

August 25, 2017

Forest Service  
Attn: Forest Plan Revision  
Custer Gallatin National Forest  
10 E Babcock, P.O. Box 130  
Bozeman, MT 59771

Virginia Kelley, Forest Plan Revision Team Leader et al.,

The first step in determining what areas in the Forest might be designated as Recommended Wilderness in the new Forest Plan is to develop a Wilderness Inventory. Part of that process is determining whether range infrastructure is “substantially noticeable.” CGNF used a GIS model to make this determination.

As a result of CGNF’s determination large and wild parts of Big Pryor Mountain were excluded from the Inventory.

We have studied the GIS methodology used by CGNF as described in the July, 2017 document “**CGNF Allotment Infrastructure & Wilderness Inventory.**”<sup>1</sup> Despite considerable effort and the best of intentions by CGNF staff, we have concluded that the methodology used is inconsistent with both the intent of the Wilderness Inventory, and the direction in the Planning Handbook, Chapter 70.

CGNF subdivided the FS part of the Pryors into 30 meter square cells, and a circle was drawn around the center of each cell. The software determined the number of miles of fence and/or water developments within the circle and the area of the circle, and from those computed the range infrastructure density for that cell location in miles of fence or water developments per square mile.

**The radius used to compute infrastructure density is inconsistent with the intent of the Wilderness Inventory. (Also see Appendix 1.)**

CGNF used a circle radius of 5,666 meters for this process. This is a radius of 3.5 miles and a diameter of 7.0 miles. Thus fences and water developments up to 3.5 miles away were included in the determination of “significant noticeability” of infrastructure at that point. The intent was to determine the visual impact on a person standing in the center of the 30 meter square cell. At a distance of 3.5 miles such features are very unlikely to be visible at all let alone “significantly noticeable.”

A circle radius of 0.5 mile = 800 meters or less would be much more consistent with the intent of the analysis. Range infrastructure beyond 0.5 mile is rarely substantially noticeable if it is visible at all. CGNF justifies the 3.5 mile radius used in footnote 3 on page 2: “*changing search radius generally provides similar outputs, so kept the default. In point density tool.*” This may, or may not, be true “*generally.*” It is not true in this case. Best practice would be to choose a radius consistent with the question the GIS model is intended to answer.

Only 2% of the area within the 3.5 mile radius circle is within 0.5 mile of the cell center. 98% of the area used by the CGNF methodology to compute the “density” value for that cell is beyond the “local” view of someone standing in that cell. Thus the calculation is strongly biased by distant infrastructure density probably unseen from the cell.<sup>2</sup>

**The scale of CGNF’s analysis is mismatched to the question.**

The 7 mile diameter circles used in CGNF’s GIS analysis each have an area of 29 square miles = 25,000 acres. Thus every density calculation done in the analysis is for a 25,000 acre area. This is one-third of the entire 75,000

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<sup>1</sup> Provided to us by Virginia Kelly, 8/17/2017

<sup>2</sup> Kim Reid writes, “*Topography, vegetation type and cover... often do not screen infrastructure and can often be viewed within a mile.*” (CGNF Allotment Infrastructure & Wilderness Inventory, page 2, emphasis added.) This implies that allotment infrastructure often is screened, and often is not visible from a mile thus suggesting one mile as a maximum for visibility. This again indicates the inappropriateness of using a 3.5 mile radius for the GIS analysis. It is inconsistent with this CGNF statement about visibility distance. Also “*can be viewed*” is a lot less than “*substantially noticeable.*” Only 8% of the area in a circle of 3.5 mile radius is within 1.0 mile of the center.

FS acreage in the Pryors, and nearly 60% of the 43,000 acres of Big Pryor Mountain!<sup>3</sup> More to the point, the whole purpose of the Wilderness Inventory is to identify areas as small as 5,000 acres that satisfy the criteria for wilderness consideration. The areas we propose for Recommended Wilderness in the Pryors are each approximately 10,000 acres. Areas of 5,000 to 10,000 acres can not be evaluated with a tool that can't see smaller than 25,000 acres.

#### **Examples of questionable results generated by the GIS methodology.**

The 6,000 or 7,000 acre heavily timbered area north and west of Big Pryor Plateau has no roads and very little range infrastructure (or other developments). The very few fences and water developments in the area are essentially invisible beyond a couple hundred feet due to the thick trees. Clearly this area meets all the required criteria and should be in the Wilderness Inventory. But CGNF's model excludes this area due to the 25,000 acre averaging with distant infrastructure implicit in the GIS model methodology.

