Recreation Opportunity Spectrum Inventory Report (Draft)

Gila National Forest
Forest Plan Revision

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Introduction

This document identifies mapping criteria and documentation for completing a Recreation Opportunity Spectrum inventory for the forest planning process of the Gila National Forest. The Recreation Opportunity Spectrum (ROS) mapping is a reflection of the existing condition of ROS settings based on recreation opportunities, including the physical, social, and managerial settings and off-forest influences (e.g. motorized roads and motorized trails on other ownerships). The Gila National Forest does not have a winter (snow) season, so this ROS inventory represents year-round ROS settings. The ROS inventory allows for comparisons and analysis at a variety of scales, provides a critical piece in defining sustainable recreation, and informs Land Management Planning and other planning efforts.

What is the Recreation Opportunity Spectrum?

Since the early 1980s, the Recreation Opportunity Spectrum (ROS) has been used as a framework to identify, classify, plan, and manage a range of recreation settings for both existing and desired conditions. ROS remains the best available framework for recreation planning (McCool, Clark, and Stankey 2007). Six distinct settings: urban, rural, roaded natural, semi-primitive motorized, semi-primitive non-motorized, and primitive are defined using specific physical, social, and managerial criteria. The following graphic displays the spectrum of ROS classes. Physical, social, and managerial settings are explained in more detail on the next page. For detailed information on ROS classes and criteria refer to Appendix A. For additional information on applications, refer to FSH 1900 and FSM 2300 directives.

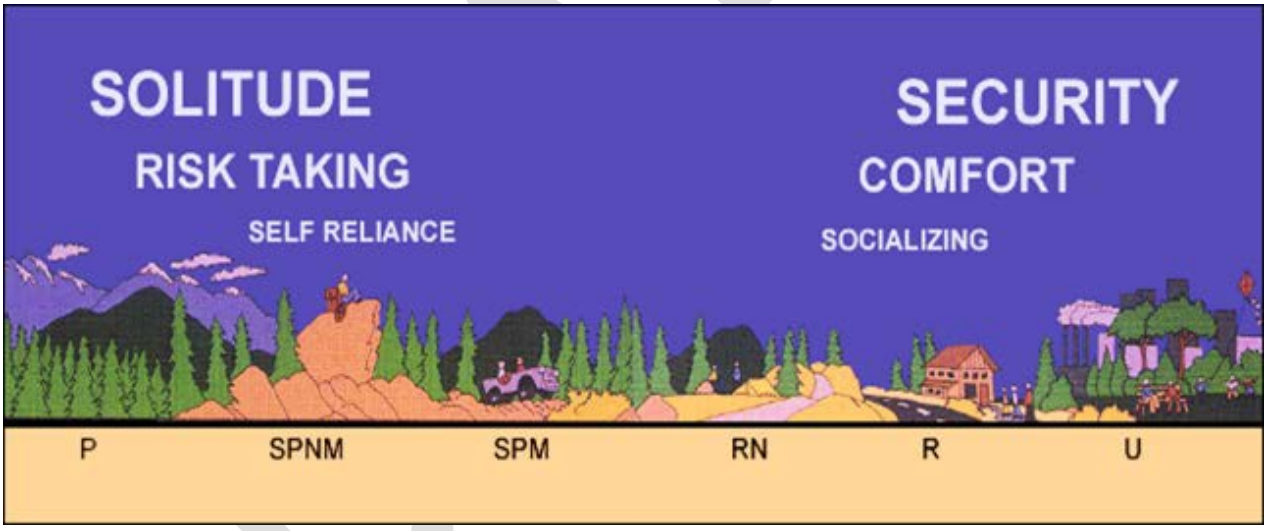

Figure 1. A graphic showing the spectrum of ROS classes. The level of access, development, and social encounters increase when moving from primitive to urban on the spectrum. Level of remoteness decreases when moving from primitive to urban on the spectrum.

The basic assumption underlying the Recreation Opportunity Spectrum is that quality in outdoor recreation is best assured through provision of a diverse set of opportunities. Settings vary in level of development, access, and other factors. Providing a wide range of settings, insures that the broadest segment of public will find quality recreational experiences, both now and in the future. Although the notion of quality is relative, (i.e., a value judgment) the concept of quality can be stated for management decisions in this way: quality depends on what experiences the individual is looking for, how much of it is realized, and the degree of satisfaction (USDA FS 1986, II-3).

Five mapping criteria are used to define the physical, social and managerial setting of each landscape. These criteria, when combined, result in an ROS class delineation. The physical, social and managerial

setting and five mapping criteria are summarized and defined below. Appendix A displays typical examples of the physical, social and managerial attributes contained in each of the ROS classes.

Table 1. ROS Setting components and criteria

	Physical Setting	Social Setting	Managerial Setting
Mapping Criteria	1. Remoteness 2. Size 3. Evidence of Humans	4. Visitor Density	5. Visitor Management

Physical Setting

The physical setting is defined by the absence or presence of the sights and sounds of people, size, and the amount of environmental modification caused by human activity and authorized uses.

Remoteness

Remoteness from the sights and sounds of people is used to indicate greater or lesser amounts of social interaction and primitive to urban influences as one moves across the spectrum. The further one is from the sights and sounds of humans, the more remote the setting and more remote one feels. Remoteness is measured by the distance from motorized use on roads and trails.

Size

The size of an area is used to indicate greater or lesser potential for self-sufficiency related to a sense of vastness, where large, relatively undeveloped areas tend to provide a sense of vastness and smaller, developed areas less so as one moves across the spectrum.

Evidence of Humans

The evidence of humans criteria is used to indicate varying degrees modifications to the natural landscape as one moves across the spectrum. Authorized uses affecting this criteria include such things as: vegetation treatments, oil and gas development, livestock grazing, recreation developments and other infrastructure. Landscapes may vary from naturally appearing to heavily altered as one moves across the spectrum. Site management may also factor into this criteria. Site management refers to the amount or degree of on-site modification (e.g. vegetation manipulation, landscaping) and the level or scale of development of constructed features (e.g. access sites, parking areas, campgrounds, trails, administrative facilities, buildings and other structures).

Social Setting

The social setting reflects the amount and type of contact between individuals or groups. It indicates opportunities for solitude and interactions with a few individuals or large groups of visitors as one moves across the spectrum.

Visitor Density

The visitor density criteria refers to the number of people encountered. Encounters commonly occur when individuals or groups of people recreating see each other on a trail, road, at a campsite or other location within the landscape.

Managerial Setting

The managerial setting reflects the amount and kind of restrictions placed on people's actions by the administering agency or private landowner which affects recreation opportunities.

Visitor Management

Visitor management criteria refers to the level of regulations, information, controls, or restrictions placed on visitors' actions. Controls can be regulatory (e.g. designated uses on motor vehicle use maps or permits) or physical (e.g. barriers).

Mapping Recreation Opportunity Spectrum

Results of this ROS mapping process is the existing condition of ROS settings based on recreation opportunities and off-forest influences to be used in the forest planning process. The Enterprise Program was contacted by the Gila National Forest to produce the existing condition ROS mapping. The existing condition ROS feature class was reviewed, edited, and finalized with Forest and District recreation staff who reviewed and provided input into the process in fall and winter of 2016 and January 2017.

The desired condition ROS feature class will be developed, reviewed, edited, and finalized through an interdisciplinary, integrated approach during the Gila National Forest plan revision process.

Recreation Opportunity Spectrum Inventory (Existing Condition)

The following summarizes the use of the draft National ROS Mapping Protocol (Protocol), dated June 2016, to map the existing ROS for the Gila National Forest using a GIS framework. The Protocol outlines the steps to map existing ROS classes, based on recreation opportunities and off-forest influences.

Ten ROS Mapping Steps for year-round settings when no seasonal variation exists, are outlined in the mapping protocol. The steps use the five mapping criteria, defined in the section above, to map the physical, social and managerial settings of the Forest.

The first seven steps describe the process and data layers used in producing initial ROS, based on the physical setting and managerial setting considerations from travel planning, travel management rule, subpart B. Enterprise Program specialists used the data layers provided by the Forest with the assumption that it was the most complete and accurate data available at the time. The Enterprise Program specialists also received verification from Forest staff regarding the use of the Forest's corporate road data to best represent travel management decisions and administrative use routes.

Remaining steps (steps 8-10) are the adjustment of initial GIS maps using subject matter expertise and professional judgement about the landscapes and use patterns, wilderness settings, other physical settings, social setting, additional managerial settings.

Steps 1-7 were completed by Enterprise Program landscape architect/recreation planner and sent to the Forest for review. Direction and edits based on local field knowledge and subject matter expertise to further refine the draft ROS delineations were provided. Further involvement may be needed to resolve the identified inconsistencies through the rest of the planning process. At the project level, specialists may identify a need to refine the inventory with information that best represents conditions on the ground.

Step 1. Categorize travel routes for ROS mapping

The Forest transportation system forms the primary basis for determining remoteness from the sights and sounds of humans and for identifying the initial division between non-motorized settings (P and SPNM) and motorized settings (SPM and RN). The map developed in this step also provided an over-all orientation to the forest boundary and areas adjacent to the forest boundary.

Using GIS and Infra, the forest transportation and access system, including all roads, trails, railroads, airstrips, and areas wholly or partially within or adjacent to NFS lands that are used by motorized vehicles

was identified. All motorized travelways within 3 miles of the Forest boundary were identified and mapped to ensure consideration of off-Forest influences. Routes were distinguished as either motorized or non-motorized.

Table 2. Travel routes and GIS data used in this analysis

Travel Routes and Areas	GIS data source	Comments	Motorized / Non-motorized
National Forest System Roads	Gila_IWeb_Road_Events A-S Roads By Description (EDW) Layer File	Provided by Brian Park via T drive (Road Layer File space). Road feature class with Infra core attributes.	Motorized and Non-motorized
National Forest System Trails	Gila_IWeb_Trail_Events Apache-Sitgreaves NF Trail (EDW) Layer File	Provided by Brian Park via T drive (Recreation Layer File space). Trail feature class with Infra core attributes.	Motorized and Non-motorized
Other Jurisdiction Roads and Trails	TravelRoute_ln	Forest corporate data, SDE Transportation feature data set.	Motorized and Non-motorized
Waterbodies	S_R03_GIL.NHDWaterbody	Motorized use identified on: Bear Canyon Lake, Lake Roberts, Snow Lake, Quemado Lake.	Motorized
Travel Management Areas	TravelManagementArea	Provided by Brian Park via T drive (Travel Management Program space). Areas designated for cross-country motorized use.	Motorized
Railroads	S_USA.Railroads_ESRI Layer File	Provided by Brian Park via email	Motorized
Aircraft Landing Strips	Airport/Landing Strip Layer File	Provided by Brian Park via T drive (Fire Aviation Layer File space).	Motorized

The travel routes listed above were placed onto one GIS routes feature class for use in the ROS inventory process. The areas listed above were also placed as arcs on the routes feature class for use in the ROS inventory process. The final routes feature was called TravelRoutes_ROSinventory. Using clip, erase, and merge commands in GIS reduced duplicating routes. All travel management decisions were reflected on the Infra core attributes. Only system roads with a route status of existing were used in the ROS inventory. NFS roads with a route status of decommissioned were not included for further analysis. When making further delineations of routes, Gila corporate road data took precedence over other data sources.

Travel Routes Delineation of “high clearance vehicle/OHV” or “standard passenger vehicle” routes

National Forest System Roads

All motorized routes were further categorized as either “high clearance vehicle/OHV” or “standard passenger vehicle.” “High clearance vehicle/OHV” routes are routes that are constructed or maintained for use by vehicles not primarily intended for highway use, such as four-wheel drive, high clearance vehicles or off-highway vehicles. “Standard passenger vehicle” routes are routes that are constructed or maintained for the use of highway type vehicles having more than two wheels. Refer to the Protocol for information on the category of routes based on information available through Infra and other GIS attributes (USDA FS 2016).

The Forest Service classifies maintenance of National Forest System roads by five levels: 1, 2, 3, 4, and 5. Maintenance level 1 roads are closed to motor vehicle use. Maintenance level 2 roads are maintained for high-clearance vehicles, maintenance level 3, 4, and 5 roads are maintained for standard passenger cars during the normal season of use. Operational maintenance level (OML) refers to a road's current maintenance level. ROS route categories were made based on operational maintenance levels as shown in the table below.

Table 3. ROS Link to Operational Maintenance Levels

Operational Maintenance Level (OML)	ROS Route Category
OML 1	non-motorized
OML 2	motorized high clearance vehicle/OHV
OML 3	motorized standard passenger vehicle
OML 4	motorized standard passenger vehicle
OML 5	motorized standard passenger vehicle

Administrative only use roads or roads authorized under a special use permit, but not open to the public, could be any maintenance level. Roads that may not be open to the public but are used by motorized vehicles for administrative use were labeled as "motorized restricted use." Restricted use routes will not be buffered, but will be categorized and discussed in later steps when identifying inconsistencies within the mapped ROS settings. Motorized restricted use roads were identified using the cff_code attribute field and querying for single purpose (SP) routes as directed by Forest personnel.

National Forest System Trails

Trail Infra core attributes were queried using the Designed_Use attribute. Designed uses assigned as "motorized high clearance vehicle/OHV" include: ATV – All Terrain Vehicle. Other designed uses (hiker/pedestrian and pack and saddle) were assigned "non-motorized."

Other Jurisdiction Roads and Trails

Attributes from TravelRoute_ln corporate data feature class were used for travel routes under other jurisdiction, primarily those within three miles of the Forest boundary.

Table 4. ROS Link to TravelRoute_ln attributes

TravelRoute_ln attributes	Attribute value	ROS Route Category
TRAIL_CFF	525 – National Recreation/Scenic/Historic Trail	non-motorized or motorized (further designation dependent on other factors defined in corporate data)
ROAD_CFF	089 - Road, 4WD, Class 5	motorized high clearance vehicle/OHV
	101 - Primary Highway	motorized standard passenger vehicle
	103 - Secondary Highway	motorized standard passenger vehicle
	105 - Light-duty Road, Composition Unspecified, Off-Forest Only)	motorized standard passenger vehicle
	106 - Unimproved Road	motorized high clearance vehicle/OHV
	108 - Road, Urban areas (SBS)	motorized standard passenger vehicle
	515 - Light-duty Road, Dirt	motorized high clearance vehicle/OHV
	517 - Light-duty Road, Paved	motorized standard passenger vehicle
	518 - Light-duty, Gravel	motorized standard passenger vehicle

TravelRoute_In attributes	Attribute value	ROS Route Category
	0	Category dependent on category of adjacent routes, Forest Visitor Maps, and appearance on aerial imagery. Documented on GIS feature class.

Other Motorized Considerations

Designated Motorized Use Areas

The corporate GIS data layer Transportation: TravelManagementArea feature class was used to identify Designated Motor Vehicle Use Areas (areas where motor vehicle use is permitted off of designated routes).

A review showed that in most cases the roads adjacent to these areas may be a more accurate reflection of potential ROS setting. However, for full consideration on ROS settings, the polygon feature was exported to a line feature and buffered the same as routes.

These areas were labeled as “high clearance vehicle/OHV” since they are mostly used for camping purposes. A number of areas are less than one acre, and one area is about three acres.

Over Water Use (Waterbodies)

Waterbodies with motorized use were identified by Forest personnel. The New Mexico Game and Fish Department fishing regulations (http://www.wildlife.state.nm.us/download/publications/rib/2015/fishing/_2015_2016-New-Mexico-Fishing-Rules-And-Info.pdf), identified the following lakes as restricted to oars or electric motors only: Quemado Lake, Bear Canyon Lake, Lake Roberts, and Snow Lake. All waterbodies were labeled as “high clearance vehicle/OHV” because of these restrictions. The restrictions and this label indicates a more semi-primitive type of experience on these lakes.

A review showed that in most cases the roads adjacent to these areas may be a more accurate reflection of potential ROS setting. However, for full consideration on ROS settings, the polygon feature was exported to a line feature and buffered the same as routes.

No streams were identified as having motorized use.

Railroads

One industrial railroad spur was identified outside of the Forest boundary but within the three mile buffer of the Forest boundary. This railroad is operated by Southwestern Railroad leading to the Cobre Mine near Fierro, NM. This route was labeled as “standard passenger vehicle.”

Aircraft Landing Strips

Airport/Landing Strip Layer File identified the points of Aircraft Landing Strips including the airstrips identified by the Forest: Beaverhead, Negrito, MeOwn, and Jewett Mesa (maintained by GNF) and Reserve and Glenwood airstrips under Special Use Permit to Catron County.

A review of the airstrip locations showed that in most occur in proximity to designated motorized routes. However, for full consideration on ROS settings, the airstrip line feature was heads up digitized based on the point locations and aerial imagery (2014 NAIP 1 Meter Layer File). The line feature was buffered the same as routes. All aircraft landing strips were labeled as “standard passenger vehicle.”

