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WYOMING OPEN SPACES INITIATIVE

AUTHORS

Benjamin S. Rashford

Abigail M. Scott

Matthew Hayes

Hall Sawyer

INITIATIVE COOPERATORS

William D. Ruckelshaus
Institute of Environment and
Natural Resources

Department of Agricultural
and Applied Economics

Department of Geography

Wyoming Natural Diversity
Database

Wyoming Geographic
Information Science Center

University of Wyoming
Extension

For more information
(307) 766-5080

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ruckelshaus-institute](http://www.uwyo.edu/haub/ruckelshaus-institute)



TARGETING CONSERVATION EASEMENT PURCHASES TO BENEFIT WILDLIFE

By Benjamin S. Rashford¹, Abigail M. Scott², Matthew Hayes³, and Hall Sawyer⁴

¹ University of Wyoming, Department of Agricultural and Applied Economics

² University of Wyoming, School of Energy Resources

³ University of Wyoming, Cooperative Fish and Wildlife Research Unit and Wyoming Migration Initiative

⁴ Western Ecosystems Technology, Inc. and Wyoming Migration Initiative

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OPTIMIZING LIMITED CONSERVATION DOLLARS

In 2013, biologists discovered a previously unrecorded mule deer migration in western Wyoming, the longest ungulate migration ever documented in the lower 48 states (Sawyer et al. 2014). Every year, migrating mule deer travel approximately 150 miles from winter ranges in the Red Desert to summer ranges in the Hoback Basin and surrounding mountains. While the Red Desert to Hoback migration corridor provides important ecological benefits to mule deer, future development (residential or other forms) presents a challenge to maintaining the corridor. As open spaces are increasingly lost and fragmented, sustaining long-distance migrations will require proactive approaches to conservation on public and private lands (Sawyer et al. 2014).

An increasingly important tool for private land conservation across the West is the purchase of conservation easements, voluntary agreements wherein a private landowner sells a property's development rights to a land trust or other buyer. Conservation easements keep agricultural lands in large, intact parcels rather than allowing them to be subdivided by limiting the amount and type of development allowed. Conservation easements can be expensive because they aim to provide landowners a fair market value to keep from developing their lands. Given limited budgets and substantial conservation needs, policymakers and conservationists need approaches to prioritize conservation spending (Margules and Pressey 2000; Rashford et al. 2007).

A common approach used by conservation buyers to decide where to invest in conservation easements is based on simple cost-effectiveness. That is, buyers calculate

where easements will generate the greatest ecological benefit per dollar. But this approach fails to consider a critical, but often overlooked, factor in prioritizing easements: a property's development potential. We offer an approach that optimizes economic cost, ecological benefit, and development potential to assist conservation buyers in their search for the best locations to invest limited conservation dollars. We illustrate how this approach could inform decision making through an applied example of the Red Desert to Hoback (RDH) mule deer migration corridor.

In short, this approach allows conservation buyers to ask, "Are the ecological benefits and development risks sufficient to justify the cost, or would this investment be more effectively targeted elsewhere?" By contemplating these tradeoffs between benefits, development potential, and costs for each prospective easement, this approach can help focus conservation investments where they will ensure the most protection. The objective of this bulletin is to demonstrate how residential development potential of private agricultural land can be used to better target conservation easements to achieve the maximum benefit for wildlife given limited conservation dollars.

STRATEGIC TARGETING, AN APPROACH

Consider a hypothetical example where a conservation buyer is deciding in which of three potential conservation easements to invest, with the

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Figure 1: Hypothetical parcels under consideration for easements

	Parcel 1	Parcel 2	Parcel 3
Easement Cost (C):	\$1,000	\$1,500	\$2,000
Ecological Benefit (B):	2,000	1,200	1,300
Development Potential (D):	0.1	0.5	0.9

Costs are hypothetical, since typical easements cost millions of dollars. Ecological benefits could be a measure of the acres of corridor available on each parcel. Development potential indicates the likelihood (probability) that the parcel will be developed in the near future.

Box 1: Definitions

Conservation easement

A voluntary agreement wherein a private landowner sells development rights for a specific property to a land trust or other entity. The easement limits the amount and type of development allowed on a property. The agreement is attached to the land's title and transfers with ownership of the land in perpetuity. See *Conservation Easements: An Introductory Review for Wyoming* (Perrigo and Iversen 2002) for further discussion of easements.

Conservation buyer

An entity, such as a land trust, that invests dollars to purchase a conservation easement with the goal of achieving a conservation outcome.

