Big game winter range and migration prioritization process across Blaine, Phillips & Valley Counties: A final report to target on-the-ground implementation

Photo: A. Jakes

In conjunction with the National Fish & Wildlife Foundation Secretarial Order #3362 Implementation Grant, "Where the antelope roam: connecting landscapes for ranching and wildlife in north-central Montana"

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Background

The Department of Interior Secretarial Order #3362, was signed in early February 2018 by Secretary Ryan Zinke, for the purpose of improving habitat quality in western big-game winter range and migration corridors. The vision was to have state identified priority big-game (i.e., elk, deer, and pronghorn) winter-range, stopover, and migration corridors protected, conserved, and/or well managed, to help sustain robust herds across 11 western states. These states include Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington and Wyoming. Each state wildlife agency then identified their top 3-5 priority migration corridor, stopover, or winter range areas across all lands and their top 2-3 priority research needs to fill data gaps in identifying those important areas.

In Montana, 4 priority areas were identified in the 2018 Montana Action Plan, including "Area D – Canadian Border to the Musselshell Plains", a six-county, 16-million acre landscape (Figure 1).

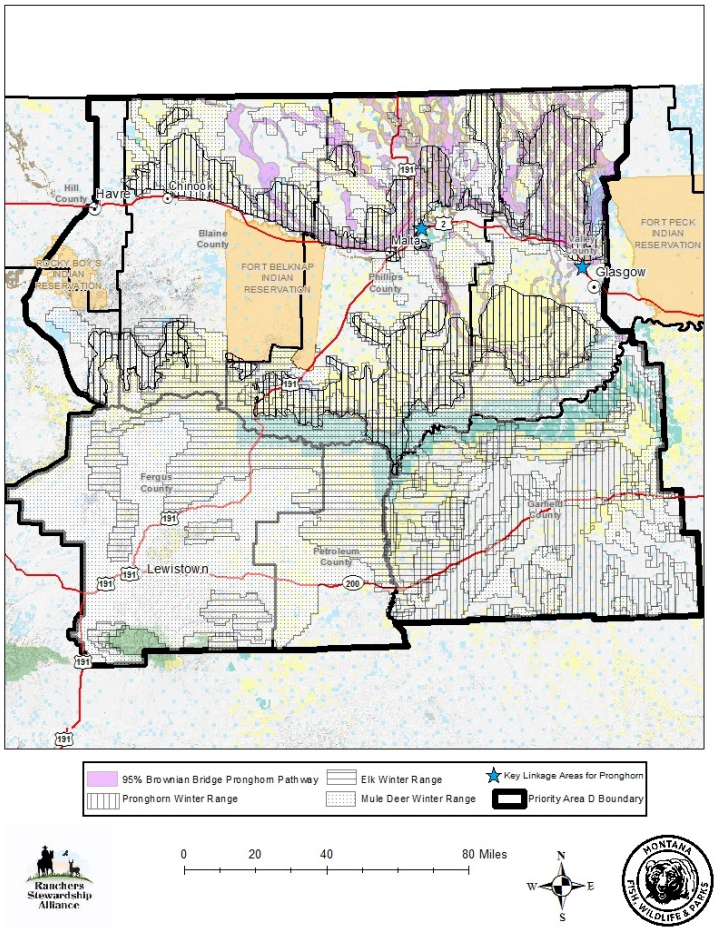


Figure 1. Draft targeting map for big game projects in Montana's "Area D". Pink shows corridors of highest importance to pronghorn migratory connectivity (data north of Missouri River only). Critical winter range for pronghorn, elk and deer are shown as vertical bars, horizontal bars, and stipple, respectively. BLM land is shown in yellow, NWR lands are shown in light green.

Within each of these 4 designated priority areas, a call for on-the-ground projects was requested to benefit big game winter range and migration habitats. Funding for these implementation projects would come from National Fish & Wildlife Foundation (NFWF). The Rancher's Stewardship Alliance (RSA), a landowner-led conservation organization based in Malta, MT was awarded one of two 2018 implementation grants in Montana with their project proposal 'Where the antelope roam: connecting landscapes for ranching and wildlife in north-central Montana'. As part of this awarded grant, it was stated that '[implementation] projects will be targeted on private lands that have the greatest potential benefit to big game species with a particular focus on enhanced connectivity…'.