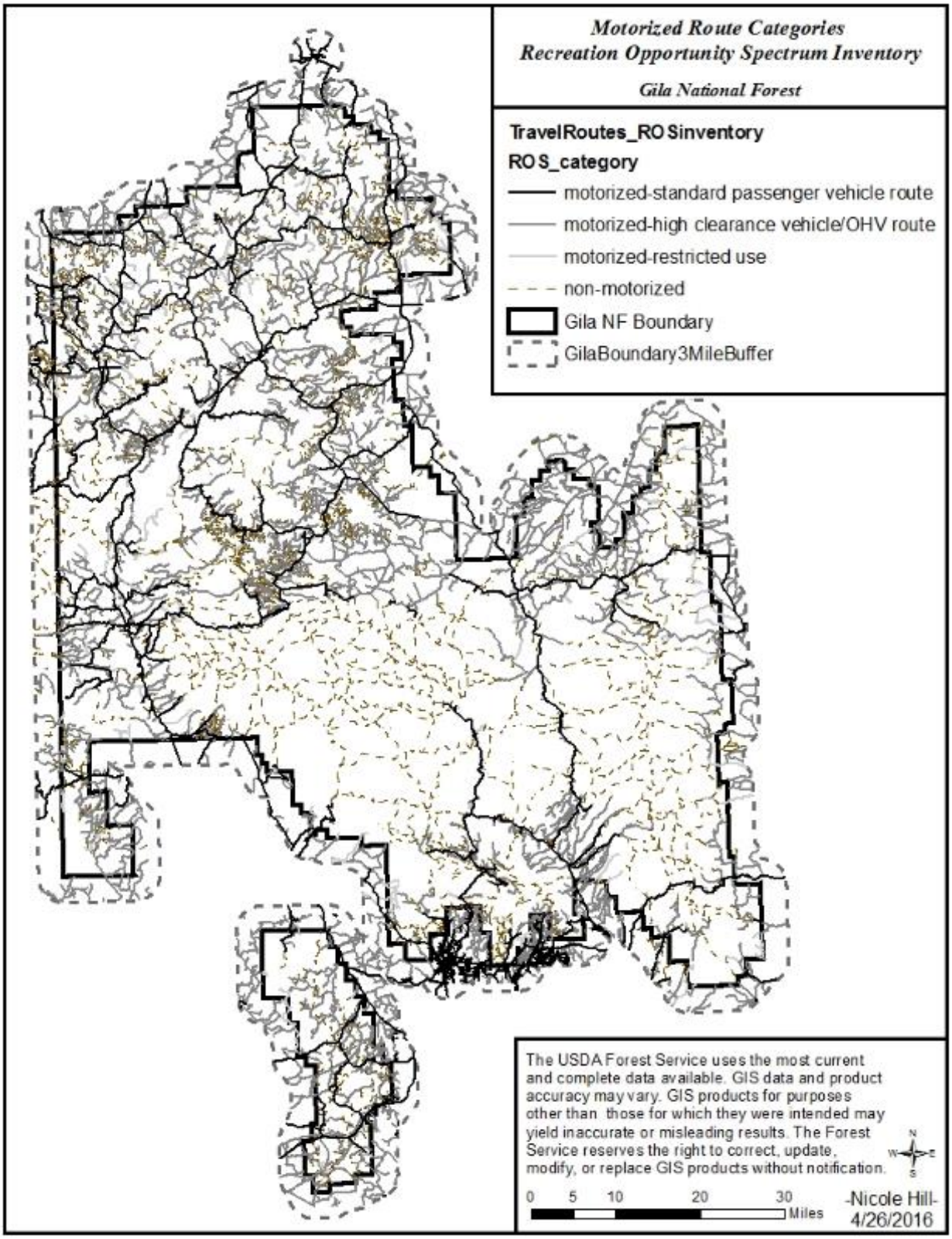

Figure 2. Travel Routes Category Map

Step 2. Buffer motorized routes and areas

This step identified initial division between motorized and non-motorized ROS settings. Motorized ROS settings are areas within ½ mile of motorized travel routes (i.e., roads, trails) identified in the previous step.

"High clearance vehicle/OHV" and "standard passenger vehicle" routes identified during the previous step were buffered separately.

All motorized routes were buffered by one-half mile and three mile buffers. Areas falling within one-half mile of motorized travel were selected and identified as "motorized." All areas outside one-half mile of motorized travel were identified as "non-motorized." Further refinement of non-motorized and motorized areas occurs in subsequent steps.

In the previous step, it was confirmed that current travel management is consistent with the operational maintenance level of the roads and trails. At this point, the draft map displays polygons that display an initial division between motorized and non-motorized ROS settings year-long.

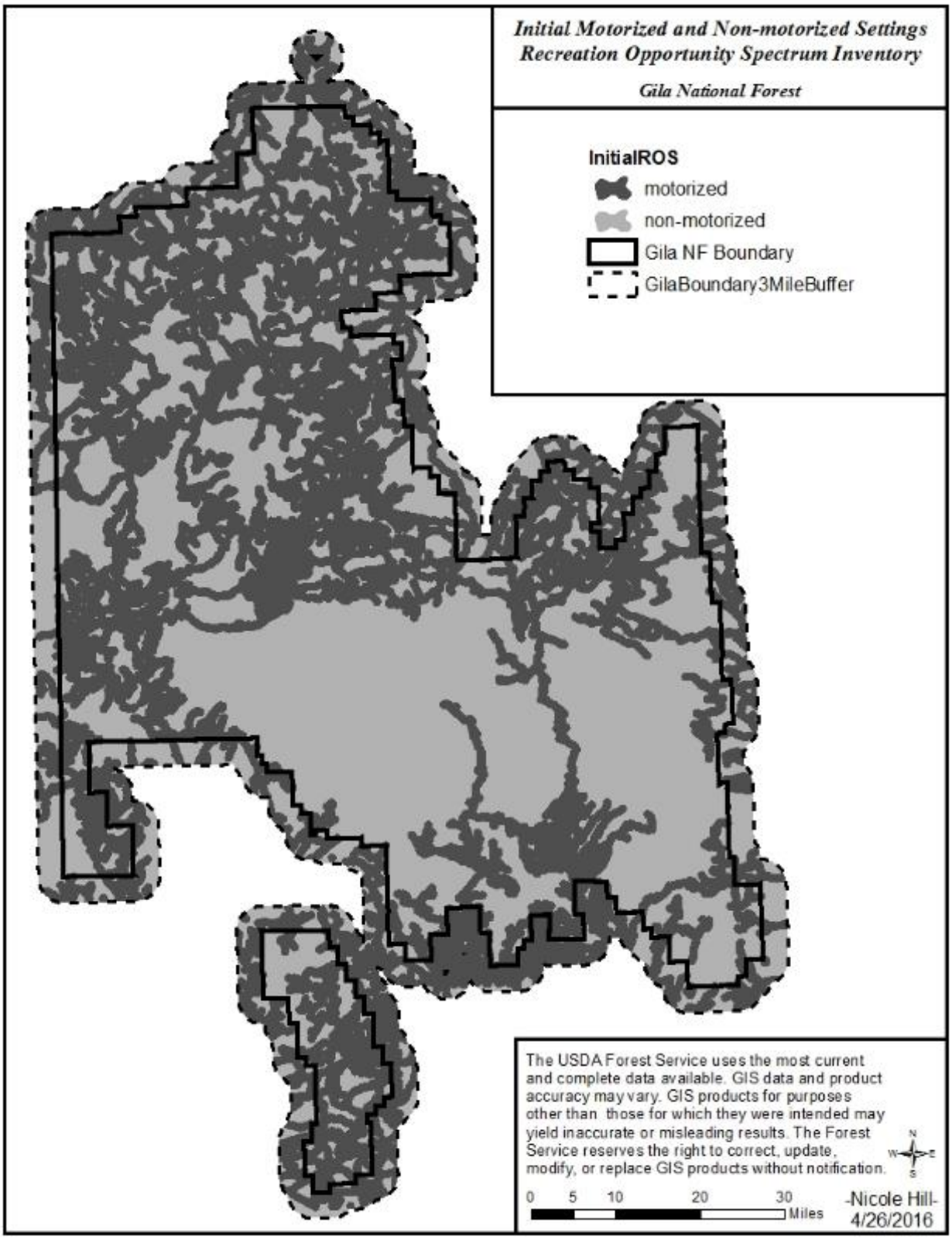

Figure 3. ROS Inventory Map, initial division between motorized and non-motorized ROS settings

Steps 3 and 4. Apply remoteness criteria to non-motorized and motorized buffers

Step 3 classifies non-motorized lands as either Primitive or Semi-primitive Non-motorized using remoteness criteria. No areas were three miles or greater away from motorized routes, so no areas were mapped as Primitive (P). Areas less than three miles and more than one-half mile from all motorized routes were initially mapped as Semi-primitive Non-motorized (SPNM).

Step 4 classifies motorized ROS settings as either Semi-primitive Motorized or Roaded Natural. Areas within the one-half mile buffer of routes categorized as "high clearance vehicle/OHV" roads were selected and initially mapped as semi-primitive motorized (SPM). Areas within one-half mile buffers for "standard passenger vehicle" roads and other motorized travel corridors were initially mapped as Roaded Natural (RN). At this point, the draft map displayed a rough division between initial Semi-primitive Non-motorized ROS settings, Semi-primitive Motorized, and Roaded Natural ROS settings.

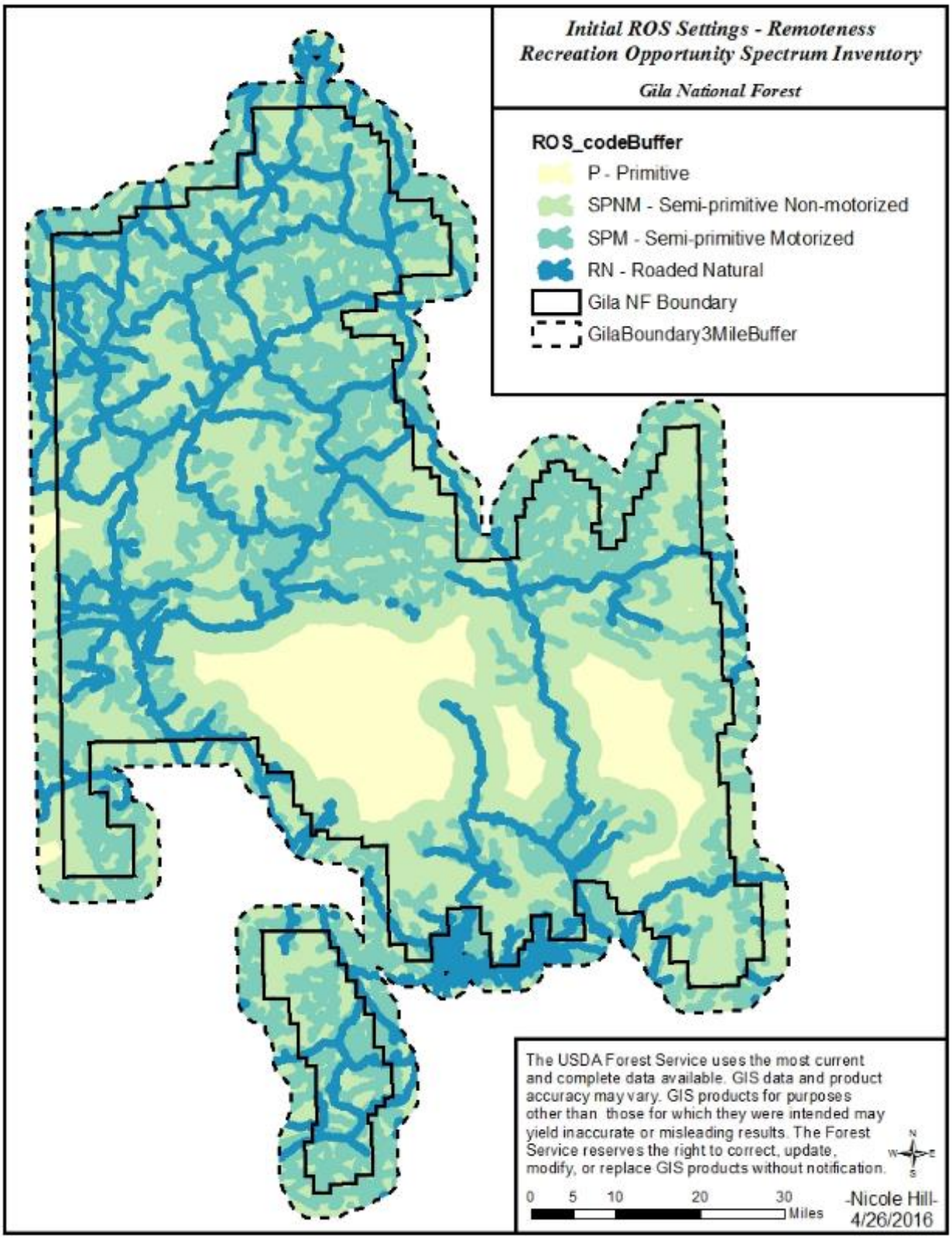

Figure 4. ROS Inventory Map, initial division between Primitive, Semi-Primitive Non-Motorized, Semi-Primitive Motorized, and Roaded Natural ROS settings

Step 5. Apply size criteria to Primitive, Semi-primitive Non-motorized and Semi-primitive Motorized settings

This step identifies areas meeting the various size criteria as well as identifying (flagging and coding) areas that do not meet the size criteria. The flagged areas are analyzed in subsequent steps to ensure other criteria are fully considered before eliminating the area due strictly to remoteness and size.

Areas initially identified as SPNM with a size greater than or equal to 2,500 acres were selected. These areas meet all criteria for Semi-primitive Non-motorized and were designated as Semi-primitive Non-motorized (SPNM). Areas not meeting the size criteria were flagged and coded as "smallSPNM" to allow for further analysis.

Areas initially identified as SPM polygons greater than or equal to 2,500 acres were selected. These polygons meet the definition of Semi-primitive Motorized and were designated Semi-primitive Motorized (SPM). Remaining areas not meeting the size criteria, polygons smaller than the 2,500 acres, were flagged and coded as "smallSPM." These areas were further analyzed in subsequent steps. If analysis did not support a SPM setting in subsequent steps, "smallSPM" areas were coded Roaded Natural (RN).

At this point, the draft map displayed the initial P, SPNM and SPM settings that meet remoteness and size criteria and small P, SPNM and SPM settings flagged for further analysis. The map also displays initial RN settings which are further differentiated in next steps. All settings are analyzed in subsequent steps to ensure other ROS inventory criteria are fully considered.

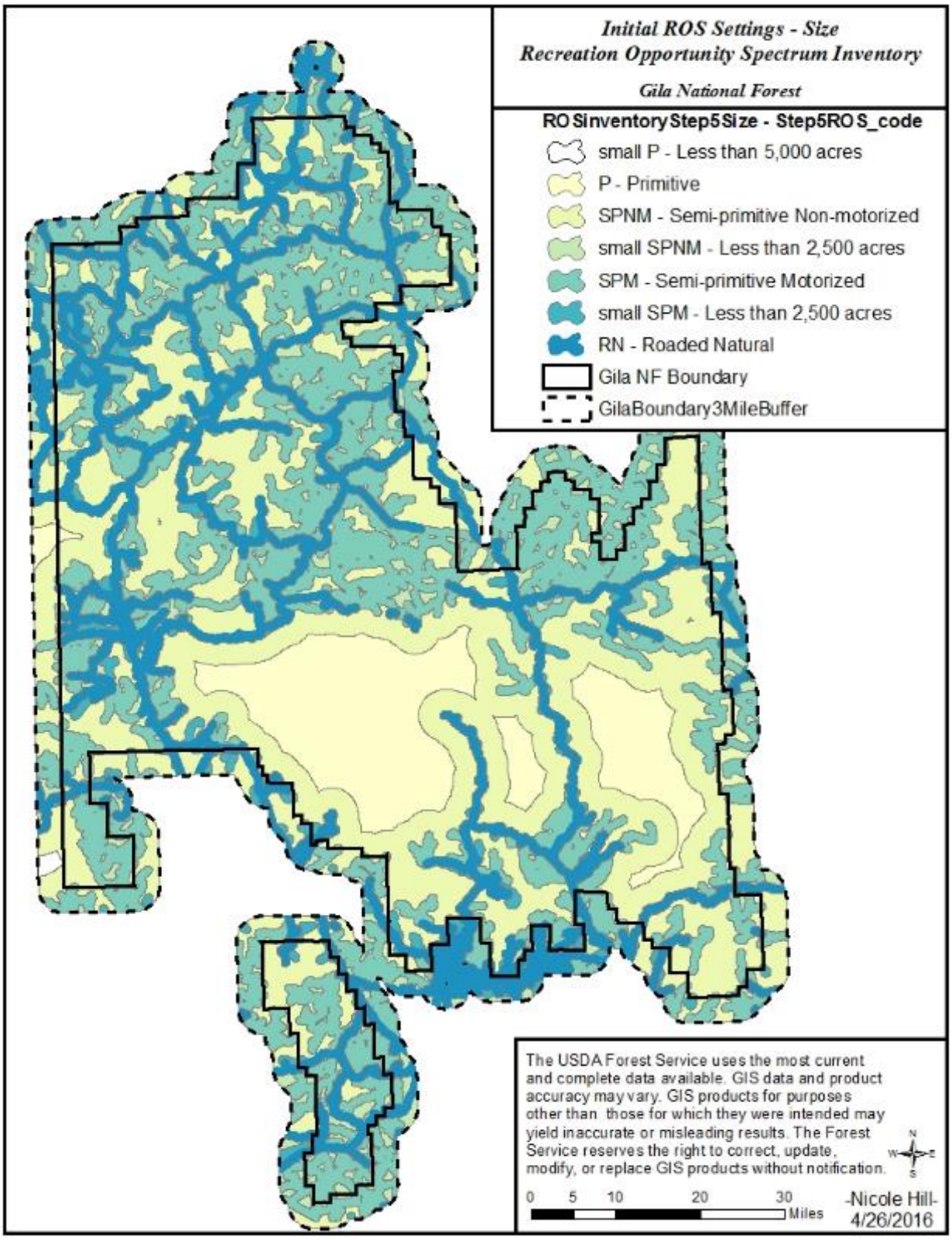

Figure 5. ROS Inventory Map, apply size criteria to Primitive, Semi-primitive Non-motorized and Semi-primitive Motorized settings

Step 6. Conduct adjacency assessment to refine P, SPNM, and SPM settings

This step conducts an adjacency assessment to refine the P, SPNM and SPM settings that do not meet size criteria. Subject matter expertise was used to refine "smallP," "smallSPNM," and "smallSPM" areas that do not meet ROS size criteria by considering adjacency to other settings.

Further assess and refine "smallP" areas

For those areas initially mapped as "smallP" (Primitive but smaller than 5,000 acres), consider adjacent ROS determinations and settings. Four "smallP" areas were mapped. One area on the western forest boundary was about 3,900 acres in size with about 14 acres located on-forest. The other areas were less than 100 acres in size. All of the areas mapped as "smallP" were changed to SPNM as they did not meet any of the considerations outlined in the Protocol. The following flowchart from the Protocol was followed to inform determinations.