Even more embarrassing for the GIS model, it reports the highest water development density anywhere in the Pryors is within this timbered area without water developments. According to the GIS produced map<sup>4</sup> (See Appendix 2, map 1.), there is an area of nearly 1,000 acres with 2.0 to 2.5 water developments per sq. mile (purple color) in the heavy timber west of Big Pryor Plateau. This same map shows that there are no water developments in that "purple" area and for a considerable distance west, north and east. This anomaly alone is sufficient reason to doubt the credibility of the model and lead to a major revision.

The north boundary of the Wilderness Inventory in the Bear Canyon area as released by CGNF was immediately puzzling to us. (See Map 2 in Appendix 2. This boundary is the line between the yellow and light tan colors.) Area north of this boundary was excluded from the Inventory, but from the FS map it is clear that in the west part of the Bear Canyon RWA there are no developments for nearly two miles north from the boundary determined by the GIS model. In the east part there are only a couple stock ponds. Again the GIS model is responding to distant infrastructure.

#### **CGNF's GIS Methodology is inconsistent with Planning direction.**

According to the Planning Handbook, **71.22b - Other Improvements**

*"After identifying lands within the plan area that meet the size criteria ...and the road improvement criteria ..., determine whether those lands contain other improvements. Include such lands in the inventory where the other improvements ... are not substantially noticeable in the area as a whole, including when the area contains the following, ...:*

*"10. Lands adjacent to development or activities that impact opportunities for solitude. The fact that nonwilderness activities or uses can be seen or heard from within any portion of the area, must not, of itself, preclude inclusion in the inventory. It is appropriate to extend boundaries to the edges of development for purposes of inclusion in the inventory." (emphasis added)*

The Forest is directed to first determine candidate areas for the Wilderness Inventory that satisfy the size and road criteria, then consider the "noticeability" of developments such as range infrastructure within that area. Range infrastructure outside the area being considered "must not ... preclude inclusion in the inventory." Unless areas satisfying the area and road criteria in the Handbook are selected first, it is not possible to know what range infrastructure is within or outside those areas. The directive 71.22b (10) can not be followed if those areas are not determined first. CGNF's GIS methodology did not include this information.

Areas north of Pryor Mountain Road (and Powerline Rd) clearly are outside of any area that might be in the Wilderness Inventory on Big Pryor. According to **71.22b (10)**, no fences or water developments adjacent to or north of Pryor Mountain Road should be considered in the GIS analysis. But there is no indication in the FS documentation of GIS methodology that any such boundaries were used in computing fence and water development densities in the 3.5 mile radius circles. Thus the computed densities for all areas on Big Pryor within 3.5 miles south

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<sup>3</sup> Area west of Crooked Creek Rd, south of Pryor Mountain Rd and the powerline, and within the FS boundary.

<sup>4</sup> CGNF Allotment Infrastructure & Wilderness Inventory, page 9, second map.

of Pryor Mountain Road included infrastructure north of Pryor Mountain Road which the Planning Handbook says should not be considered. This includes most of Big Pryor Plateau and most of our proposed Big Pryor RWA.

### **Consideration of our proposed RWAs.**

Our proposed Big Pryor RWA of approximately 12,000 acres is mostly bounded by Pryor Mountain Road and other motor legal routes. To appropriately consider this proposal from the public, an analysis of that area by itself should be completed. According to the Planning Handbook this analysis should not consider any fences or water developments outside the proposed RWA boundaries (i.e. north of Pryor Mountain Road, south of route 2091 etc.).<sup>5</sup> A similar analysis should be done for our proposed Bear Canyon RWA.

The second map in Appendix 2 shows the water developments and fences reported by CGNF. We have added the red lines showing approximate boundaries of our proposed Big Pryor and Bear Canyon RWAs which mostly follow motor legal routes. (Ignore the colors on the map.) It is obvious from the FS map that there are very few water developments and fences within these proposed RWAs. This is even more true if a few developments very close to the boundary motor routes are excluded by slight adjustment of the boundaries.

According to the Planning Handbook (71.22 b (10), "*It is appropriate to extend boundaries to the edges of development...*") Counting only the fences and water developments within the RWA boundaries, as directed by the Planning Handbook, will give values well below CGNF's arbitrary break point of 1 (mile fence + water development) per square mile.