This document serves as the final report of a multi-layered process that will be adopted by RSA to prioritize implementation projects that benefit big game (i.e. elk, mule deer, pronghorn) winter range and migration corridors. The RSA Conservation Committee will use the tools provided here to help rank restoration projects specifically within Blaine, Phillips and Valley Counties.

Methods

The process to target implementation projects for big game requirements was developed collaboratively by the RSA Conservation Committee. The committee includes a consortium of ranching families, federal and state agencies and nonprofit groups that each care for the prairie grasslands and the communities that live in this landscape. A big-game subcommittee (BGSC) of the conservation committee was formed to work specifically on this targeting process. The conservation committee agreed that MT Fish, Wildlife and Parks (FWP), U.S. Bureau of Land Management (BLM) and, U.S. Fish & Wildlife Service (FWS) wildlife biologists within Area D would aid in the development of prioritization outputs. A list of personnel that served on the BGSC is provided as Appendix 1. Next, a timeline was developed and agreed to by RSA Conservation Committee and BGSC. Having a timeline in-place at the onset of the project was essential because 1) Multiple personnel were providing direction and deadlines were required to keep the process progressing and, 2) The grant stipulates that funding must be spent within a two-year time period. NFWF grant managers were transparent that a prioritization process should be established to assist in selecting which restoration projects should be completed with this funding. As such, the prioritization process needed to be completed before the second year of the grant, so that restoration projects could be initiated and completed between the late spring-early fall time period. The prioritization process timeline is provided as Appendix 2.

The RSA BGSC met in-person, by conference call and through electronic communication multiple times to work through important details in creating a biologically significant prioritization process. The BGSC agreed that first, prioritization matrices that simultaneously assess multiple landscape factors should be constructed and secondly from this, a map should be created to spatially target priority landscapes. Below is an overview of the required steps and the decisions made to build prioritization matrices:

Decision 1: Given the differences in biological requirements for big game species on winter range as opposed to along migratory pathways, assess winter range and migration requirements using separate matrices.
Decision 2: Identify the important factors (i.e., inputs) for winter range and migration prioritization, based on biological significance, data availability and expert opinion.
Decision 3: Provide *initial* input 'scores' for each factor associated with either the winter range or migration matrix. A score is only indicative of the internal differences within a single input dataset. For example, scores for the fence density input in the migration matrix were standardized between 1-10. Important factors were further stratified as either priority or secondary inputs. Priority inputs were defined as those important factors that had continuous data across the 3-county area and were of biological significance in affecting winter seasonal range or migration pathways. Secondary inputs were defined as those important factors that were either policy driven, did not have continuous data across the 3-county area or had multiple categories per input.
Decision 4: Once priority and secondary inputs were scored, weights were assigned to each important factor. Input weights designate the importance that each specific input receives when combined with other input datasets into the overall model. Priority inputs weights were between 1-10 whereas secondary input weights were reduced to between 1-5, which appropriately assigned greater significance to priority inputs in the overall model.
Decision 5: Once initial matrices and spatial maps were developed and distributed to BGSC members for review, *final* scores and weights for each priority and secondary input were discussed and agreed to.
Decision 6: Decisions regarding spatial analyses and displaying results for specific important factors was required. For example, in the 'roads plowed during snowstorm' secondary input, it was decided that areas $\leq .5$ miles from a plowed road during a snowstorm would receive a higher score (as these areas adjacent to roads were identified as higher priorities) than areas $> .5$ miles from a plowed road during a snowstorm (as these areas further from roads were identified as lower significance and as a result, received a lower score).
Decision 7: Once final matrices were developed, final maps were constructed to spatially identify priority areas to target on-the-ground implementation projects.

Winter Range Matrix

Priority Input	Score*	Weight
Elk – FWP identified winter range	Out (0), In (1)	7
Pronghorn – FWP identified winter range	Out (0), In (1)	9
Mule Deer – FWP identified winter range	Out (0), In (1)	9
Area within contiguous native range^	0-9	8

Secondary Input	Score*	Weight
Land adjacent to lands in easement or public lands#	1-4	5
Roads plowed during snowstorm**	>.5 mile (0), ≤ .5 mile (1)	3
Area within BLM identified crested wheat grass^^	Out (0), In (1)	2
Area within identified sage-grouse core areas	No (0), Yes (1)	3

Notes

*Greater scores indicate greater importance

^Grassland parcel blocks were assigned scores ranging from 0-9. Score of 1 is given to a single block and up to 9 (8 neighboring blocks + source block).