Economic cost

The value of a conservation easement in dollars (i.e., the dollar amount a landowner is willing to accept to enter into a conservation easement).

Ecological benefit

The biological value of conservation actions on a property. Typically measured as the area of key habitat necessary to maintain or improve a wildlife population.

Development potential

The likelihood a parcel of land will be developed within some time period.

Benefit targeting

A method of determining where to purchase a conservation easement that takes into account only the ecological benefit of protecting that land regardless of cost.

Cost-effective (or benefit/cost) targeting

A method of determining where to purchase a conservation easement that takes into account the cost and ecological benefit of protecting that land through an easement (the ecological benefit per dollar.)

Strategic (benefit/cost/loss) targeting

A method of determining the most beneficial place to invest in the purchase of a conservation easement that takes into account the cost of the easement, the ecological benefit of protecting that land, and the development potential for the land under consideration.

goal of achieving the maximum conservation benefit to protect the mule deer migration corridor (Figure 1). Each of the three parcels varies in terms of economic cost, ecological benefit, and development potential.

There are at least three ways to decide on which parcel to purchase a conservation easement given a \$2,000 budget: “Benefit targeting,” which considers only the ecological benefit regardless of cost; “cost-effective (benefit/cost) targeting,” which considers ecological benefit relative to cost; and “strategic (benefit/cost /loss) targeting,” which considers ecological benefit relative to cost and development potential (Box 1). Applying these different methods for targeting results in different choices about where to place the easement (Figure 2).

If the conservation buyer makes the determination of which parcel to buy using the benefit targeting approach, the outcome will be to purchase a conservation easement on parcel 1 because purchasing that easement will yield the most ecological benefit, followed by parcel 3, which yields the second-most ecological benefit. Similarly, cost-effective targeting will also lead the conservation buyer to purchase an easement on parcel 1 because that parcel yields the most ecological benefit for the lowest economic cost, followed by parcel 2. Strategic targeting, however, which takes the parcel’s development potential into consideration, leads the conservation buyer to purchase an easement on parcel

3, a different outcome from the other two targeting methods.

Now consider how this hypothetical scenario might play out into the future: if the conservation buyer had used the cost-effective targeting method and invested the conservation dollars into parcel 1, half the money would be left over to invest in another parcel. However, parcel 3, the second most valuable ecologically, would likely be developed within a few years unless the conservation buyer can raise twice as much money as already expended.

If the conservation buyer uses the strategic targeting method and invests in parcel 3, no money is leftover. However, parcel 1, the area most valuable ecologically, has low development potential, so both parcels 1 and 3 likely avoid development into the future, offering the greatest ecological benefit for the money invested.

CONSERVATION IN SUBLETTE COUNTY’S MULE DEER MIGRATION CORRIDOR

Strategic targeting prioritizes conservation easements in a region by optimizing economic costs, ecological benefits, and development potential of prospective parcels. Consider, for example, efforts to protect valuable wildlife habitat, such as the Red Desert to Hoback mule deer migration corridor. Which parcel(s) should be conserved first? Parcels vary in their economic costs and

Figure 2. Targeting methods resulting in different conservation purchase choices

		Parcel 1	Parcel 2	Parcel 3
Benefit targeting	Benefit	2,000	1,200	1,300
Cost-effective targeting	$\frac{\text{Benefit}}{\text{Cost}}$	$\frac{2,000}{\$1,000} = 2.00$	$\frac{1,200}{\$1,500} = 0.80$	$\frac{1,300}{\$2,000} = 0.65$
Strategic targeting	$\frac{\text{D. Potential} \times \text{Benefit}}{\text{Cost}}$	$\frac{(0.1 \times 2,000)}{\$1,000} = 0.20$	$\frac{(0.5 \times 1,200)}{\$1,500} = 0.40$	$\frac{(0.9 \times 1,300)}{\$2,000} = 0.59$

Solid boxes outline the first choice (highest value) parcel for conservation and dashed boxes indicate the second choice parcel for conservation according to each targeting method. Note that strategic targeting recommends a different parcel for conservation than either of the other two methods.

ecological benefits (e.g., some may contain a larger area of the corridor or critical stopover sites where animals feed and rest; Sawyer and Kauffman 2011). A standard cost-effective targeting approach would weigh these two values to identify the prospective easement property with the greatest ecological benefit per dollar invested. But parcels also vary in their likelihood of being developed.

Some parcels may have physical characteristics, such as steep slopes, that limit development potential. Other parcels may lack amenity characteristics, such as scenic views, proximity to towns, or access to recreation, that attract residential development (Table 1). Parcels with low development threat are likely to provide continued ecological benefits even in the absence of an easement.