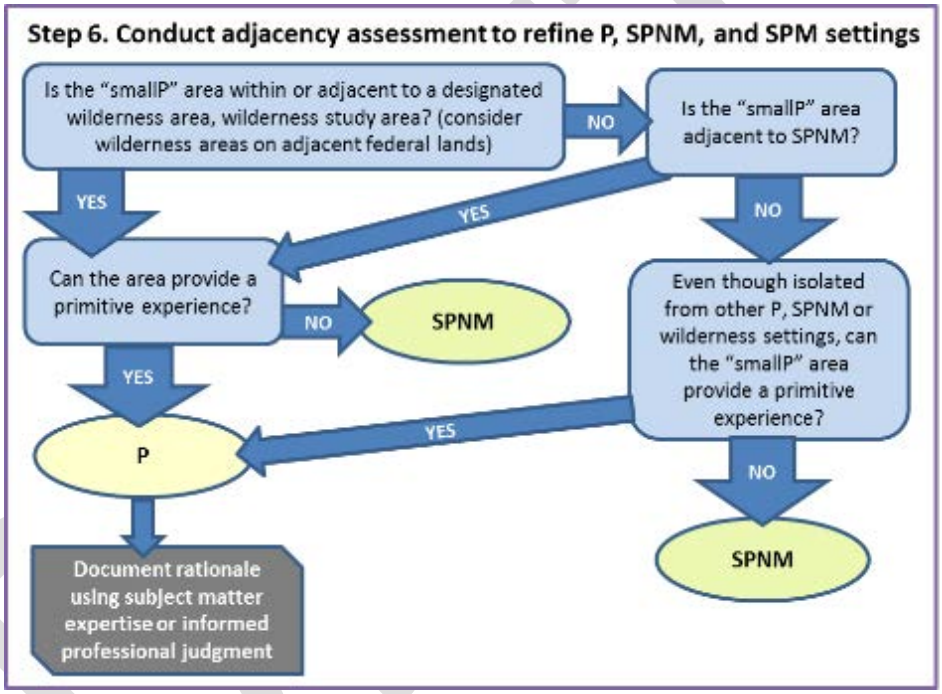

Figure 6. Adjacency assessment to refine "smallP" areas flowchart

Further assess and refine "smallSPNM" areas

For those areas initially mapped as "smallSPNM" (Semi-primitive Non-motorized but smaller than 2,500 acres), adjacent ROS determinations were considered. The following flowchart from the Protocol was followed to inform determinations.

Some "smallSPNM" areas (generally those over 1,500 acres) were carried forward into next steps to apply subject matter expertise and professional judgment to determine if the area can provide a SPNM experience if under 2,500 acres and apply considerations, such as steep topography, in subsequent steps.

The following are considerations when determining how to label "smallSPNM" areas:

- If adjacent lands are Primitive, the polygon may still provide a SPNM experience and be mapped as such.

- "SmallSPNM" areas may be identified as SPNM, even though they do not meet the size criteria if the "smallSPNM" area is contiguous to a designated wilderness area or wilderness study area.
- "SmallSPNM" areas adjacent to "SmallSPM" were mapped as SPM areas if, when combined, they total 2,500 acres. "SmallSPNM" areas engulefed by SPM, were mapped as SPM. Although motorized use does not occur in all portions of the setting, all portions contribute to the semi-primitive character.
- If the area was isolated due to topography or other permanent landscape features, the area, even though not 2,500 acres, may be mapped as SPNM.
- If none of the above conditions occurred, the area was mapped as RN.

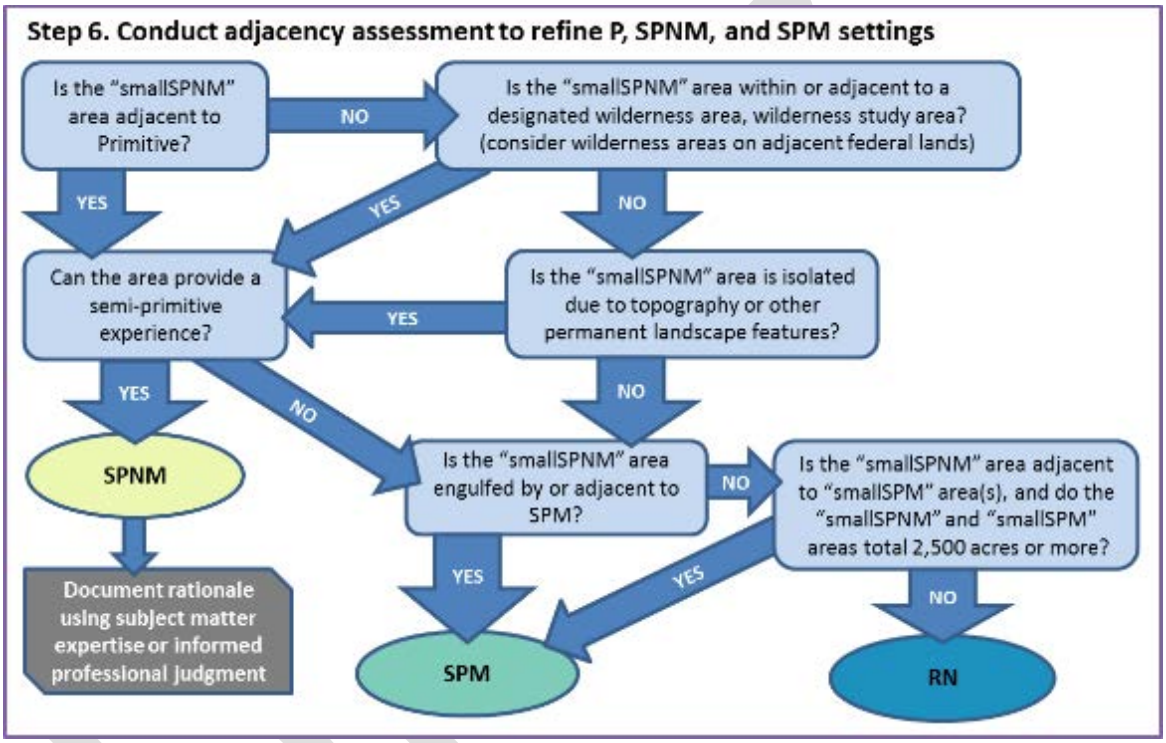

Figure 7. Adjacency assessment to refine "smallSPNM" areas flowchart

Further assess and refine "smallSPM" areas

For those areas initially mapped as "smallSPM" (Semi-primitive Motorized but smaller than 2,500 acres), adjacent ROS determinations were considered. The following flowchart from the Protocol was followed to inform determinations.

Some "smallSPNM" areas (generally those over 1,500 acres) were carried forward into next steps to apply subject matter expertise and professional judgment to determine if the area can provide a SPNM experience if under 2,500 acres and apply considerations, such as steep topography, in subsequent steps.

The following are considerations when determining how to label "smallSPM" areas:

- "SmallSPNM" areas adjacent to "SmallSPM" were mapped as SPM areas if, when combined, they total 2,500 acres. Although motorized use does not occur in all portions of the setting, all portions contribute to the semi-primitive character.

- If the area was isolated due to topography or other permanent landscape features, the area, even though not 2,500 acres, may be mapped as SPM. Some "smallSPM" areas were carried forward into next steps to apply subject matter expertise and professional judgment using other considerations in subsequent steps.
- If none of the above conditions occurred, the area was mapped as RN.

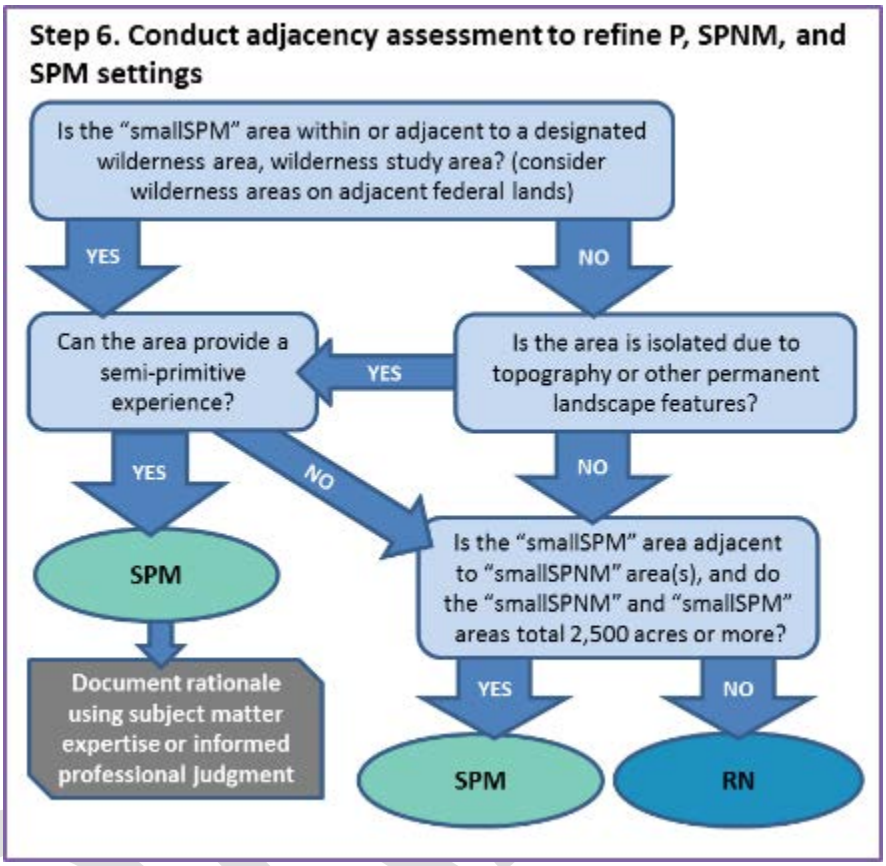

Figure 8. Adjacency assessment to refine "smallSPM" areas flowchart

At this point, the draft map displays initial SPNM and SPM settings that meet remoteness and size criteria and still includes small SPNM and SPM areas that need further consideration by recreation subject matter experts. The map also displays initial RN settings which are further differentiated in the next step. All settings continue to be analyzed in subsequent steps to ensure other ROS inventory criteria are fully considered.

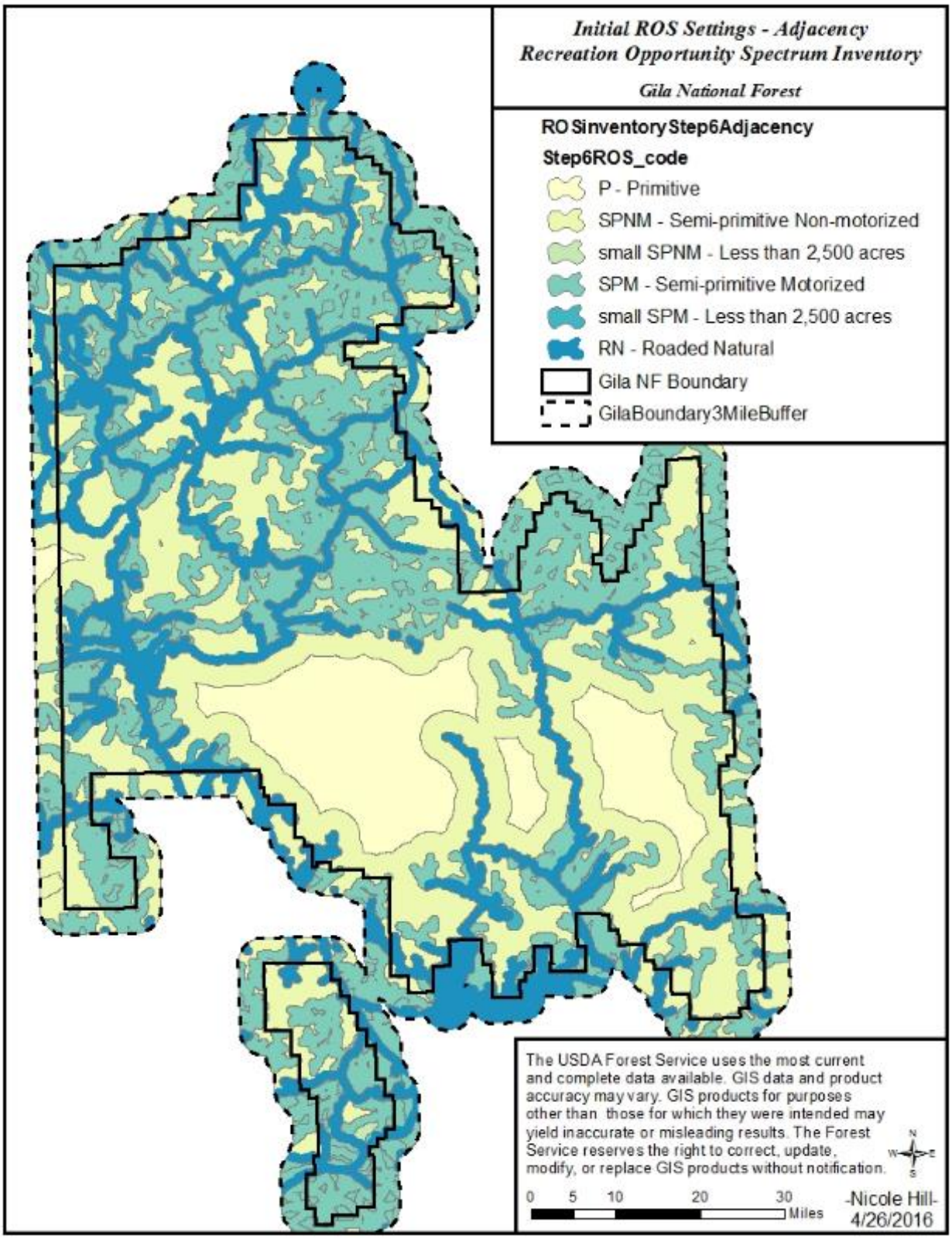

Figure 9. ROS Inventory Map, adjacency assessment to refine Primitive, Semi-Primitive Non-Motorized, and Semi-primitive Motorized settings

Step 7. Apply evidence of humans criteria to differentiate between RN, Rural and Urban settings

This step differentiates between Roaded Natural, Rural and Urban settings by applying the physical setting, evidence of humans criteria. Evidence of humans criteria indicates varying degrees modifications to the natural landscape as one moves across the spectrum.

No size criteria apply to Roaded Natural, Rural, or Urban ROS classes. Remaining buffered areas within ½ mile of "standard passenger vehicle" roads were identified as RN in Step 4. No real distinction between Roaded Natural, Rural and Urban ROS classes can be derived from operational maintenance levels 3, 4, and 5. Any of these three ROS classes are feasible where these maintenance levels occur.

Data options for differentiating Roaded Natural, Rural or Urban ROS classes include: route density, level of development, or subject matter expertise using the evidence of humans criteria in the 1982 User Guide. The above data options were reviewed, and the best data available for differentiating these ROS classes was to for Forest staff to identify areas using subject matter expertise using the evidence of humans criteria. The determinations are also reflective of level of development data option. No areas were identified as Urban ROS. The following areas were identified as Rural ROS by District and Forest staff:

- Quemado Lake recreation area and developments
- Lake Roberts recreation area
- Fort Bayard
- Gomez Peak
- Rancho Grande Estates
- Reserve community area
- Kingston community area
- Beaverhead Work Center
- Kingston Campground

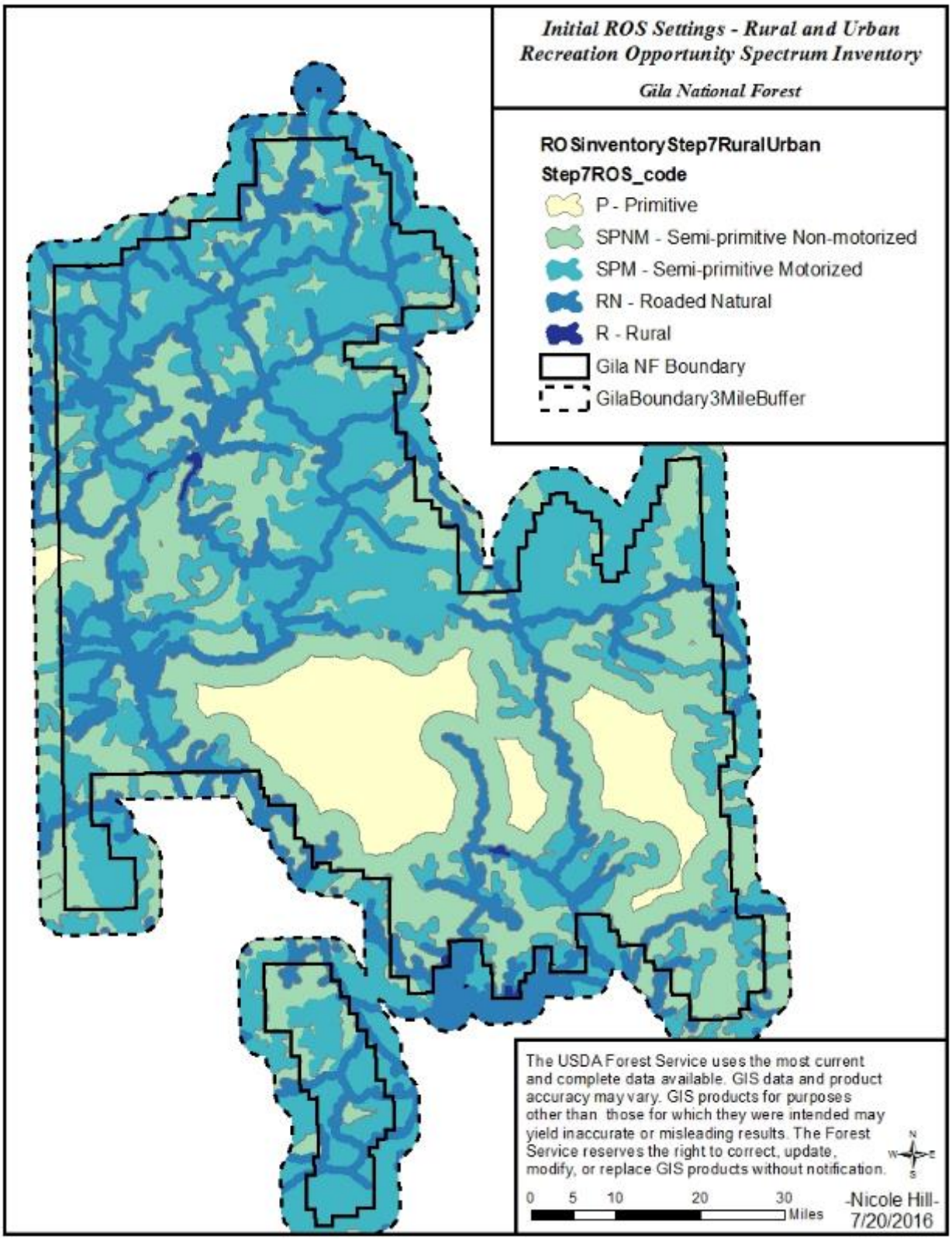

Figure 10. ROS Inventory Map, distinguish between Roaded Natural, Rural, and Urban ROS classes. Note: map may not show all Rural areas identified since some were identified during the fall/winter review by District and Forest staff. All identified Rural areas are shown on subsequent maps.