#Easements and public lands unioned and buffered and scored to 4 levels (< .25 miles, .25-.5 miles, .5-.75 miles, .75-1 mile) with increasing adjacency

**Plowed roads buffered to .5 mile and scored as: outside buffered area (0), within of buffered area (1)

^^County crested wheatgrass datasets unioned and scored as: area outside (0), area within (1)

Winter Range Model

The winter range model used input data from the winter range prioritization matrix and generated both a priority and secondary surface. Those raster surfaces were then combined to create a final raster surface. Projection: UTM Zone 11, Datum: NAD 83

The general process was as follows:

- For each input in vector format, the dataset was clipped to the county boundaries identified (Blaine, Phillips, and Valley).

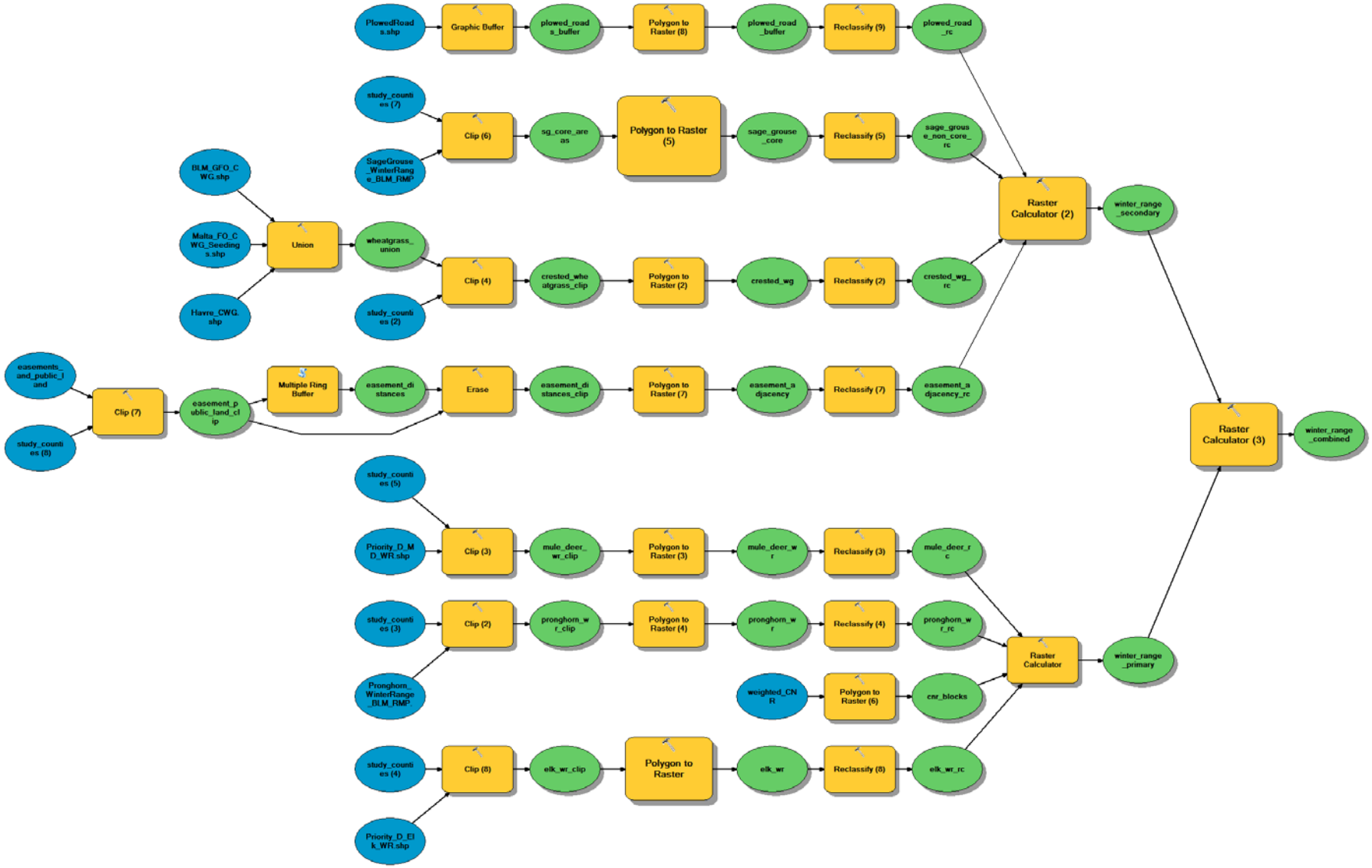
- The clipped dataset was then converted to raster format.