Figure 3. Land use and ownership in the Red Desert to Hoback mule deer migration route (in Sublette County, WY)

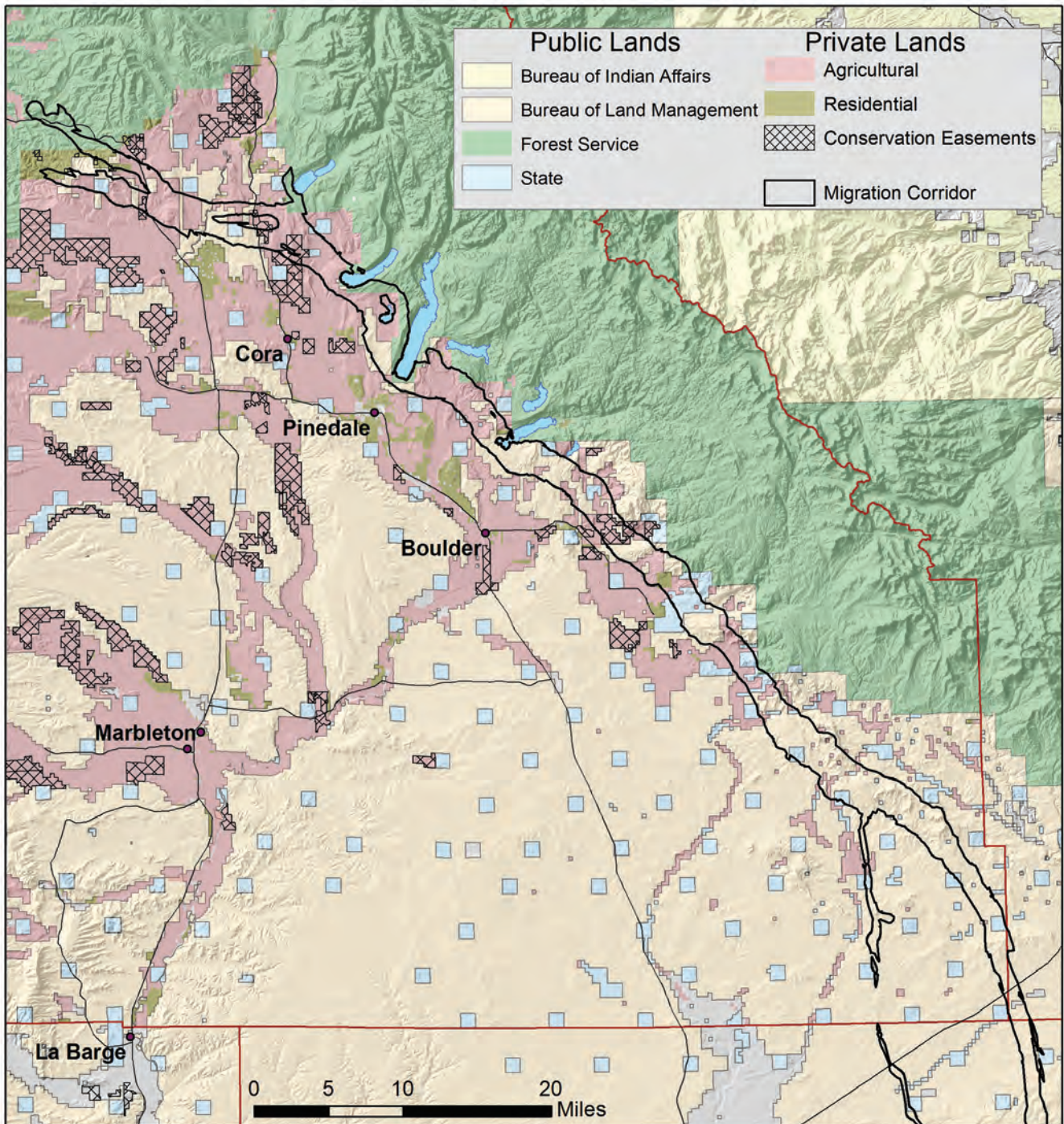


Table 1. Factors affecting values associated with conservation easement placement

Economic cost	Ecological benefit	Development potential
Proximity to towns, roads, or recreational areas including national forests	Level of wildlife/deer use High priority habitat types	Proximity to towns, roads, or recreational areas including national forests Gentle terrain lacking steep, unbuildable slopes
Acreage	Habitat contiguity	Viewshed quality including nearby land cover and mountain vistas

Determining the conservation benefit of purchasing an easement therefore depends on the potential of a parcel being developed in the absence of an easement (Newburn et al. 2004).