(However we consider this standard unreasonably strict since it only considers the existence of the developments. It does not consider either visibility, or noticeability.)

### **Should the GIS Model be rerun with changes?**

It might be interesting to rerun the GIS model for the Pryors with modifications based on the above comments. But we are not convinced that GIS density calculations are the right tool for determining substantially noticeable developments and the appearance of naturalness for the Wilderness Inventory. (See below.) And we are not convinced that 1 water development or mile of fence per square mile is a reasonable break point for substantial noticeability. (See our August, 9, 2017 letter.) FS staff time might be better used for other tasks.

If the GIS model is rerun we recommend the following changes:

1. Use 0.25 mile or 0.5 mile for the radius to be more consistent with the subjective visual impact.
2. Follow the direction in 71.22b (10) and limit the range developments in the GIS calculations to those inside areas predetermined by the 5,000 acre area and road requirements in the Planning Handbook.
3. Run the model specifically considering the Big Pryor and Bear Canyon RWAs we have proposed. Again follow 71.22b (10) as in point 2 above.

### **GIS may be the wrong tool.**

The emphasis in section 71.22 of the Planning Handbook is on the appearance of naturalness. The Handbook quotes the Wilderness Act in which the definition of wilderness includes an area of land which "*generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable.*"

The standard here is clearly subjective and is about visual impression and impact, not just visibility. Visibility is not the same thing as noticeability or substantive noticeability. (See below.)

Kim Reid writes, "*To be substantially noticeable, the improvement or concentration of improvements must be more dominant than the surrounding natural landscape scene.*" (CGNF Allotment Infrastructure & Wilderness Inventory, page 1, emphasis added.) This condition is much stronger than mere visibility. The fences and stock tanks on Big Pryor Mountain are often not even visible because they are over a rise, down in a draw, or screened (or

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<sup>5</sup> The boundaries we suggested for Big Pryor RWA were never intended to be definitive. We assumed during detailed planning they would be fine tuned for local circumstances. Small adjustment of the RWA boundary from #2091 could exclude several water developments from the Big Pryor RWA. The noticeability of infrastructure should then be re-evaluated without considering those excluded infrastructure.

largely screened) by vegetation etc. Even the plateau is not flat. If a fence or water development is not visible it is not noticeable. In other cases noticeability is lost to insignificance in the wide and expansive views.<sup>6</sup>

Nothing in either the CGNF GIS methodology, or in CGNF's fence/water development density standard it is based on, addresses the concept of noticeability (substantial or not) or even visibility of grazing infrastructure. The GIS analysis is simple "bean counting": How many miles of fence and how many water developments are within 3.5 miles of the 30 meter square where someone might be standing? The GIS doesn't "know," and can't compute whether each fence or water development is substantially noticeable or even visible from any particular point on the ground.

### **Density may not be a useful concept for this analysis.**

The Planning Handbook makes no mention of quantitative "density" of infrastructure. "Density" is a statistical concept useful when numbers are large enough to ignore individuals. But it loses meaning and usefulness when numbers are small.

An example: The stellar density of the Milky Way can be a useful concept when considering volumes of a million cubic light years containing perhaps 10,000 stars. But the stellar density of one cubic light year containing only one star (e.g. the sun) is not meaningful. (Another example is in the footnote.<sup>7</sup>)

A 5,000 acre (8 sq. mile) wilderness with a range infrastructure "density" of one stock pond per square mile would have only eight stock ponds. Many places a person on the ground would see none of the stock ponds. Some places they might see one. (Seeing two would be rare.) The person sees a stock pond or not.<sup>8</sup> He/she does not see a "density" of stock ponds and is certainly not "surrounded by allotment infrastructure and opportunity for a sense of solitude is diminished substantially." (CGNF Allotment Infrastructure & Wilderness Inventory, page 2) This is the situation on Big Pryor Mountain. We are convinced that most of Big Pryor Mountain should be included in the Wilderness Inventory, but are recommending only about half of that area for eventual Wilderness designation.

Some people might notice that the Pryors do not have characteristics that other Wilderness areas do. They might then conclude these areas are not "worthy" of wilderness designation. We think it is precisely this difference from other Wilderness that argues strongly for wilderness protection of important parts of the Pryors now while we can.