- At this point, each input dataset was in raster form, and was reclassified according to the scores provided by the winter range matrix.

- The reclassified rasters were then multiplied by the appropriate weight and combined to create both a priority surface and secondary surface.

- The priority and secondary surfaces were added together to create a combined surface for the winter range model.

In the following model, created in ArcMap Model Builder, the flow of work moves from left to right where ‘blue circles’ indicate priority/secondary inputs, ‘orange rectangles’ indicate the ArcMap tool used, and ‘green circles’ indicate outputs. Overall, the model shows steps to create the ‘winter range combined surface’ spatial map.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Reclassify (9)
plowed_road_rc
study_counties (7)
SageGrouse_WinterRange_BLM_RMP
Clip (6)
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sage_grouse_core
Reclassify (5)
sage_grouse_non_core_rc
BLM_GFO_CWG.shp
Malta_FO_CWG_Seedings.shp
Havre_CWG.shp
Union
wheatgrass_union
Clip (4)
crested_wheatgrass_clip
Polygon to Raster (2)
crested_wg
Reclassify (2)
crested_wg_rc
study_counties (2)
Raster Calculator (2)
winter_range_secondary
easements_and_public_land
study_counties (8)
Clip (7)
easement_public_land_clip
Multiple Ring Buffer
easement_distances
Erase
easement_distances_clip
Polygon to Raster (7)
easement_adjacency
Reclassify (7)
easement_adjacency_rc
Raster Calculator (3)
winter_range_combined
study_counties (5)
Priority_D_MD_WR.shp
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Reclassify (3)
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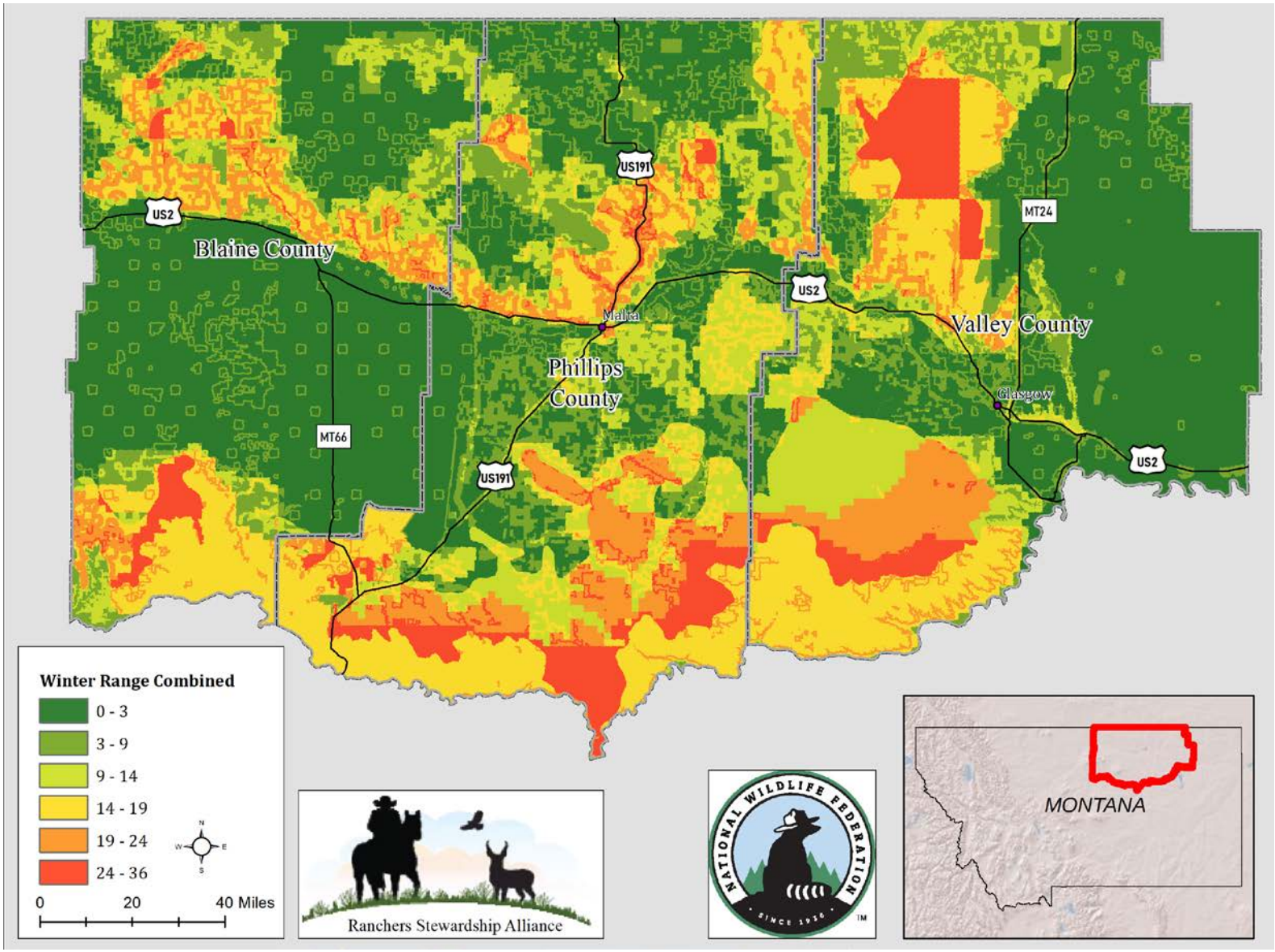
Winter Range Combined Surface Map