Step 8. Apply other considerations and recreation subject matter knowledge

Other available information, such as topography, may be used to further refine polygons. Where routes are contained within steep canyons or areas with steep topography, the "influence" zone of those routes may be less than ½ mile.

The Protocol includes an ArcGIS model available for optional use that utilizes travel routes and terrain (specifically slope) to model ROS classes based on the difficulty in reaching a particular point (USDA FS 2013a). The ROS model was developed to account for the increased difficulty of traveling over rough terrain. Slope was used to measure the difficulty; the steeper the slope, the tougher it is to cross the landscape. Therefore, in steep areas Semi-primitive Non-motorized areas could be less than ½ mile from a motorized route. Following the recommendation in the Protocol, the model was used in conjunction with the other steps in this mapping protocol. The model was used to determine where influence zones of travel routes are less than ½ mile due to terrain. As recommended in the Protocol, the model was not used to determine where influence zones are more than ½ mile as little documentation exists on the appropriate distance to use in such cases. In areas with flat terrain, the standard buffers were used as documented in previous steps.

The adjustments made during this step were based on recreation subject matter expertise and professional judgment by the Enterprise Program landscape architect/recreation planner. The initial ROS mapping, completed in previous steps, was compared with the terrain model ROS.

When comparing P areas, the largest primitive area was selected. By doing this, SPNM areas were decreased and P areas were increased. The model mapped some Primitive areas which do not meet size criteria (5,000 acres). Three small P areas on the Glenwood Ranger District and 2 areas on the Silver City Ranger District were determined to provide a Primitive setting, even though they do not meet size criteria. See Appendix B for the documentation and rationale on how these areas provide a Primitive setting.

When comparing SPNM areas, the smallest motorized distance was selected. By doing this, SPM and RN areas were decreased and SPNM areas were increased. After editing for SPNM, if an area of SPM or RN from terrain modeling was engulfed by SPNM, the area was changed to SPNM. Small SPNM areas on multiple Ranger Districts were determined to provide a SPNM setting, even though they do not meet size criteria. See Appendix B for the documentation and rationale on how these areas provide a Semi-primitive Non-motorized setting.

When comparing SPM areas, the smallest motorized distance was selected. By doing this, RN areas were decreased, and SPM areas were increased. By increasing SPNM areas, some SPM areas no longer met size criteria. Most SPM areas no longer meeting size criteria were changed to RN. Some small SPM areas no longer meeting size criteria were mapped as SPM based on professional judgement, providing a SPM setting, even though they do not meet size criteria. See Appendix B for the documentation and rationale on how these areas provide a Semi-primitive Motorized setting.

Rationale for all adjustments based on the District and Forest staff review are documented in the ROS inventory feature class comment attributes. A map showing the result of this step is shown with Step 9 below.

Step 9. Review wilderness settings

Designated wilderness areas typically prohibit motorized and mechanized use, do not contain facilities or recreation developments, and are managed for a primitive recreation experience. Although designated wilderness areas have a desired condition of Primitive ROS, the existing condition vary from that due to

their proximity of motorized routes and remoteness criteria (1/2 mile buffer) applied to them. The Primitive ROS class is not synonymous with designated wilderness when mapping existing conditions. This process applied the same ROS criteria independently of any area designation, as described in the 1982 User Guide (page IV-3).

Designated wilderness boundaries were placed over the existing ROS inventory resulting from step 8. Some polygons were initially mapped as RN or SPM due to their proximity of motorized routes. All polygons initially mapped as motorized (SPM and RN) ROS settings were reviewed.

For the Gila NF, RN and SPM settings within designated wilderness occurred in isolated situations, under limited circumstances. Motorized ROS delineations were limited to narrow corridors (e.g. along cherry stem roads and roads that follow the designated wilderness boundary). Adjustments for terrain decreased SPM and RN areas along designated wilderness boundaries but did not eliminate them entirely.

Gila NF recreation staff found that motorized use in most cases is infrequent and not a significant impact to the wilderness experience in these areas and that the ROS inventory should accurately represent the recreation opportunity in these areas. Therefore, all SPM and RN polygons within designated wilderness were mapped as SPNM.

Several operational maintenance level 2 roads, which are also designated on the MVUM, are located in the Hell Hole Wilderness Study Area and Lower San Francisco Wilderness Study. A SPM setting occurs due to the presence and use of these roads. Some RN settings also occur in these wilderness study areas due to the proximity of standard passenger vehicle roads to the wilderness study area boundaries.

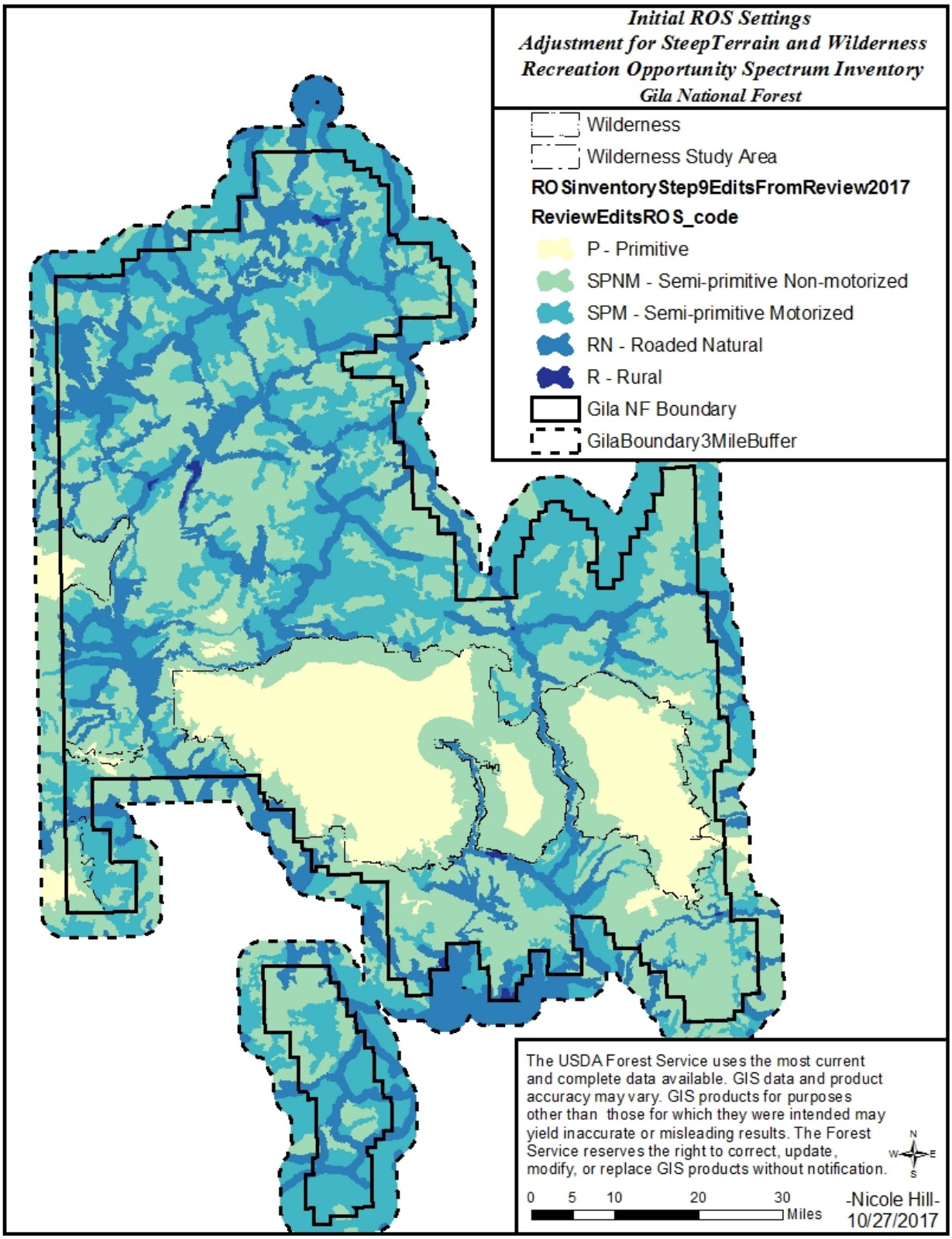

Figure 11. ROS Inventory Map, Adjustments for steep terrain and wilderness settings. Other considerations and recreation subject matter knowledge applied. All fall/winter review edits provided by District and Forest staff are incorporated into this mapping step.

Step 10. Apply additional physical setting, social setting and additional managerial setting information to identify and map inconsistencies with mapped ROS settings.

The previous mapping steps show the inventoried ROS settings, which reflect the physical and managerial settings based on travel planning, travel management rule, subpart B decisions.

Additional physical settings (evidence of humans criteria), social setting and additional managerial settings are reviewed in this step to identify corrections and identify inconsistencies with the ROS mapped in previous steps. The additional physical, social and managerial setting criteria, in most cases, do not drive the delineation of one ROS class over another. Rather, they are helpful in identifying an inconsistency. When the physical, social and/or managerial setting criteria of an ROS class are not fully met, this is considered a setting inconsistency within the overall managed ROS setting.

The Gila NF does not have complex social or managerial settings and recorded this information on the ROS feature class rather than a separate feature class. The 1982 ROS User Guide physical settings (evidence of humans criteria), social setting and managerial settings used in this step are shown in Appendix C of this report.

In the 2016 fall/winter review, District and Forest recreation staff reviewed results the ROS inventory mapping outlined in previous steps, confirmed the adjustments made using the terrain model, identified additional areas meeting the evidence of humans criteria for Rural or Urban, and also identified inconsistencies with the recreation opportunities shown in the ROS mapping.

Additional Physical Setting

In previous mapping steps, the evidence of humans criteria was only applied to differentiate between Roaded Natural, Rural, and Urban ROS settings. In this step, the evidence of humans criteria may also be applied to Primitive, Semi-primitive Non-motorized and Semi-primitive Motorized settings to identify inconsistences with those settings. The overall inventoried ROS setting will not be changed in Primitive, Semi-primitive Non-motorized and Semi-primitive Motorized settings, but will be mapped as an inconsistency. District and Forest staff identified several areas with a physical setting inconsistent with mapped ROS settings.

On the Black Range Ranger District the Apache Camp area and NFSR 761 corridor in vicinity of Wilderness is currently mapped as Primitive. Private property has motorized access to inholding which is inconsistent with mapped ROS settings. Also on the Black Range Ranger District, a large powerline corridor affects the remoteness in an inventoried SPNM setting in the northern portion of the District in the vicinity of Silver Creek.

Areas with roads or motorized trails which are closed to public, but may receive some administrative use or permitted use. This use may affect the remoteness criteria, since users may encounter administrative motorized use in an otherwise non-motorized setting. This was determined by considering previously identified “motorized restricted use” routes from Step 1. Those “motorized restricted use” routes can be buffered with a ½ mile buffer. If that ½ mile buffer occurred within P or SPNM mapped ROS class, a physical setting inconsistency was mapped. Areas within ½ mile of designated dispersed camping corridors where the ½ mile distance occurs within mapped P or SPNM mapped ROS class were also mapped as a physical setting inconsistency.

Social Setting

The visitor density criteria from the 1982 ROS User Guide will be used to determine social settings that were inconsistent with the mapped ROS classes. District and Forest recreation staff should use field knowledge and professional judgement based on number of encounters. Several areas on multiple districts were identified as having social setting more developed than the mapped ROS setting would indicate due to the amount of use. Refer to Appendix C of this report for the social setting criteria. Areas identified with a social setting inconsistency include:

- Silver City Ranger District
  - Portions of NFSR 810 (Big Bear corridor) due to amount of use
  - Portions of NFSR 118 (Saddle Rock Canyon corridor) due to amount of use
  - NFSR 91 and surrounding areas due to mine traffic and designated ATV use
  - Portion of NFSR 841 (WD Ranch, Hoodoo Canyon corridor) due to amount of use
- Wilderness Ranger District
  - Areas surrounding NFSR 4079T (Lincoln Canyon Loop) due to high use
  - NFSR 4202K and 4202M corridors and surrounding areas due to heavy OHV use and camping
- Black Range Ranger District
  - Non-wilderness portion of inventoried Primitive around Apache Camp. Amount of use is inconsistent with inventoried Primitive setting
  - Road corridors with high use during hunting season: NFSR 4088N, 4074Y, NFSR 4074Z, NFSR 895 (Midnight Cabin), NFSR 114 (South Fork Cuchillo) and other multiple road corridors in the northern portion of the Ranger District

Additional Managerial Setting

Managerial setting information, visitor management criteria, can either be visible (barriers, signs, etc.) or invisible (such as permits, etc.). Managerial setting information was considered at the beginning of the ROS mapping since travel management decisions were incorporated. At this point, any other restrictions, seasonal closures, or other closures will be checked to ensure that all managerial settings are incorporated. No managerial setting inconsistencies were identified. Refer to Appendix C of this report for managerial setting criteria.

Final Adjustments and Acreage Summary

Once all adjustments identified by Forest and District recreation staff are made, the ROS classification will be clipped with the planning unit boundary. To display acres, the ROS classification will be intersected with the basic surface ownership layer provided by the Forest. The following table summarizes acres in each ROS class on National Forest ownership.

Table 5. Recreation Opportunity Spectrum Inventory Acres

Recreation Opportunity Spectrum Class	Acres	Percent of Forest
Primitive	522,758	16
Semi-primitive Non-motorized	1,429,814	44
Semi-primitive Motorized	798,190	24
Roaded Natural	518,190	16
Rural	5,139	less than 1
Urban	0	0

Note: The acres calculations only include National Forest System lands.

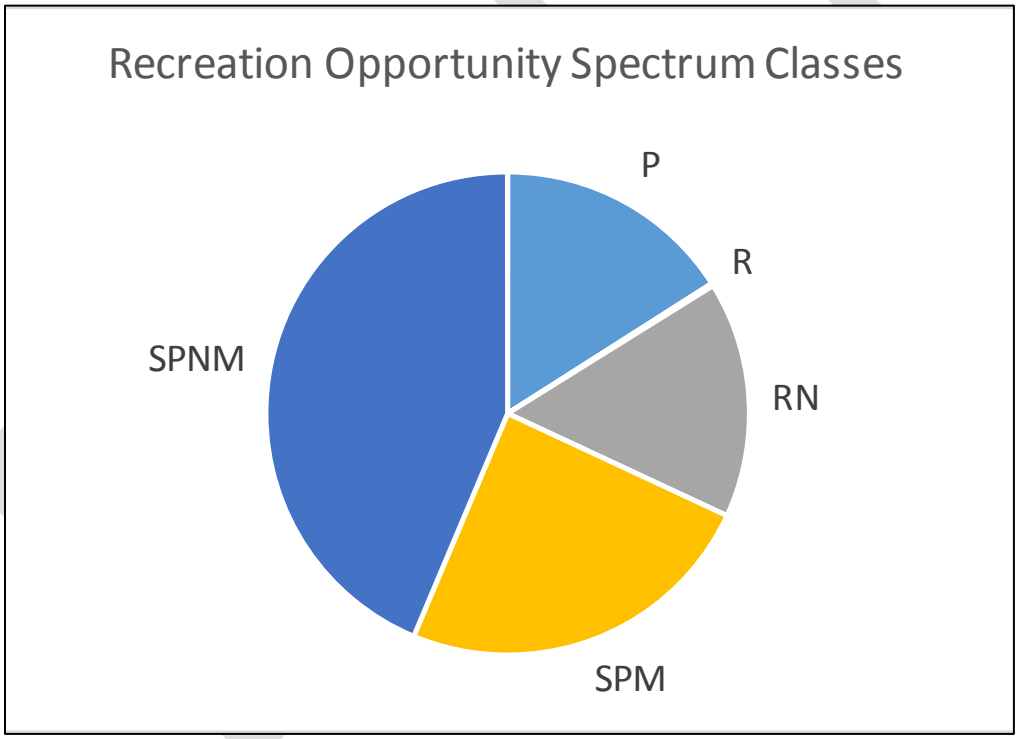

Figure 12. Existing ROS Inventory Chart

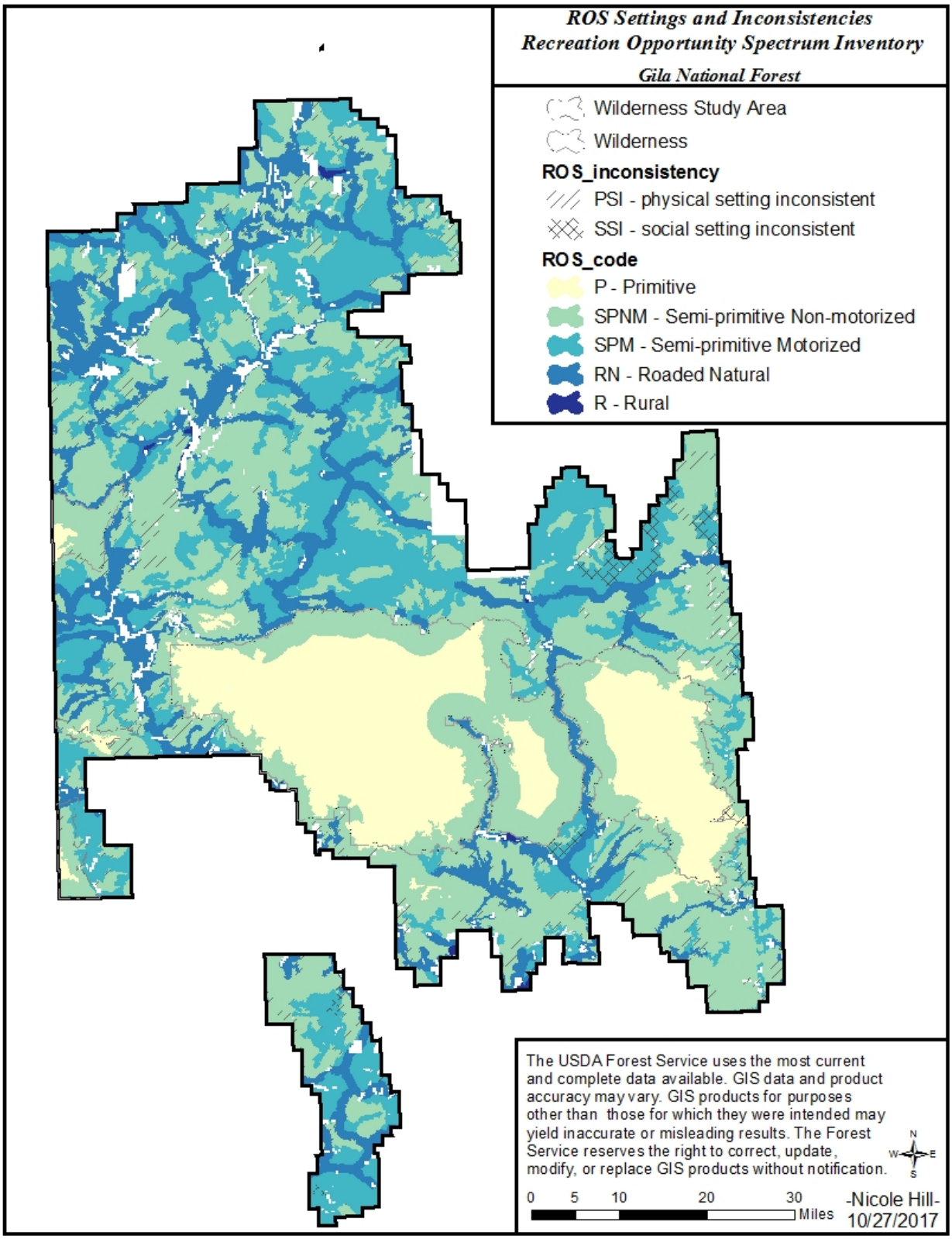

Figure 13. Recreation settings and inconsistencies, Recreation Opportunity Spectrum Inventory Map based on recreation opportunities and off-forest influences