Please join us for a visit to see that the range infrastructure is sparse and not substantially noticeable in the areas we propose for RWAs. This unique landscape "appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable."

Sincerely,

Dick Walton  
For  
The Pryors Coalition  
[Info@PryorMountains.org](mailto:Info@PryorMountains.org)

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<sup>6</sup> On August 23, several of us made a 17 mile transect within the area on Big Pryor excluded from the Wilderness Inventory. We followed routes 2814, 2850, 2091, 2095A, and 2088 stopping to make observations every ½ mile. At most of these spots (and in between) we could see no range developments. In some places developments were visible, but not particularly noticeable. The only places where we found substantially noticeable infrastructure is the few places where the route went through a gate in a fence.

<sup>7</sup> Another example: The concept of "density" is useful for study of physical substances (solid, liquid, gas) when considering quantities such that individual atoms or molecules are not important. But when studying substances at small enough scale that individual molecules are "seen," the concept of density loses meaning and usefulness.

<sup>8</sup> And we must remember that fences and stock ponds are permitted and to be expected in Wilderness areas where grazing is allowed.

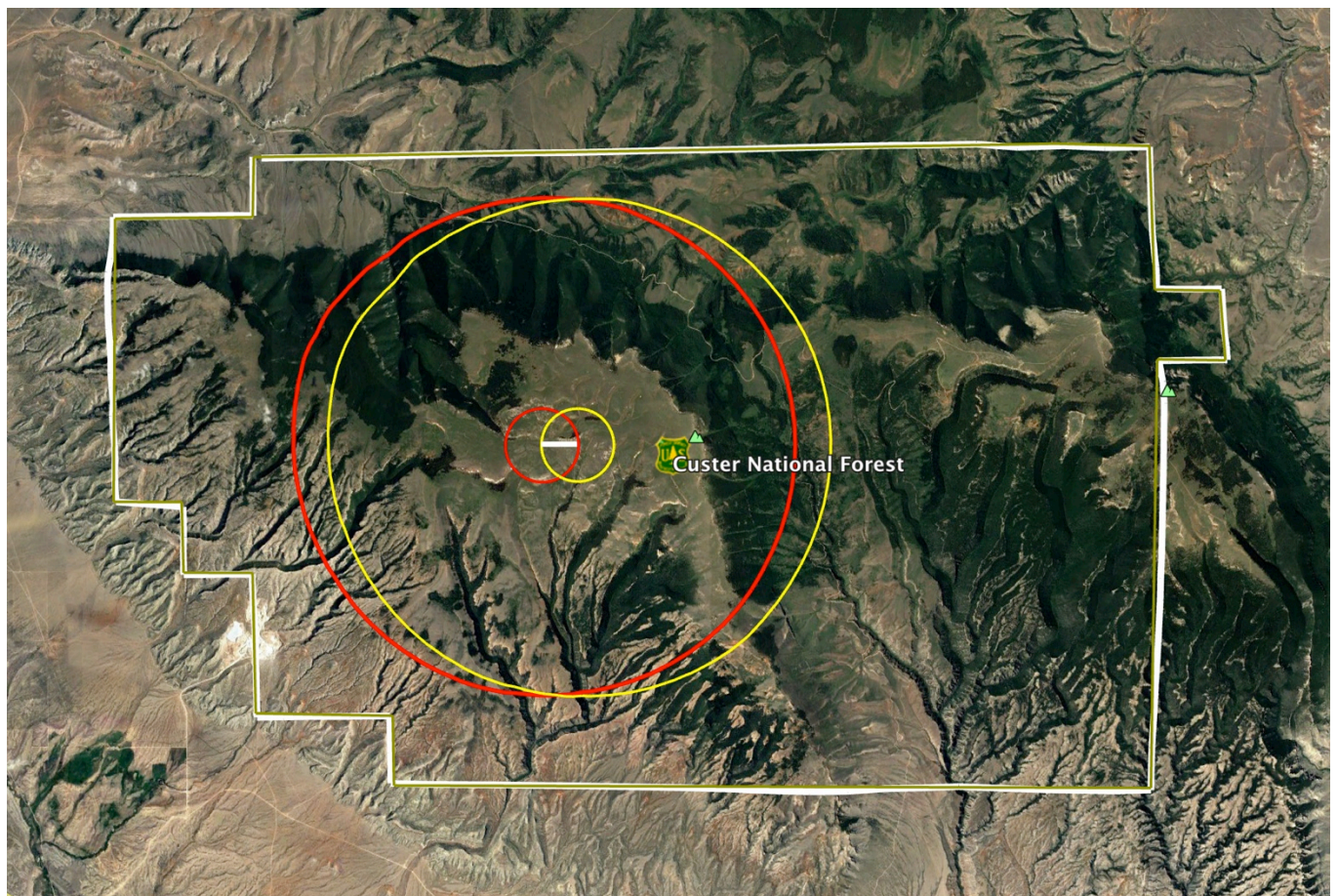
## Appendix 1

In the Google Earth view below the white polygon is the FS boundary in the Pryors. The short white line in the center is  $\frac{1}{2}$  mile long. It is just north of route 2091 and is in the southern part of our proposed Big Pryor RWA. The red circles are centered on the west endpoint of the white line and the yellow circles are centered on the east endpoint. The large circles have a 3.5 mile radius and 25,000 acres. The small circles have a 0.5 mile radius and 500 acres.