Migration Matrix

Priority Input	Score*	Weight
Pronghorn – identified spring migration area^,#	1-10	9
Pronghorn – identified fall migration area^,#	1-10	9
Lower fence density#,**	1-10	8
Developed vs. non-developed land^^	0-1	6
Lower paved road density#	1-10	6
Lower all road density#	1-10	7
Lower oil/gas pad density#	1-10	5

Secondary Input	Score*	Weight
Landownership	Private (0), CE (1), BLM (2)	3
Adjacency to railroads##	> .5 mile (0), ≤ .5 mile (1)	5
Adjacency to identified HWY 2 key-linkage area[a]	> .5 mile (0), ≤ .5 mile (1)	5
Area within identified sage-grouse migration pathways	No (0), Yes (1)	3
Land has > 50% native grasslands[b]	No (0), Yes (1)	1
Roads plowed during snowstorms[c]	> .5 mile (0), ≤ .5 mile (1)	3
Adjacency to identified CMR key-linkage area	> .5 mile (0), ≤ .5 mile (1)	5
Fence types[d]	0-10	5

Notes

*****Greater scores indicate greater importance

^Serves as a proxy for mule deer

#Continual parameter, classified using natural breaks in input dataset

******Poor, E., Jakes, A., Loucks, C., Suitor, M. 2014. Modeling fence location and density at a regional scale for use in wildlife management. PLoS One. 9(1): e83912

^^Categorical parameter, using 'ESLF_code' field in land cover classification. Developed areas classified as 0, all else as 1

##For fence project only. Railroads buffered to .5 miles

[a] Roads and railroads buffered to .5 miles, respectively

[b] From FWP Grasslands Initiative GIS layer

[c] Plowed roads buffered to .5 mile, outside buffered area (0), within of buffered area (1)

[d] 3- and 4-strand barbed wire prioritized over woven wire fence. Fence types available only along roads is parts of Blaine, Phillips and Valley Counties. Fence type identified for both sides of the road are buffered to .5 miles. Fence input data was grouped into 3 classes based on fence codes from Poor et al. 2014 – Appendix 1. Low resistance (Codes 1-2), Medium resistance (Codes 3-4), High resistance (Codes 5-6). Fences from both sides of the roads merged together and given a score between 0-10 which include 0 – Low resistance/Low resistance, 2 – Low resistance/Medium resistance, 4 – Medium resistance/Medium resistance, 6 – Low resistance/High resistance, 8 – Medium resistance/High resistance, 10 – High resistance/High resistance.

