may be mailed or delivered to the Natural Resource Policy Advisor, P.O. Box 200801, 1301 East Sixth Avenue, Helena, MT 59620; fax (406) 444-4151; or may be made by completing a request form at any rules hearing held by the Governor's Office.

8. An electronic copy of this proposal notice is available through the Secretary of State's web site at http://sos.mt.gov/ARM/Register. The Secretary of State strives to make the electronic copy of the notice conform to the official version of the notice, as printed in the Montana Administrative Register, but advises all concerned persons that in the event of a discrepancy between the official printed text of the notice and the electronic version of the notice, only the official printed text will be considered. In addition, although the Secretary of State works to keep its web site accessible at all times, concerned persons should be aware that the web site may be unavailable during some periods, due to system maintenance or technical problems.

9. The bill sponsor contact requirements of § 2-4-302, MCA, apply and have been fulfilled. The primary bill sponsor was contacted by e-mail and postal mail on May XX, 2018.

10. With regard to the requirements of 2-4-111, MCA, the department has determined that the amendment and repeal of the above-referenced rules may directly impact small businesses. Documentation of the MSGOTs above-stated determination is available upon request to, Sage Grouse Habitat Conservation Program Manager, Montana Sage Grouse Oversight Team, c/o Department of Natural Resources and Conservation, P.O. Box 201601, Helena, MT 59620-1601, or to csime2@mt.gov.

/s/ ______________________________
Raphael Graybill
Rule Reviewer

/s/ ________________________
Patrick Holmes
Natural Resource Policy Advisor
Governor's Office

Certified to the Secretary of State May XX, 2018