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Appendix A. Summary of ROS Setting Characteristics from draft 2309.XX directives (as of October 2016)

	Setting	Description
Primitive	Physical	**Theme:** Predominately unmodified, naturally evolving, vast, and remote
		Remoteness: 3 miles or more from designated motorized routes and areas
		Size: 5,000 or more acres
		Infrastructure (access and facilities): *Access* - Non-motorized trails, class 1; Travel on foot and horse, no motorized travel, no mechanized travel within designated Wilderness *Rec sites* – Dev. scale 0, no improvements *Sanitation* – no facilities, leave no trace *Water supply* – undeveloped natural *Signing* – minimal, constructed of rustic, natural materials *Interpretation* - through self-discovery *Water crossing* – minimal, pedestrian only, made of natural materials
		Vegetation: Natural, no treatments except for fire use.
		Scenic Integrity: Very High
	Managerial	Little to no on-site regimentation, few encounters with rangers
	Social	Very high probability of solitude; closeness to nature; self-reliance, high challenge and risk; little evidence of people. Typically 6 or less encounters with other parties on trails, and less than 3 parties visible from camping sites.
Semi-Primitive Non-Motorized	Physical	**Theme:** Predominately natural/natural appearing; rustic improvements to protect resources.
		Remoteness: ½ mile or more from designated motorized routes and areas.
		Size: 2,500 or more acres
		Infrastructure (access and facilities): *Access* – Non-motorized routes, trail classes 1-2 typical. Foot/horse/mountain bike use - no motorized travel. Closed and temporary roads may be present. *Rec sites* – Dev Scale 0-1, minor investments to protect resources *Sanitation* – no facilities, leave no trace *Water supply* – undeveloped natural *Signing* – rustic, natural materials *Interpretation* – typically self-discovery *Water crossing* – rustic structures for foot/horse traffic
		Vegetation: Predominately natural; treatment areas exist to enhance forest health but are few and widely dispersed
		Scenic Integrity: High
	Managerial	Minimum or subtle signing, regulations, or other regimentation. Low encounters with rangers.
	Social	High probability of solitude, closeness to nature, self-reliance. High to moderate challenge and risk. Usually 6-15 encounters with other parties on trails. 6 or less parties visible from camping sites.

	Setting	Description
Semi-Primitive Motorized	Physical	**Theme:** Predominately natural appearing, motorized use visible and audible.
		Remoteness: within half mile of OML 2 roads and ½ mile or more from OML 3-5 roads
		Size: 2,500 or more acres
		Infrastructure (access and facilities): *Access* – Motorized routes: OML 2 roads and trail class 2 typical; OHVs allowed on designated routes and areas *Rec sites* – Dev. Scales 0-2; investments to protect resources *Sanitation* – limited facilities, outhouses may be in areas of concentrated use *Water supply* - undeveloped natural *Signing* – rustic, made of natural materials *Interpretation* – self-discovery, some located on site or at trailheads *Water crossing* - rustic structures or bridges
		Vegetation: treatment areas are very small in number, widely disbursed, and consistent with natural vegetation patterns.
		Scenic Integrity: High or Moderate
	Managerial	Minimum, subtle on-site controls; designated motorized routes/areas
	Social	Moderate to high probability of solitude. High degree of risk/challenge
Roaded Natural	Physical	**Theme:** Natural Appearing with nodes and corridors of development such as campgrounds, trailheads, boat launches, and rustic, small-scale resorts.
		Remoteness: within ½ mile of ML 3-5 roads**.**
		Size: n/a
		Infrastructure (access and facilities): *Access* – Typically OML 2-5 roads and Trail Class 3-4, hwy. vehicles, OHVs and non-motorized travel on designated routes *Rec sites* – Dev. Scales 0-3 typical *Sanitation* – typically vault toilets *Water supply* – often developed *Signing* – variety of materials, blend with natural setting *Interpretation* – simple roadside signs, some interpretive displays *Water crossing* – bridges, natural materials
		Vegetation: Vegetation treatment are evident but in harmony/subordinate to natural setting.
		Scenic Integrity: High to Low
	Managerial	Signs and regulations present but typically subordinate to the setting. Moderate likelihood of encountering Forest Service rangers.
	Social	Moderate evidence of human sights and sounds; moderate concentration of users at campsites; little challenge or risk.

	Setting	Description
Rural	Physical	**Theme:** Altered landscapes with cultural emphasis such as: rural, pastoral, and/or agricultural. Administrative sites, historic complexes, and moderately developed resorts are typical
		Remoteness: not remote, often near other (non-FS) rural settings and communities
		Size: n/a
		Infrastructure (access and facilities): *Access* – typically OML 3-5 roads and trail classes 3-5, mass transit sometimes available *Rec sites* – Dev. scale 4-5 *Sanitation* – Flush toilets *Water supply* – developed, showers common *Signing* – natural and synthetic materials *Interpretation* – roadside exhibits, interpretive programs, etc. *Water crossing*s – bridges, accommodating hwy. vehicles, RVs, heavy equipment
		Vegetation: Changes (treatments) to the natural vegetation patterns may be dominant treatments that blend with landscape.
		Scenic Integrity: High to Low
	Managerial	Obvious signing (regulation and information), education and law enforcement staff. Motorized and mechanized travel common and often separated.
	Social	High interaction among users is common. Other people in constant view. Little challenge or risk associated with being outdoors.
Urban	Physical	**Theme:** Highly developed site modifications and facilities. Ski areas, large visitor centers, and large resorts are examples of urban nodes within NF System lands.
		Remoteness: often close to towns and cities.
		Size: n/a but typically small nodes
		Infrastructure (access and facilities): *Access* - ML 4-5 roads and trail classes 4-5, mass transit often available *Rec sites* – Dev scale 5 typical *Sanitation* – flush toilets *Water supply* – Hot water, showers *Signing* – extensive *Interpretation* – exhibits in staffed visitor centers, highly developed and formalized exhibits, etc. *Water crossings* – bridges for: hwy. vehicles, buses, RVs, heavy equip.
		Vegetation: often planted, manicured and maintained
		Scenic Integrity: High to Low
	Managerial	Intensive on-site management, obvious signs, and staffing, education and law enforcement available. Motorized and mechanized travel restricted to designated routes. No motorized or mechanized travel allowed off designated travel routes.
	Social	High degree of interaction with people. People are in constant view. Challenge and risk are unimportant except for competitive sports.

Appendix B. District/Forest Review – Fall/Winter 2016

Ranger District	GIS Id	Review Category	Acres	Initial ROS Class (recommended by Nicole Hill - step9ROS_code)	Final ROS Class Determination	Determined By	Rationale
Black Range	1	smallP	907	SPNM	SPNM	District Ranger Michael Hutchins	Include rationale if mapped as P:
Black Range	10	smallP	1242	SPNM	SPNM	District Ranger Michael Hutchins	Include rationale if mapped as P:
Black Range	13	smallSPM	1367	RN	SPM	District Ranger Michael Hutchins	Include rationale if mapped as SPM: *Road is not conducive to allow much vehicle travel, doesn't see much use at all*
Black Range	39	smallSPNM	2441	SPNM	SPNM	District Ranger Michael Hutchins	Include rationale if mapped as SPNM: *(NHill Rationale)* Size is 98% of size criteria. Surrounded by SPM, so semi-primitive setting is likely provided.
Glenwood	5	smallP	3790	SPNM	P	District Ranger Anne Casey	Include rationale if mapped as P: *located within wilderness study area, roads end outside the WSA, difficult to access*
Glenwood	6	smallP	3143	SPNM	P	District Ranger Anne Casey	Include rationale if mapped as P: Located in very lightly visited, rarely used trails area, opportunities for solitude and self-reliance, characteristic more of primitive than non-primitive area
Glenwood	7	smallP	1741	SPNM	P	District Ranger Anne Casey	Include rationale if mapped as P: Located in very lightly visited, rarely used trails area, opportunities for solitude and self-reliance, characteristic more of primitive than non-primitive area
Glenwood	8	smallP	1313	SPNM	SPNM	District Ranger Anne Casey	Include rationale if mapped as P:
Glenwood	16	smallSPM	1617	RN	SPNM and SPM	District Ranger Anne Casey	Include rationale if mapped as SPM: *Western portion should be SPNM because the road is closed/inaccessible, Eastern side should be SPM because lower development road with very little use – see notations made on the map itself*

Ranger District	GIS Id	Review Category	Acres	Initial ROS Class (recommended by Nicole Hill - step9ROS_code)	Final ROS Class Determination	Determined By	Rationale
Glenwood	26	smallSPM	2305	SPM	SPM	District Ranger Anne Casey	Include rationale if mapped as SPM: *(NHill Rationale)* Claremont Road 119 corridor. Size is 92% of size criteria. SPNM either side of road corridor so semi-primitive setting is provided
Glenwood - partially off-forest	18	smallSPM	2159	RN	RN	District Ranger Anne Casey	Include rationale if mapped as SPM:
Quemado	19	smallSPM	1540	RN	SPM	District Ranger Emily Irwin	Include rationale if mapped as SPM: *Very little use in the area outside of hunting seasons*
Quemado	20	smallSPM	1917	RN	SPNM / RN	District Ranger Emily Irwin	Include rationale if mapped as SPM: *East side should be SPNM, and north/west should be RN. Too difficult to manage as separate. The SPNM identified portion may be more applicable for desired conditions, how we want to manage it, rather than the existing condition inventory.*
Quemado	21	smallSPM	1678	RN	SPM	District Ranger Emily Irwin	Include rationale if mapped as SPM: *very steep terrain, very little use of the area*
Quemado	22	smallSPM	1938	RN	SPM	District Ranger Emily Irwin	Include rationale if mapped as SPM: *receives very little use, and is surrounded by SPNM*
Quemado	28	smallSPM	2052	SPM	SPM	District Ranger Emily Irwin	Include rationale if mapped as SPM: *(NHill Rationale)* Road 4040A, near Prairie Point Peak. Size is 82% of size criteria. SPNM on several sides of polygon so semi-primitive setting is likely provided
Quemado	30	smallSPM	2411	SPM	SPM	District Ranger Emily Irwin	Include rationale if mapped as SPM: *(NHill Rationale) Road* 4007O, near Fox Mountain Lookout. Size is 96% of size criteria. SPNM on two sides of polygon so semi-primitive setting is provided
Quemado	37	smallSPNM	2109	SPM	SPM	District Ranger Emily Irwin	Include rationale if mapped as SPNM:
Quemado	38	smallSPNM	2073	SPM	SPNM	District Ranger Emily Irwin	Include rationale if mapped as SPNM: *There are no roads, and it receives very little use outside of hunting season*

Ranger District	GIS Id	Review Category	Acres	Initial ROS Class (recommended by Nicole Hill - step9ROS_code)	Final ROS Class Determination	Determined By	Rationale
Quemado	40	smallSPNM	2445	SPNM	SPNM	District Ranger Emily Irwin	Include rationale if mapped as SPNM: *(NHill Rationale)* Size is 98% of size criteria. Surrounded by SPM, so semi-primitive setting is likely provided.
Reserve	9	smallP	1693	SPNM	SPNM	District Ranger John Pierson	Include rationale if mapped as P:
Reserve	17	smallSPM	1515	RN	RN	District Ranger John Pierson	Include rationale if mapped as SPM:
Reserve	27	smallSPM	2058	SPM	SPM	District Ranger John Pierson	Include rationale if mapped as SPM: *(NHill Rationale)* Roads south of US 180, near Joe Peak. Size is 82% of size criteria. SPNM on several sides of polygon so semi-primitive setting is likely provided
Reserve	29	smallSPM	2247	SPM	SPM	District Ranger John Pierson	Include rationale if mapped as SPM: *(NHill Rationale)* Road 4033Y, northeast of Eagle Peak Trailhead. Size is 90% of size criteria. SPNM on several sides of polygon so semi-primitive setting is likely provided
Reserve	34	smallSPNM	1911	SPM	SPM	District Ranger John Pierson	Include rationale if mapped as SPNM:
Reserve	35	smallSPNM	1999	SPM	SPM	District Ranger John Pierson	Include rationale if mapped as SPNM:
Reserve	36	smallSPNM	2018	SPM	SPM	District Ranger John Pierson	Include rationale if mapped as SPNM:
Silver City	2	smallP	2273	SPNM	SPNM	District Ranger Diane Taliaferro	Include rationale if mapped as P:
Silver City	3	smallP	815	SPNM	P	District Ranger Diane Taliaferro	Include rationale if mapped as P: *Terrain is prohibitive to the development of future roads and trails, access is difficult and experience is challenging and high risk. Very unlikely to encounter others of any kind when visiting the area. Almost entirely unmodified, and many primitive characteristics*

Ranger District	GIS Id	Review Category	Acres	Initial ROS Class (recommended by Nicole Hill - step9ROS_code)	Final ROS Class Determination	Determined By	Rationale
Silver City	4	smallP	624	SPNM	P	District Ranger Diane Taliaferro	Include rationale if mapped as P: *terrain is prohibitive for the development of future roads and trails. Isolated and access is difficult, high degree of challenge and risk, fits better as Primitive than Semi-Primitive, is literally undeveloped.*
Silver City	14	smallSPM	1706	RN	SPM	District Ranger Diane Taliaferro	Include rationale if mapped as SPM: *due to recent fire activity and road closures, the area has fallen into infrequent use. Difficulty in route finding makes it more challenging to access. Unlikely to encounter other users. Good opportunity to experience solitude and practice self-reliance*
Silver City	15	smallSPM	1605	RN	SPM	District Ranger Diane Taliaferro	Include rationale if mapped as SPM: *Although near forest boundary with private, and containing dispersed camping corridors, there is little to no development in the area and characteristics are closer to SPM than RN for remoteness, solitude, access and challenge*
Silver City	23	smallSPM	2266	SPM	SPM	District Ranger Diane Taliaferro	Include rationale if mapped as SPM: *(NHill Rationale)* Jacks Peak Road 836 corridor. Size is 90% of size criteria. SPNM either side of road corridor so semi-primitive setting is provided
Silver City	33	smallSPNM	1376	SPM	SPM	District Ranger Diane Taliaferro	Include rationale if mapped as SPNM:
Silver City - mostly off-forest	11	smallSPM	2342	RN	SPM	District Ranger Diane Taliaferro	Include rationale if mapped as SPM: *Little to no traffic uses this road, access is difficult and opportunity for solitude is very high, need for self-reliance is extreme*
Silver City - partially off-forest	12	smallSPM	1238	RN	SPM	District Ranger Diane Taliaferro	Include rationale if mapped as SPM: *Access is closed from the south from adjacent private lands, area relieves very little use*

Ranger District	GIS Id	Review Category	Acres	Initial ROS Class (recommended by Nicole Hill - step9ROS_code)	Final ROS Class Determination	Determined By	Rationale
Silver City - partially off-forest	31	smallSPNM	1907	SPM	SPNM	District Ranger Diane Taliaferro	Include rationale if mapped as SPNM: *terrain and location make this a very unlikely area for any road or motorized trail development, very remote despite proximity of roads, Road conditions discourage traffic, and lack of attractions make it remote with little visitation, affording a higher opportunity for self-reliance and solitude, no roads or motorized trails enter the heart of the area*
Silver City - partially off-forest	32	smallSPNM	2230	SPM	SPM	District Ranger Diane Taliaferro	Include rationale if mapped as SPNM:
Silver City and Black Range	24	smallSPM	2211	SPM	SPM/ BUT split recommended, south part SPNM	District Ranger Diane Taliaferro	Include rationale if mapped as SPM: *(NHill Rationale)* Royal John Road 886 and Donahue Road Road 797 corridors. Size is 88% of size criteria. SPNM either side of road corridors so semi-primitive setting is provided - South part is actually non-motorized due to loss of route existence on the ground because of lack of use. Area adjacent is very isolated and affords good opportunity for solitude, very unlikely to encounter other users in this area
Wilderness	25	smallSPM	1623	SPM	SPM	District Ranger Rachelle Huddleston-Lorton	Include rationale if mapped as SPM: *(NHill Rationale)* McKnight Road 152 corridor. Follows west boundary Aldo Leopold Wilderness. SPNM either side of road corridors and proximity to Wilderness provides semi-primitive setting

Appendix C. Evidence of Humans Criteria, Social Setting Criteria, and Managerial Setting Criteria from 1982 ROS User Guide

Table 6. Evidence of Humans Criteria from the 1982 ROS User Guide.