Migration Model

The migration model used input data from the migration prioritization matrix and generated both a priority and secondary surface. Those raster surfaces were then combined to create a final raster surface. Projection: UTM Zone 11, Datum: NAD 83

The general process was as follows:

- For each input in vector format, the dataset was clipped to the county boundaries identified (Blaine, Phillips, and Valley).

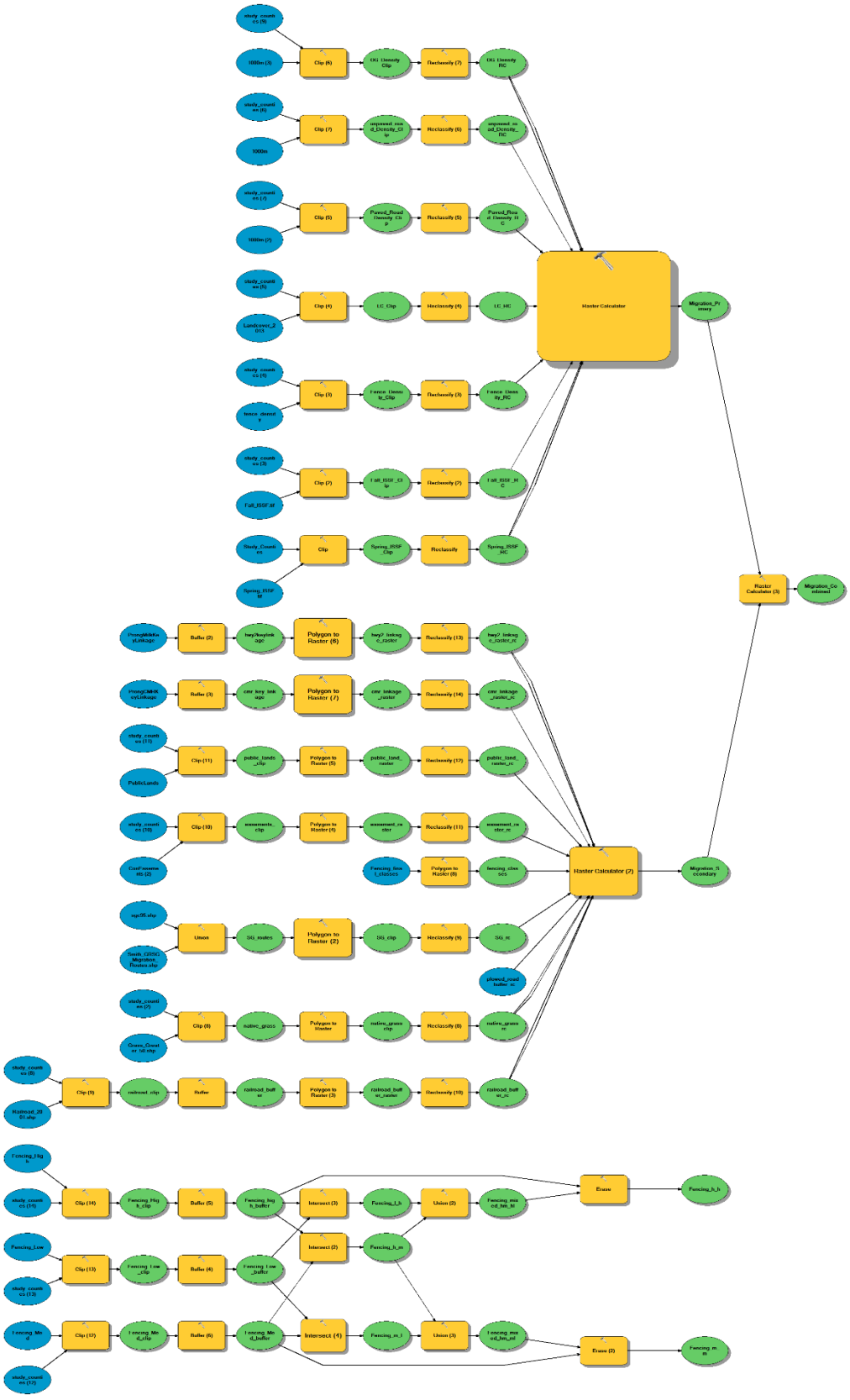
- The clipped dataset was then converted to raster format.