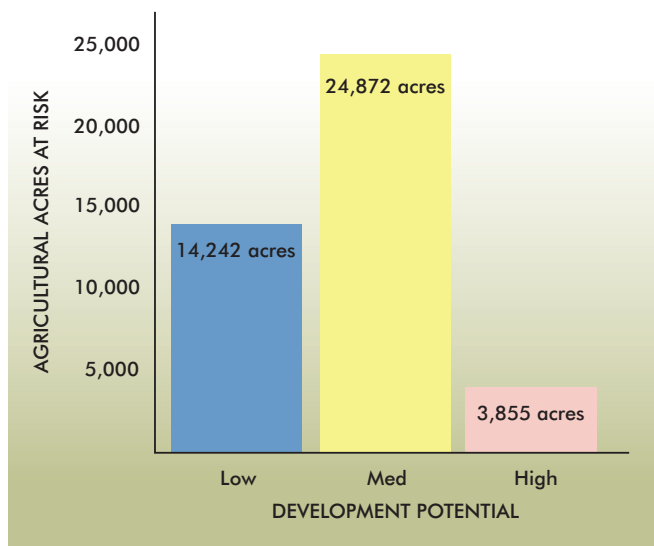
Much of the 150-mile (approximately 130,000 acres within Sublette County, WY) Red Desert to Hoback corridor is either public land or is already protected by conservation easements, and thus is not threatened by residential development (though there may be other threats, such as energy development) (Figure 3). However, 31% (41,000 acres) of the corridor is unprotected agricultural land with the potential to be developed. From 2000 to 2010, Sublette County had the highest population growth rate (73%) and the highest proportion of second homes (25%) of any county in Wyoming (Taylor and Lanning 2012a, 2012b). Sublette County was recently ranked first in Wyoming and thirteenth in the Rocky Mountain West among areas with ‘prime ranchland’ at risk of conversion to residential development (AFT 2002).

Throughout the county, agricultural land is not uniform, and some parcels are more attractive to developers than others. Recent research at the University of Wyoming estimated development potential (Box 1) by comparing characteristics of developed residential parcels and undeveloped agricultural parcels (Mellinger 2012). The comparison focused on physical and amenity

characteristics generally associated with rural residential development, such as proximity to towns, roads, and national forest; roughness of terrain; and the near (e.g., surrounding land cover) and distant (e.g., mountain peaks) views available from each parcel (Table 1). A focus on physical and amenity characteristics provides an important broad view of development potential, but other landowner characteristics, such as conservation preferences or financial circumstances, also have important impacts on development potential that should also be considered when targeting conservation easements.

The statistical model generated an estimate of the probability of development for each agricultural parcel. For the purpose of modeling, parcels with development probability greater than 50% were categorized as high development potential, parcels between 30% and 50% as medium development potential, and parcels with less than 30% probability as low development potential. Results showed that two-thirds (28,727 acres) of the agricultural land that provides connectivity of the Red Desert to Hoback corridor had medium to high development potential, while the remaining one-third of agricultural land in the corridor had low development potential, meaning it was less likely to benefit from immediate protection through conservation easements (Figure 4).

Figure 4. Range of development potential for agricultural land within the RDH mule deer migration route in Sublette County, WY



Land parcels near existing roads or towns, and with scenic viewsheds tended to be the most at-risk for development. Most (80%) of the land with high development potential was in the northern part of the migration corridor in Sublette County, where residential development has already encroached on the corridor (Figure 5). Much (70%, or 16,000 acres) of the agricultural land in the Finger Lakes area, a 34-mile-long stretch in the center of the corridor that contains several important bottlenecks (pinch points where the corridor narrows), had at least medium potential for development. The more rural and isolated parcels in the southern portion of the corridor tended to be at low risk of development.