CGNF's GIS model computed the range infrastructure density at the west endpoint of the white line from all the fences and water developments within the large red circle. Note that this includes most of Big Pryor Mountain and also includes area north of Pryor Mountain Road. (Part of Pryor Mountain Road is visible in the NE quadrant of the large circles.)

The range infrastructure density at the east endpoint of the white line was computed from the fences and water developments within the large yellow circle. Notice that the red and yellow circles almost entirely overlap. The calculated densities are nearly the same for the two points  $\frac{1}{2}$  mile apart. The only difference is due to range developments in the thin crescents between the red and yellow circles. Thus the only difference is due to fences and water developments 3+ miles distant.

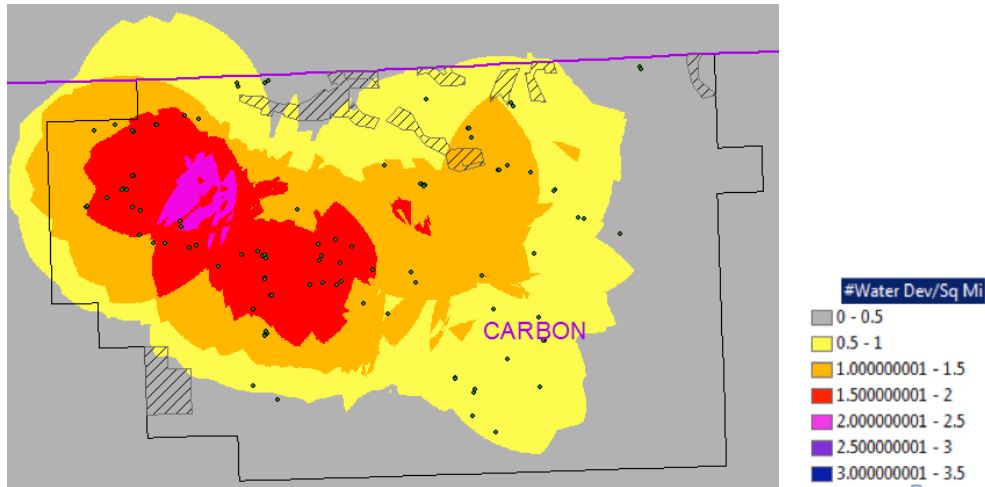
The small circles illustrate how the GIS calculation would work using a  $\frac{1}{2}$  mile radius. Density would be computed from "local" range infrastructure within  $\frac{1}{2}$  mile of the point. Densities computed for two points  $\frac{1}{2}$  mile apart could be significantly different because only a fraction of the two circles overlap.



## Appendix 2

The maps below are from **CGNF Allotment Infrastructure & Wilderness Inventory**, pages 9 & 10. The square “bump” on the east Forest boundary is one section and provides a scale.

**Map 1:** Water developments in the Pryors (small circles) and densities computed by GIS model (colors). Note that model reports the highest density (purple) in an area with no water developments.



**Map 2:** Water developments (small circles) and fences (black lines with tiny “X”es). Color coding is complex, but all areas NOT yellow or gray were excluded from the Wilderness Inventory. We added the red lines to indicate the boundaries of our proposed Big Pryor and Bear Canyon Recommended Wilderness Areas. Most of these boundaries are along motor legal routes. Note that there are very few water developments or fences within these proposed RWAs.