- At this point, each input dataset was in raster form, and was reclassified according to the scores provided by the migration matrix.

- The reclassified rasters were then multiplied by the appropriate weight and combined to create both a priority surface and secondary surface.

- The priority and secondary surfaces were added together to create a combined surface for the migration model.

In the following model, created in ArcMap Model Builder, the flow of work moves from left to right where ‘blue circles’ indicate priority/secondary inputs, ‘orange rectangles’ indicate the ArcMap tool used, and ‘green circles’ indicate outputs. Overall, the model shows steps to create the ‘migration combined surface’ spatial map.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Clip (12)
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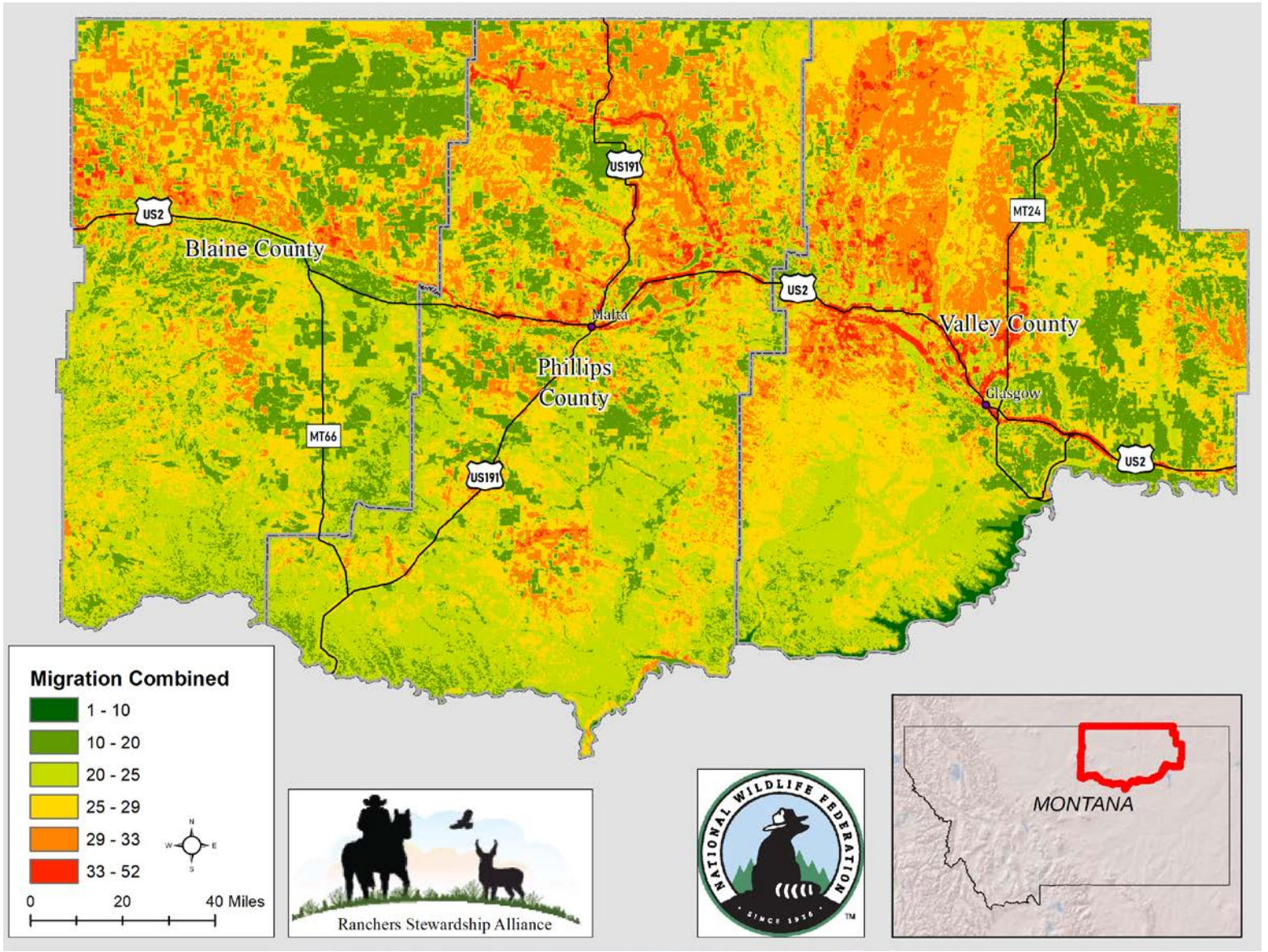
Erase (2)