ROS Class	Evidence of Humans Criteria
Primitive	Setting is essentially an unmodified natural environment. Evidence of humans would be unnoticed by an observer wandering through the area Evidence of trail is acceptable, but should not exceed standard to carry expected use. Structures are extremely rare.
Semi-primitive Non-motorized	Natural* setting may have subtle modifications that would be noticed but not draw the attention of an observer wandering through the area. Little or no evidence of primitive roads and the motorized use of trails and primitive roads. Structures are rare and isolated.
Semi-primitive Motorized	Natural* setting may have moderately dominant alterations but would not draw the attention of motorized observers on trails and primitive road within the area. Strong evidence of primitive roads and the motorized use of trails and primitive roads Structures are rare and isolated.
Roaded Natural	Natural* setting may have modification which range from being easily noticed to strongly dominant to observers within the area. However from sensitive** travel routes and use areas these alterations would remain unnoticed or visually subordinate There is strong evidence of designed roads and/or highways Structures are generally scattered, remaining visually subordinate or unnoticed to the sensitive** travel route observer. Structures may include power lines, microwave installations and so on
Rural	Natural* setting is culturally modified to the point that it is dominant to the sensitive** travel route observer. May include pastoral, agricultural, intensively managed wildland resource landscapes or utility corridors. Pedestrian or other slow moving observers are constantly within view of culturally changed landscape There is strong evidence of designed roads and/or highways Structures are readily apparent and may range from scattered to small dominant clusters including power lines, microwave installations, local ski areas, minor resorts and recreation sites.
Urban	Setting is strongly structure dominated. Naturally or naturally-appearing elements may play an important role but be visually subordinate. Pedestrian and other slow moving observers are constantly within view of artificial enclosure of spaces. There is strong evidence of designed roads and/or highways and streets Structures and structure complexes are dominant and may include major resorts and marinas, national and regional ski areas, towns, industrial sites, condominiums or second home developments.

* In many southern and eastern forests what appears to be natural landscapes may in actuality have been strongly influenced by humans. The term natural-appearing may be more appropriate in these cases,

** Concern Level 1 and 2 travel routes from Landscape Aesthetics Handbook 701

Table 7. Social Setting Criteria.

ROS Class	Social Setting Criteria from the 1982 ROS User Guide along with qualitative considerations
Primitive	Little to no encounters with other visitors. Perceived crowding is non-existent. Usually less than 6 parties per day encountered on trails and less than 3 parties visible at campsite
Semi-primitive Non-motorized	Low to moderate encounters with other visitors. Perceived crowding is low. Usually 6-15 parties per day encountered on trails and 6 or less visible at campsites
Semi-primitive Motorized	Low to moderate encounters with other visitors. Perceived crowding is low. Low to moderate* contact frequency
Roaded Natural	Moderate to high encounters in front country areas close to or on roads; low to moderate on trails and away from roads in backcountry areas. Perceived crowding is moderate. Frequency of contact moderate to high on roads. Low to moderate* on trails and away from roads
Rural	Encounters are moderate to high in developed sites, on roads and trails and on waterways. Moderate away from developed sites. Perceived crowding may be prominent. Frequency of contact is Moderate to High* in developed sites, on roads and trails, and water surfaces. Moderate away from developed sites.
Urban	Large numbers of visitors on site, throughout the setting, and in nearby areas. Perceived crowding is evident.

These criteria apply during the typical recreation use season. Peak days may exceed these limits.

*Specific numbers must be developed to meet regional or local conditions (USDA FS 1982).

Table 8. Managerial Setting Criteria from the 1982 ROS User Guide.

ROS Classes	Managerial Setting Criteria
Primitive	On-site regimentation is low with controls* primarily off-site
Semi-primitive Non-motorized	On-site regimentation and controls* present but subtle
Semi-primitive Motorized	On-site regimentation and controls* present but subtle
Roaded Natural	On-site regimentation and controls* are noticeable but harmonize with the natural environment
Rural	On-site regimentation and controls* obvious and numerous, largely in harmony with the human environment
Urban	On-site regimentation and controls* obvious and numerous.

*Controls can be physical (such as barriers) or regulatory (such as permits).

Appendix D. ROS Inventory Maps by Ranger District

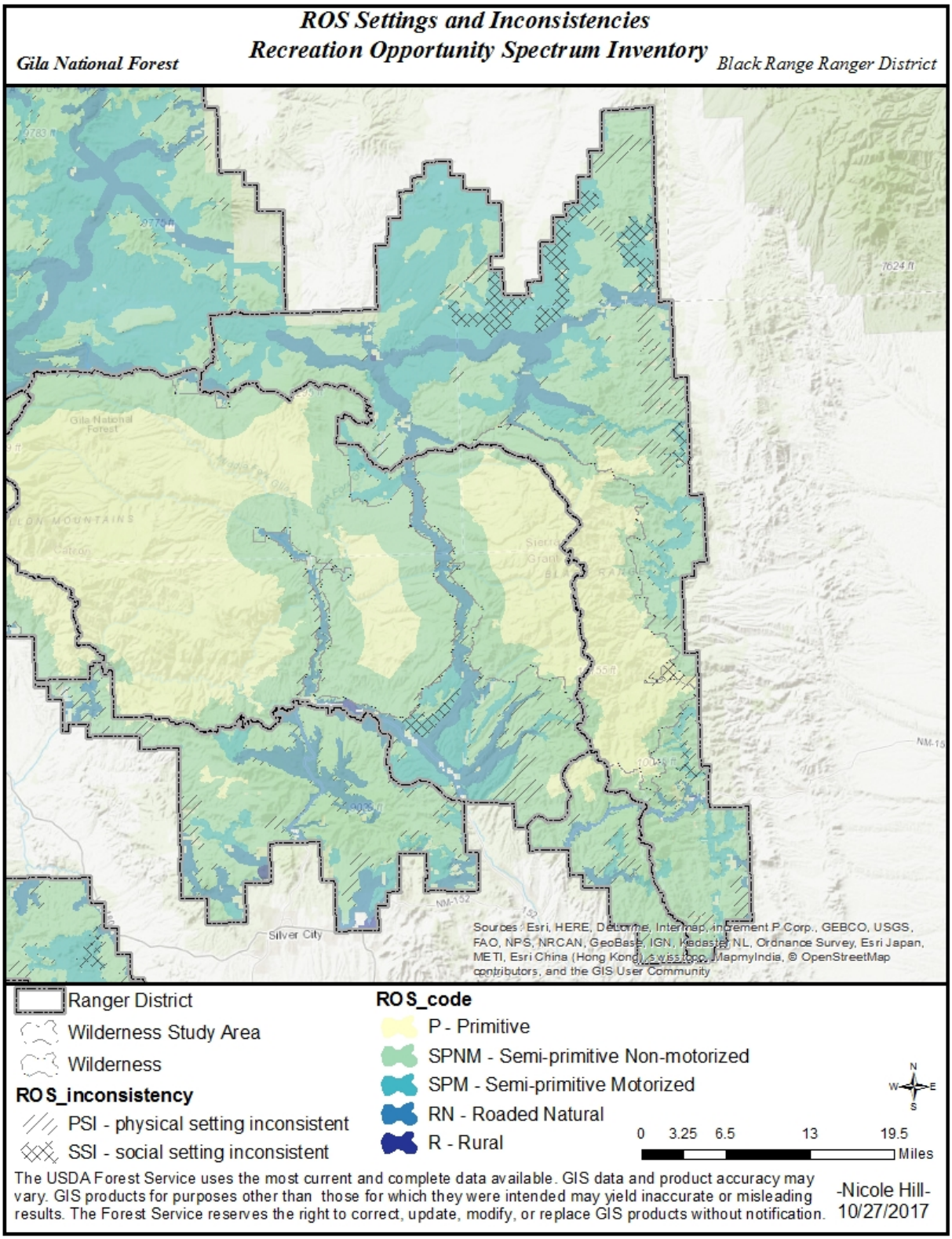

Figure 14. Black Range Ranger District. Recreation settings and inconsistencies, Recreation Opportunity Spectrum Inventory Map based on recreation opportunities and off-forest influences

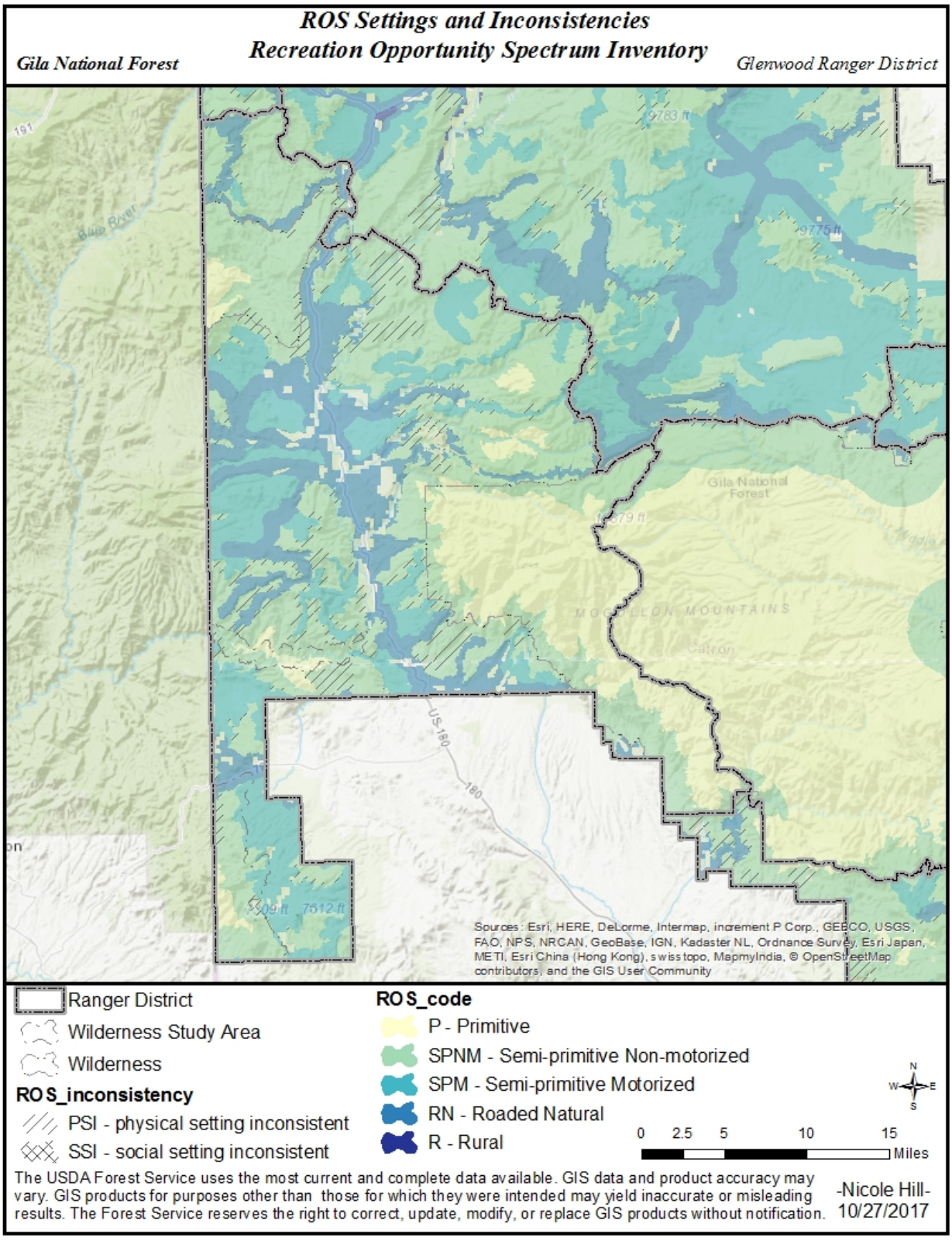

Figure 15. Glenwood Ranger District. Recreation settings and inconsistencies, Recreation Opportunity Spectrum Inventory Map based on recreation opportunities and off-forest influences

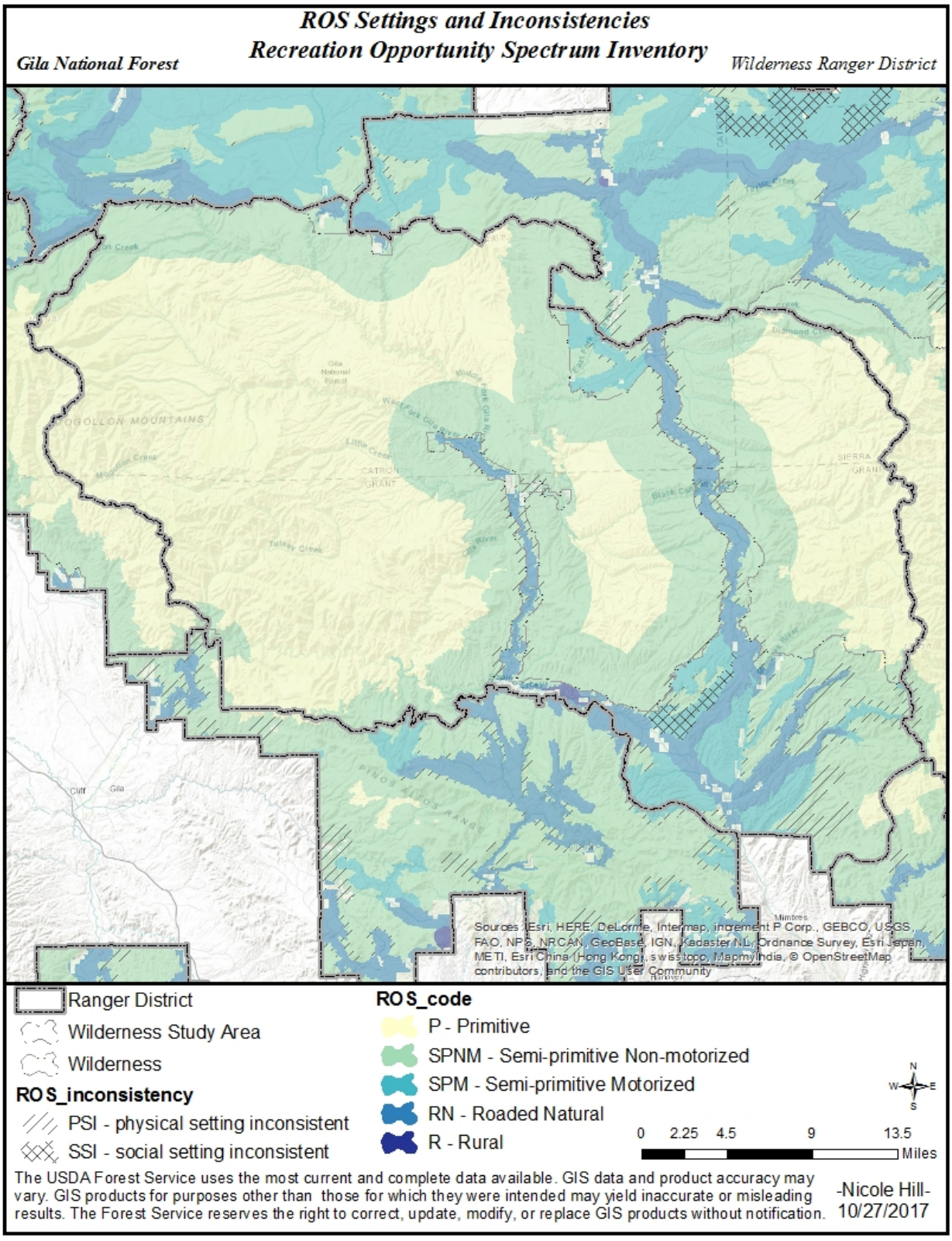

Figure 16. Wilderness Ranger District. Recreation settings and inconsistencies, Recreation Opportunity Spectrum Inventory Map based on recreation opportunities and off-forest influences

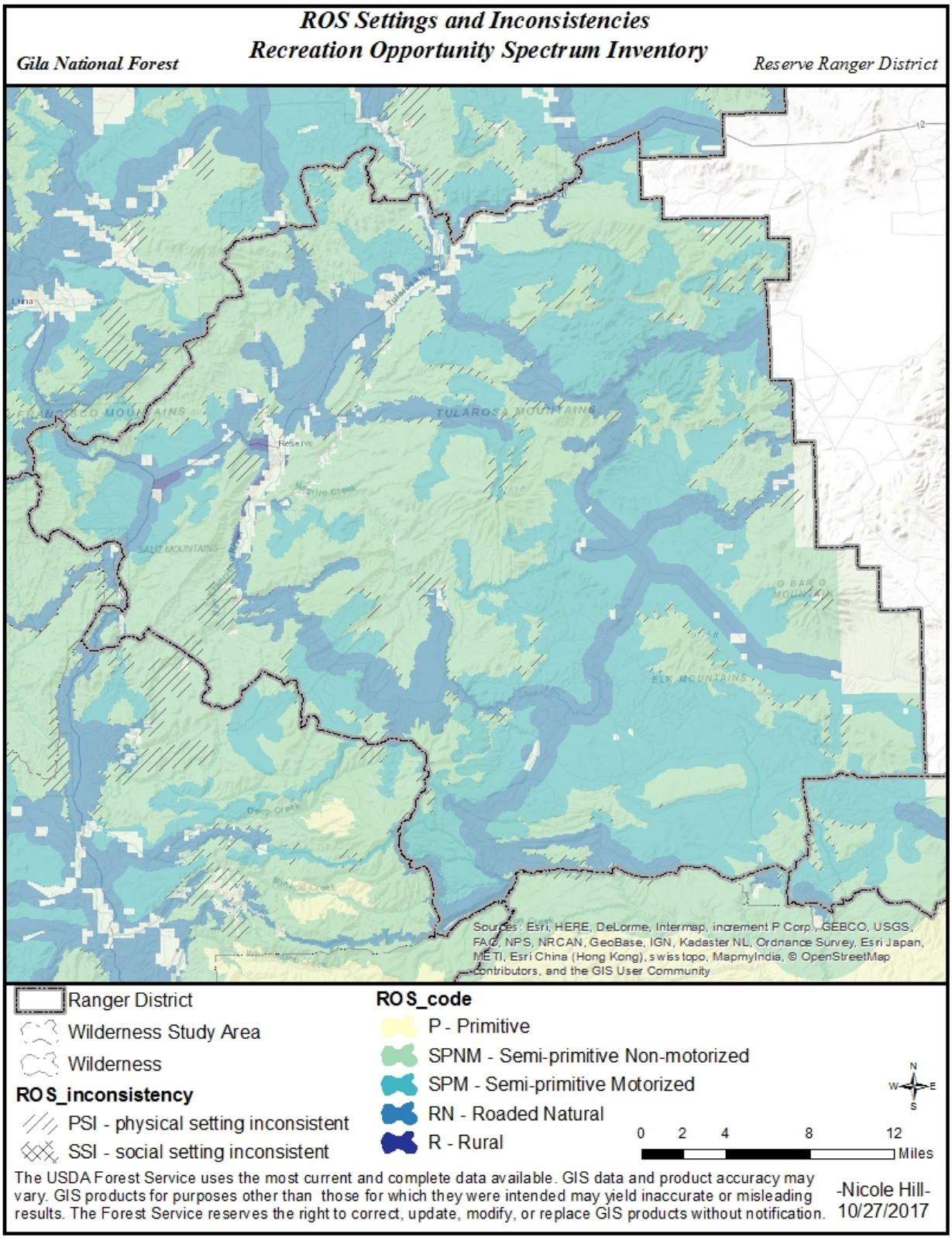

Figure 17. Reserve Ranger District. Recreation settings and inconsistencies, Recreation Opportunity Spectrum Inventory Map based on recreation opportunities and off-forest influences