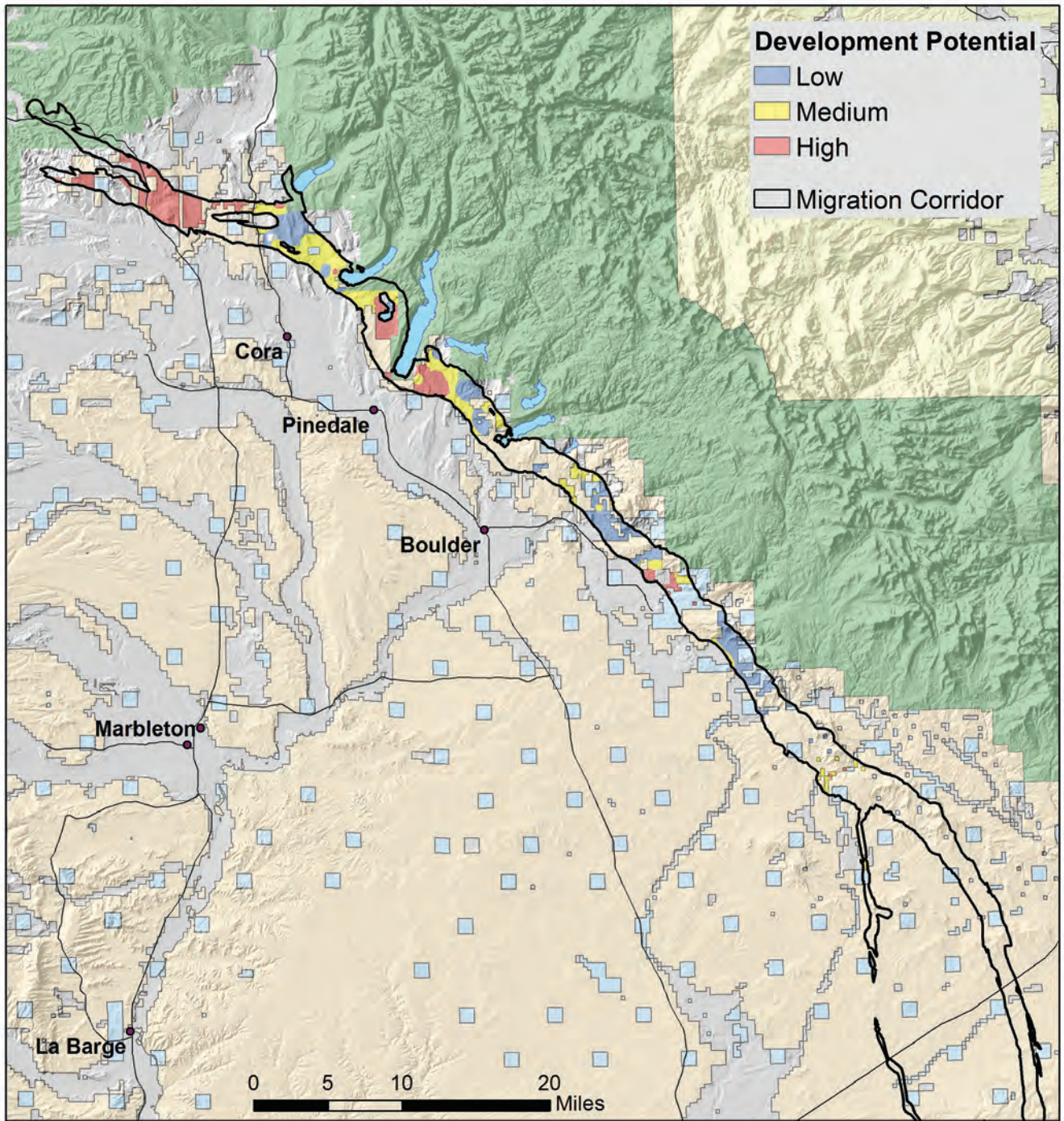
Conservationists have already shown interest in using conservation easements as one tool to maintain

the connectivity of the Red Desert to Hoback mule deer migration corridor through Sublette County. Using benefit or cost-effective targeting methods to prioritize easement purchases, conservation buyers would tend to focus on parcels with high ecological benefits or relatively low cost without regard to development potential. While helpful, these approaches could exhaust conservation funds by conserving parcels that may not need immediate protection (i.e., have relatively low development potential). By taking development potential into consideration, the approach of strategically targeting conservation easements can help ensure as much conservation is achieved as possible given limited budgets.

INFORMATION GAPS AND OPPORTUNITIES

In areas such as the mule deer migration corridor in Sublette County, important wildlife habitat is under immediate threat from development, conservation easements cost millions of dollars, and conservation dollars are limited. Optimizing the placement of conservation efforts is therefore essential. Although estimates of development potential and ecological benefits are incomplete and likely imperfect, conservationists can still use the principles of strategic targeting to improve conservation outcomes. By contemplating tradeoff questions for each prospective easement, conservation buyers can focus their efforts to increase the overall effectiveness of conservation decisions, which ultimately ensures more protection.

Figure 5. Development potential on agricultural parcels along the RDH mule deer migration route in Sublette County, WY



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