Migration Combined Surface Map



Adaptive Management

The BGSC identified conservation tools and additional biological and social factors that may be considered by the RSA conservation committee to aid in further identifying implementation projects. To quote one BGSC member, additional tools and factors could be considered to 'avoid funding good projects in the wrong locations and avoid funding mediocre projects in the right location'. Consequently, an additional implementation ranking criteria could be developed by the RSA conservation committee to identify current opportunities and challenges. Alternatively, the prioritization outputs created for this report could be used solely to rank on-the-ground projects which at this time, was the recommendation of the BGSC. Regardless, an adaptive management approach could be considered in the future to prioritize projects as additional opportunities to manage and conserve big game winter range and migration requirements come to fruition.

Specific conservation tools for on-the-ground implementation were identified for both winter range and migration big game requirements, these include but are not limited to:

-Grazing systems with water development
-Fence modifications
-Fence removals
-Open gate agreements
-Reseeding – priority for sagebrush
-Reseeding – priority for CRP lands
-Browse species restoration in riparian areas
-Conservation easements
-Roadway and highway mitigation efforts
-Railroad mitigation efforts
-Education and outreach

Additional biological and social factors and accompanying data sources were identified for potential use in prioritization matrices, spatial maps and/or implementation ranking. The following data were either incomplete, unavailable to the public or not considered for current prioritization and spatial modelling but may be addressed in the future:

-Fence locations on local BLM lands
-Lands containing expiring CRP lands
-Permanence of reseeding efforts (i.e., 10, 20, 30-year or permanent agreements)
-World Wildlife Fund's annual Plowprint report and data
-Cultivation risk model from: Smith, J.T., Evans, J.S., Martin, B.H., Baruch-Mordo, S., Kiesecker, J.M., Naugle, D.E. 2016. Reducing cultivation risk for at-risk species: predicting outcomes of conservation easements for sage-grouse. Biological Conservation, 201:10-19.

Appendix 1: Participants

Last Name	First Name	Organization	Title	Location	Email
Anderson	Sonja	FWP	Area Wildlife Biologist	Lewistown	sanderson@mt.gov
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Hemmer	Scott	FWP	Area Wildlife Biologist	Havre	shemmer@mt.gov
Henry	Drew	FWP	Area Wildlife Biologist	Glasgow	dhenry@mt.gov
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Matchett	Randy	FWS	Supervisory Wildlife Biologist	Lewistown	randy_matchett@fws.gov
Miller	Craig	BLM	Wildlife Biologist	Havre	cmiller@blm.gov
Mitchell	Emily	FWP	Area Wildlife Biologist	Jordan	emily.mitchell@mt.gov
Oestreich	Andy	BLM	Wildlife Biologist	Lewistown	aoestrei@blm.gov
Thompson	Scott	FWP	Regional Wildlife Manager	Glasgow	sthompson@mt.gov
Tribby	Kathy	BLM	Wildlife Biologist	Malta	ktribby@blm.gov

Appendix 2: Prioritization Process Timeline

January 10, 2019 – RSA submits grant proposal to NFWF

April 18, 2019 – NFWF awards grant to RSA

April 22, 2019 – RSA Conservation committee creates big-game subcommittee (BGSC)

May – August, 2019 – Data gathering, literature review, data gaps identified

September 10, 2019 – First BGSC meeting (in-person) to discuss prioritization matrices

September 30, 2019 – NWF provides initial draft matrices for review to BGSC

November 1, 2019 – BGSC provides comments on initial draft matrices to NWF

November 15, 2019 – NWF provides initial GIS maps to BGSC for review

December 9, 2019 – Second BGSC meeting (conference call) to discuss matrices scoring

December 15, 2019 – BGSC provides comments on initial GIS maps to NWF

February 15, 2020 – NWF provides second draft of matrices and GIS maps to BGSC for review

March 1, 2020 – BGSC provides final comments on matrices and GIS maps to NWF

April 1, 2020 – NWF provides final report to RSA conservation committee