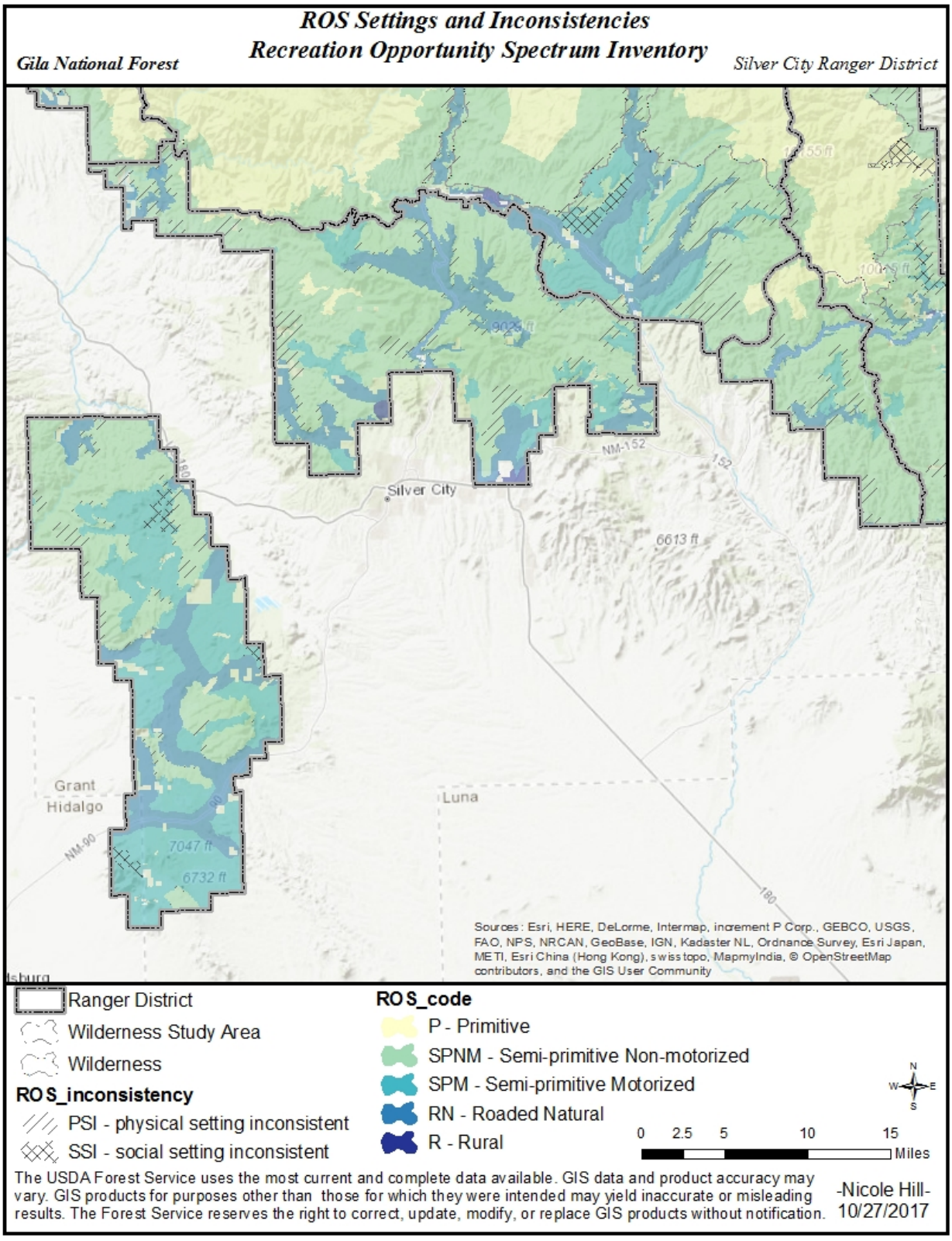

Figure 18. Silver City Ranger District. Recreation settings and inconsistencies, Recreation Opportunity Spectrum Inventory Map based on recreation opportunities and off-forest influences

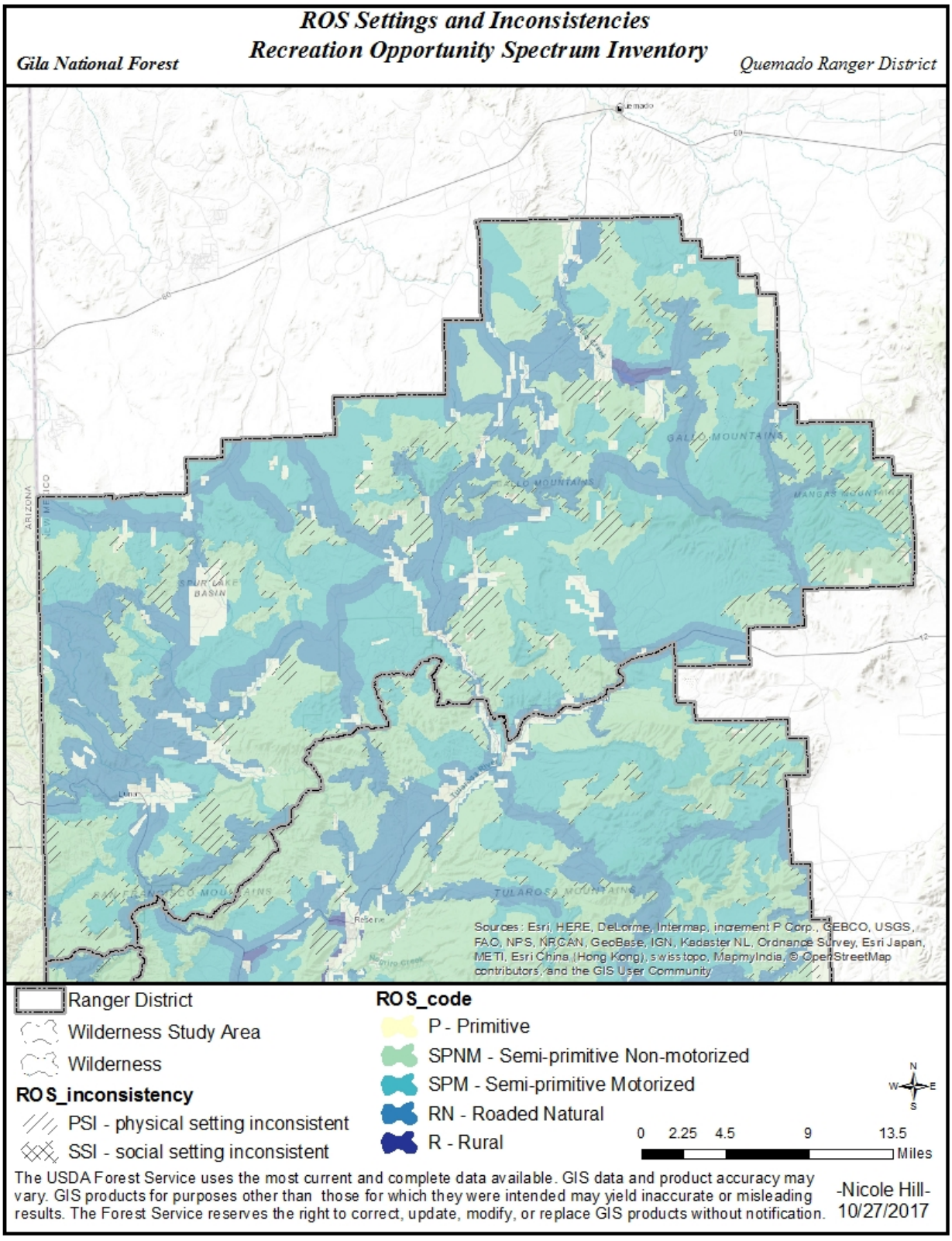

Figure 19. Quemado Ranger District. Recreation settings and inconsistencies, Recreation Opportunity Spectrum Inventory Map based on recreation opportunities and off-forest influences

Appendix E. Modeling Summer ROS Using Travel Routes and Terrain

The ROS_Models_2013.tbx Toolbox models were used in the ROS inventory mapping step: Apply other considerations and recreation subject matter knowledge. As recommended in the draft ROS inventory mapping protocol, the model was used to determine where the influence zone of a route was less than ½ mile. SPNM areas were increased over SPM, RN, and R areas. SPM areas were increased of RN and R areas. The model was not used to determine where influence zones are more than ½ mile as little documentation exists on the appropriate distance to use in such cases. In areas with flat terrain, the standard buffers were used as documented in ROS inventory mapping steps 1 through 7. Few Rural and Urban areas in the model were included in the ROS inventory mapping for the Santa Fe National Forest. Other data sources were more informative than the route density mapping completed in the model. The following documentation covers the entire ROS Model outputs even if not all outputs were used in the ROS inventory mapping for the Gila National Forest.

Introduction

This documentation was created in 2010 by Dave McMorran, Humbolt-Toiyabe Forest (retired), and was revised by Chip Fisher R1 Geospatial Group in Feb/July 2013. A set of Recreation Opportunity Spectrum (ROS) modeling tools were developed in 2010 for use in ArcGIS 9.3 and those tools were updated for use in ArcGIS 10.0 SP4. The general ROS model process is described below and then some detailed GIS processing instructions follow that section. The ROS model process requires a travel routes (road and trails) layer that identifies improved motorized roads, unimproved motorized roads, and motorized trails. It also requires a 30m digital elevation model (DEM) and a project area boundary (typically a forest administrative boundary).

The documentation was further revised by Nicole R. Hill, Landscape Architect, Enterprise Program, to reflect specifics for running the model for the Gila National Forest based on the 2016 draft ROS inventory mapping protocol. The document was placed into a Gila NF inventory report Appendix B and edited to reflect ROS modeling for the Gila National Forest based on the 2016 draft ROS inventory mapping protocol.

General Process

Recreational Settings in the toolbox are primarily determined by motorized travel routes and terrain (specifically slope). There are six primary ROS classes in order of highest to lowest solitude or undeveloped level: Primitive, Semi-Primitive Non-Motorized, Semi-Primitive Motorized, Roaded Natural, Roaded Modified, Rural, and Urban (abbreviated in the models as follows: PR, SPNM, SPM, RN, RM, R, U). To model recreation settings ROS zones are used and they are based on the difficulty in reaching a particular point. In general these are applied to zones ½ mile and 3 miles around motorized road and trails. In earlier ROS modeling ½ mile and 3 mile buffers were used to define three ROS zones: 0 to ½ mile, ½ to 3 miles, and greater than 3 miles. Urban, Rural, Roaded Natural, or Semi-Primitive Motorized were defined in the 0 to ½ mile zone; Semi-Primitive Non-Motorized in the ½ to 3 mile zone; and Primitive areas in the greater than 3 mile zone. Additional criteria (road density level and improved vs. unimproved roads/trails), were used to separate Urban, Rural, Roaded Natural, or Semi-Primitive Motorized areas. Size criteria were applied to reclassify small Primitive and Semi-Primitive Non-Motorized areas to other ROS settings.

In 2010 a new ROS model was developed to account for the increased difficulty of traveling over rough terrain. Slope was used to measure the difficulty; the steeper the slope, the tougher it is to cross the

landscape. Thus, in steep areas Primitive areas could be less than 3 miles from a motorized route and in flat areas farther than 3 miles.

Slopes, in percent, can be calculated from the digital elevation model. This slope raster is then used to assign a cost or impedance to crossing each cell in the raster. Human modifications, like roads and trails can mitigate the slope impedance. Raster math is used to modify the impedance for cells containing roads and trails using the following table.

Table 9: Raster math for impedance of cells containing roads and trails

Type of route	Impedance
Improved Roads	0
Unimproved Roads, Motorized Trails	slope / 3
Closed Roads, Non-Motorized Trails,	slope / 3
Unimproved terrain	slope

Cost Distance mapping computes the accumulative cost of crossing the raster. For every cell, the impedance (slope) and distance (cell size) are combined to develop a map of the relative costs of getting from every cell to the nearest source cell. The cost distance function uses two raster inputs: a source cell raster based on motorized routes and a cost raster based on slope calculated above. Two cost distance paths are mapped, once for the improved roads and again using all motorized routes as a source cell. The difference between the two maps determines the SPM settings. For example if 30 meter cell 1 has slope of 5 and 30 meter cell 2 has slope of 10 then the cost at cell 2 is: (5*30m + 10*30m) / 2 = 225; if 30 meter cell 3 has slope 25 then the cost at cell 3 is: (225 + 20*30m) / 2 = 412.5.

Each cost distance map is reclassified into three zones (1, 2, 3) where zone one is the equivalent of the ½ mile zone, 2 is the ½ to 3 mile zone and 3s represent everything over 3 miles (on flat land). Region 1 recreation staff working with Dave McMorran developed the following reclassification table of cost distances based on ROS modeling of forests in Region 1.

Table 10: Cost distance Reclassification

Cost distance Reclass	
0-8,000	0 to ½ mile
8,000-60,000	½ to 3 mile
60,000+	Greater than 3 mile

When the two reclassified cost distance maps are combined, a matrix table can be used to assign ROS setting. For example if a cell in the improved roads cost distance is 2 and the same cell in all roads cost distance is 1 then it is a Semi-Primitive Motorized (SPM) setting.

Table 11: Matrix for assigning ROS setting from cost distance maps

Improved / All Roads	1	2	3
1	Roaded Natural (RN) (or above)	Roaded Natural (RN)	Roaded Natural (RN)
2	Semi-Primitive Motorized (SPM)	Semi-Primitive Non-Motorized (SPNM)	Semi-Primitive Non-Motorized (SPNM)
3	Semi-Primitive Motorized (SPM)	Semi-Primitive Motorized (SPM)	Primitive (PR)

Road density is used to determine Urban or Rural settings within the Roaded Natural areas delineated above. Road densities are computed for all roads, using Spatial Analysis focal functions. Roaded Natural areas have road densities < 2.5 miles/square mile, Rural areas have road density from 2.5 to 8 miles/square mile, and Urban areas have road densities above 8 miles/square mile. At this point there is a draft raster ROS classification with up to six ROS settings (P, SPNM, SPM, RN, R, and U).

In the last step, the draft raster is converted to polygons and the ROS units are then checked for minimum sizes as defined in the ROS handbook (USDA FS 1986). ROS units smaller than the minimum size are reclassified into other ROS settings. Recreation staff should review Urban and Rural settings to see if they are actually Roaded Modified areas which the model does not classify.

Table 12: Size criteria by ROS setting

Setting	Minimum Size (Acres)
Primitive	5,000 (can consider adjacent to Semi-Primitive Non-Motorized)
Semi-Primitive Non-Motorized	2,500 (can consider adjacent to Primitive
Semi-Primitive Motorized	2,500
Roaded Natural	no minimum
Rural	no minimum
Urban	no minimum

GIS Processing Instructions

Assigning road and trail motorized use levels (ROS_type)

The model requires a travel routes layer created by combining roads and trails into a single layer and assigning values to an attribute called: ROS_type (short). It is probably easier to add the ROS_type attribute and assign values to it in the roads and trail layers separately as the attributes queried to assign ROS_type values are different in roads and trails. Non-National Forest System roads (State/County/Other Federal/Private) within the project boundary and up to 3 miles outside the project boundary need to be added to the final travel routes layer (ROS classification is based on all motorized routes in an area). This is the most difficult and time consuming part of the ROS model process.

Forest Service personnel complete the initial mapping of motorized and non-motorized travel routes following Step 1 of the ROS inventory mapping protocol.

A further refinement of motorized routes requires a determination of “high clearance vehicle/OHV” or “standard passenger vehicle” following Step 1 of the ROS inventory mapping protocol. Document data sources, assumptions, and rationale for “high clearance vehicle/OHV” and “standard passenger vehicle” categories.

Table 13: Route Categories and Values for ROS Model

Route Category	Value for ROS Model
motorized standard passenger vehicle	10
motorized high clearance vehicle/OHV	3
motorized standard passenger vehicle	1

Running ArcGIS 10 Models in ROS Toolbox

In the ROS_Models_2013.tbx ArcGIS 10.0 SP4 toolbox there are four models that are run to create a draft Summer ROS classification polygon layer. It is assumed the draft Summer ROS classification layer may require some edits after review by a unit's Recreation Staff. In particular areas classified as Rural or Urban in the model could be reclassified as Roaded Modified based on the Forest setting (this is because timber production areas tend to have high road density that get classified as Rural or Urban in the ROS model). Note there is a fifth model in the ROS_Models_2013.tbx toolbox used for Winter ROS modeling only.

Step 0 – Open ArcMap and add input layers, toolbox, and reclass tables

Open an ArcMap project and add the following layers: combined travel routes layer of roads and trails with ROS_type assigned a 1, 3, or 10 following instructions above; a forest admin boundary or other project area polygon; a 30 meter DEM. Add the three reclass tables from the ROStables.gdb and the ROS_Models_2013.tbx toolbox. Create an ROS model output file geodatabase to store all of the model outputs into (there will be over 20 layers created during the process) with the final ROS classification called: ROS.

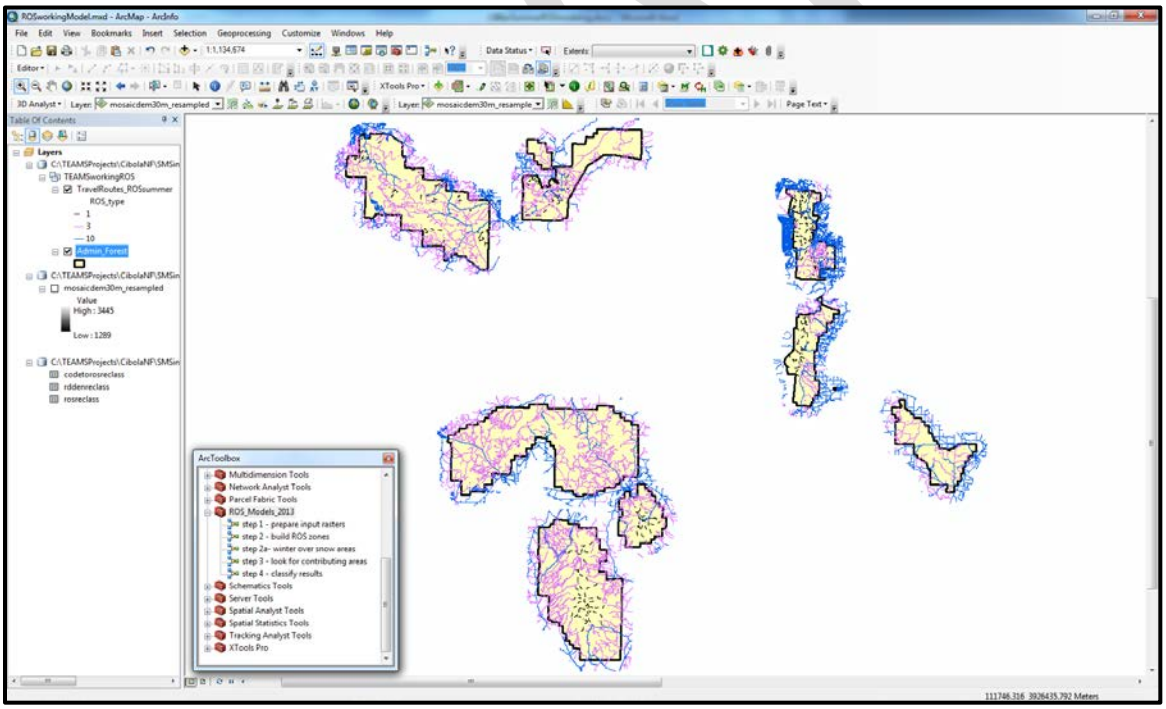

Figure 20. Screen Capture of ArcMap Project for running ROS models

Step 1 - prepare input rasters model

In this model a 30 meter percent slope raster is created and the travel routes layer is converted to a 30 meter raster layer based on the ROS_type attribute. This model has four required inputs: 30 meter DEM,

travel routes line layer with ROS_type attribute filled in from step 1 above, project area boundary polygon layer (Administrative Forest boundary for most forests), and a output geodatabase to store output GIS layers. The travel routes line layer and the percent slope raster are clipped to the project area boundary to reduce the processing time in the second model. In the slope raster, cells with slope < 1 are set to 1 and cells with slope > 100 are set to 100. This is done to simplify the cost distance function. This model produces two outputs: a 30 meter route raster (routeGRD) and a 30 meter slope raster (Slope_pct).

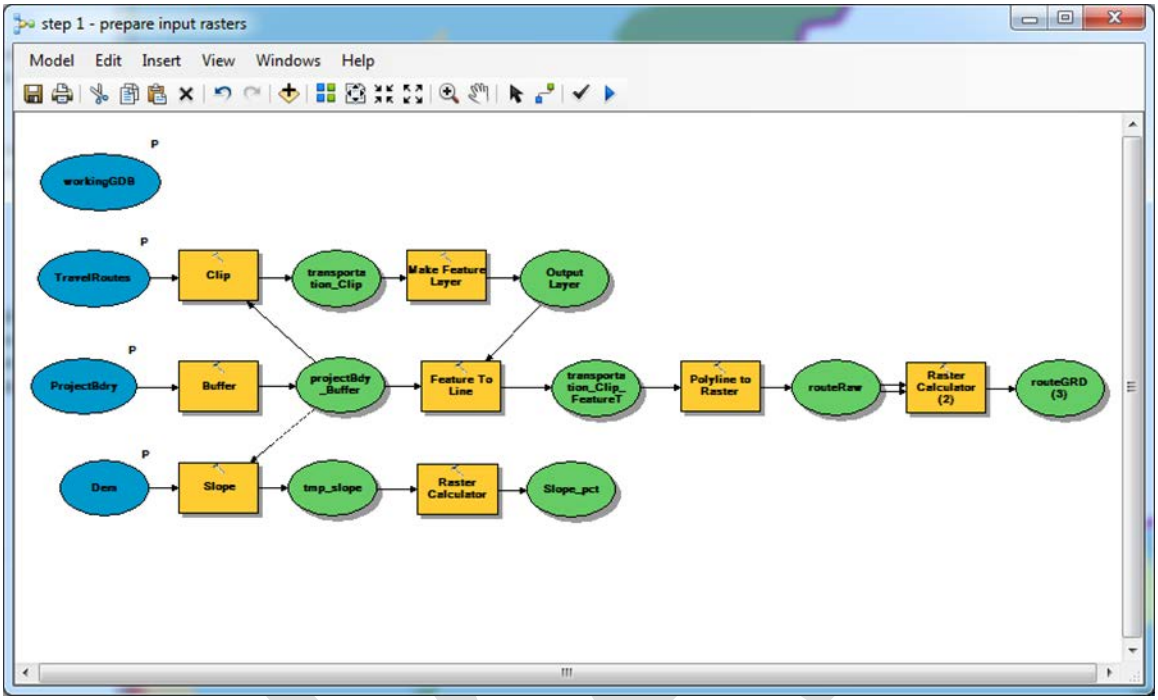

Figure 21. Screen Capture of Step 1 Model from ROS models toolbox

Step 2 - build ROS zones model

This model has four main steps: A) create a cost distance raster for all motorized routes; B) create a cost distance raster for improved roads only; C) create a route density raster; and D) reclassify and combine the three rasters from steps A through C. This model has seven required inputs: the 30 meter route raster (routeGRD) and a 30 meter slope raster from model 1 (Slope_pct), and output geodatabase (ROSModelOutputFinal.gdb), and four tables for recoding raster layers (in the ROStables.gdb provided with the Toolbox).

In step A, two rasters are created for cost distance mapping of all motorized routes: a source raster with all motorized route cells recoded to 1 and all other cells set to nodata and a cost raster based on slope with adjustment for cells identified as motorized (slope / 3). The two input rasters are then used in the cost distance function to produce a cost distance raster with values from 0 to 500,000+ (remember it is slope * 30 meters summed over many cells going away from motorized routes).

Step B is the same as step A except only improved roads are recoded to 1. Step B also produces a cost distance raster with values from 0 to 500,000+.

Step C uses the all motorized route source raster in a focal sum function to produce a road density raster.

Step D reclassifies the two cost distance rasters and the road density raster into three classes each and then combines all three rasters. The combined raster is then recoded into a draft ROS classification raster called ROSclass. The ROSclass raster has values: 1 (U), 2 (R), 3 (RN), 4 (SPM), 5 (SPNM), and 6 (P).

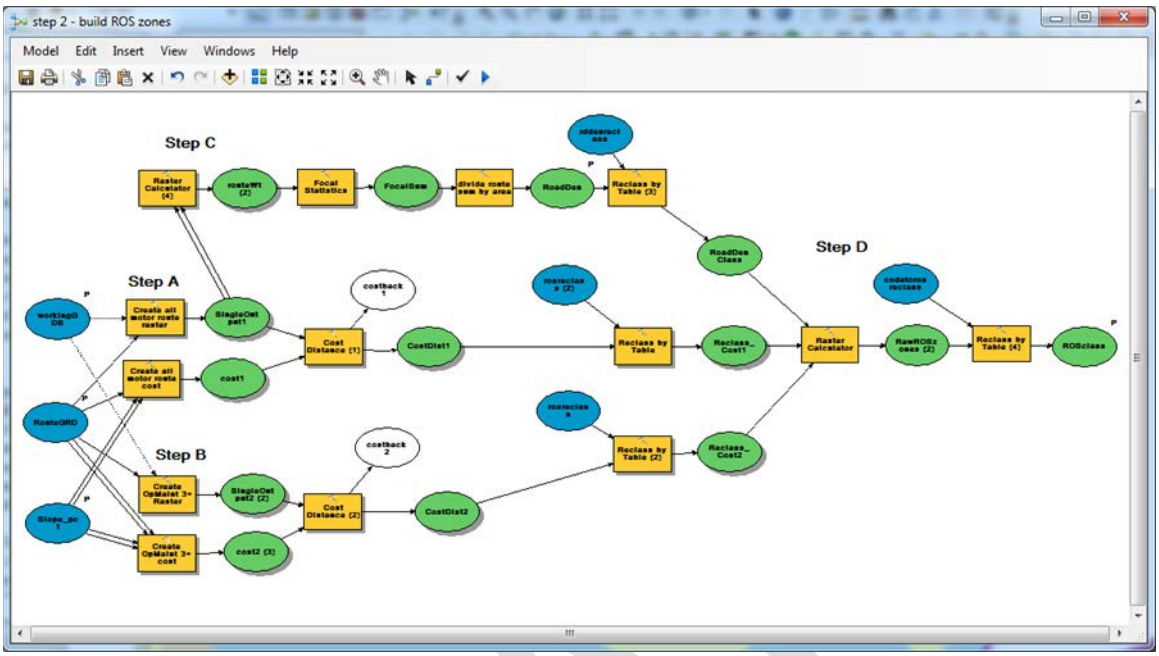

Figure 22. Screen Capture of Step 2 Model from ROS models toolbox

Step 3 - look for contributing areas model

This model converts the draft ROS classification into multiple polygon layers and then runs identities on them to calculate areas of overlap in the ½ mile to 3 mile zone. This model has two required inputs: the draft ROS classification raster from model 2 (ROSclass) and an output geodatabase (ROSModelOutputFinal.gdb). This model produces a draft ROS classification polygon layer (rosCompareIdentity2).

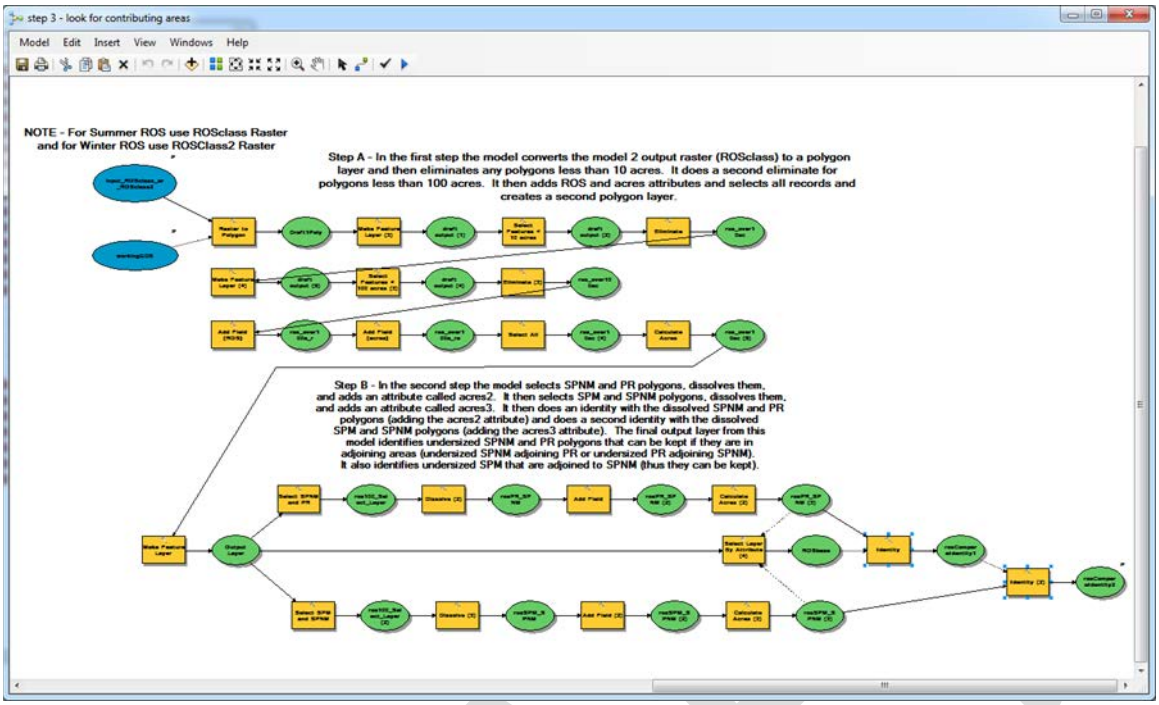

Figure 23. Screen Capture of Step 3 Model from ROS models toolbox

Step 4 - classify results

This model reclassifies undersize ROS settings (Primitive, Semi-Primitive Non-Motorized, etc.) into other ROS settings based on criteria supplied by the Region 1 Recreation staff and 1987 ROS documentation (USDA FS 1986). The output polygon is the final ROS classification for review by Recreation Staff (ROS). Remember to evaluate areas classified as Urban or Rural that might be Roaded Natural or Roaded Modified.

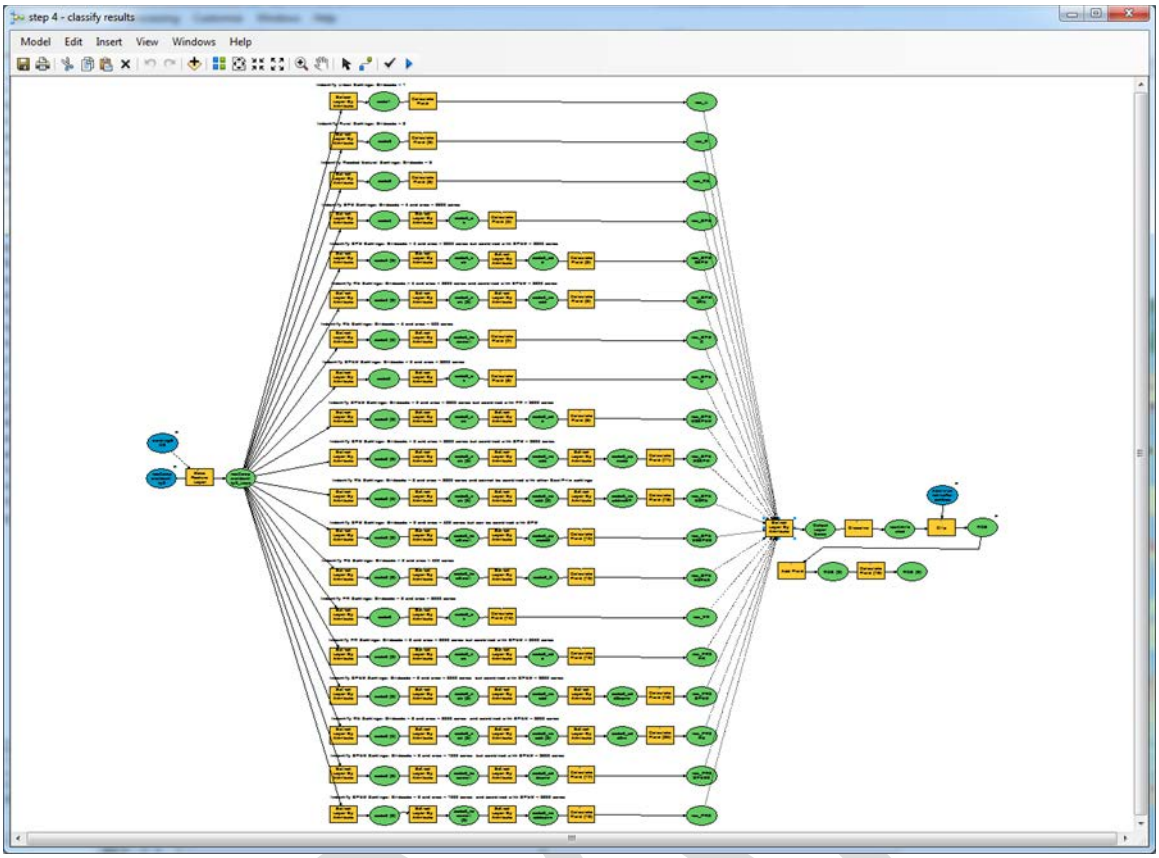

Figure 24. Screen Capture of Step 4 Model from ROS models toolbox

Final step – Review by recreation subject matter experts including forest and district recreation staff

The draft ROS classification needs to be reviewed by recreation subject matter experts including forest and district recreation staff including accuracy of all ROS setting classifications, in particular classification of Rural and Urban areas based on route density, social and managerial settings, wilderness criteria, and any other subject matter expertise or professional judgement. .

The use of terrain in the ROS model results in more area mapped as Roaded Natural that in previous ROS inventories in areas with flat terrain. Areas of gentle topography with “high clearance vehicle/OHV” routes that would be rated Semi-Primitive Motorized using distance alone, may be mapped as Roaded Natural with these models. It is believed that the ROS models gave greater emphasis to motorized use on gentle topography in these areas, since the models assume less difficulty traveling over gentle terrain and that semi-primitive areas in flat areas could be further than ½ mile from a motorized route. Route density calculations may also contribute to the over emphasis of Roaded Natural classifications. It is recommended that this model be used in conjunction with the other steps in the ROS inventory mapping protocol. The model should be used to determine where influence zones are less than ½ mile due to terrain. As the model is currently written, it should not be used to determine where influence zones are more than ½ mile. In areas with flat terrain, the model (as currently written) over emphasizes the effect of motorized travel routes.

Interim output of Step 3 (draft ROS classification polygon layer (rosCompareIdentity2)) should be reviewed to determine if all areas meeting size and adjacency criteria were carried forward or if smallP, smallSPNM and smallSPM areas may still meet the over-all ROS characteristics for P, SPNM or SPM.

Document rationale for any areas not meeting size or adjacency criteria, but still mapped as P, SPNM or SPM based on subject matter expertise or professional judgement.

ROS model documentation states to evaluate areas classified as Urban or Rural that might be Roaded Modified. Roaded Modified has been used as a subclass of Roaded Natural by several Forests and Regions for many years. These areas may also be Roaded Natural if other Rural and Urban criteria are not met and if a forest is not planning to use this subclass in the future.

During the review, areas classified as Rural or Urban due to high road densities need review recreation staff to determine if Roaded Natural, Rural or Urban was the most accurate ROS setting. If "high clearance vehicle/OHV" routes road density appeared to be affecting the Rural rating, the rating should be changed to Roaded Natural. If the high road density affecting the initial Rural or Urban rating were mostly on other ownerships, the rating should be changed to Roaded Natural.

Once all adjustments identified by forest and district recreation staff are made, The ROS classification can be clipped with the planning unit boundary. If only National Forest ownership is wanted, the ROS classification can be intersected with the basic surface ownership layer (from forest corporate SDE database) and only polygons in USDA Forest Service ownership have the ROS_CODE attribute filled in (i.e., removed ROS classification from lands in other ownerships).