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# **Transportation Specialist's Report**

## **Anderson Mesa Landscape Scale Assessment**

**Mormon Lake, Mogollon Rim Ranger Districts,  
Coconino National Forest  
Coconino County, Arizona**

Prepared by: Paul Standing, Transportation Team Leader

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## **Introduction**

This landscape level Roads Analysis Report will primarily address maintenance level 1 and 2 roads (closed and high clearance vehicle roads). It will also incorporate and verify, for Anderson Mesa, the work of the “Coconino National Forest, Forest Level Roads Analysis report” which analyzed maintenance level 3, 4 and 5 level roads (passenger cars roads) (also see appendix B for definitions).

The objective of roads analysis is to provide line officers with critical information to implement a road system that is both safe and responsive to the public, and has a minimal negative ecological impact on the land, within the available funding. This report can also provide a basis for selecting areas for site-specific NEPA analysis and public involvement. (See appendix A for additional information on this process.)

### ***Existing Situation***

**Geographic Area:** The entire mesa is geographically defined by 4 watershed boundaries and is large in scale, covering approximately 262,000 acres, or 409 square miles.

**Land ownership:** There are a number of in-holdings which will require access.

**Key user groups:** This is a popular area and provides a variety of uses for ranchers, wood gathers, hunters, campers, fishermen, rock climbers and those who drive for recreation.

### ***Existing condition***

The analysis area is moderately roaded. The terrain offers little or no natural barriers for off road travel. The policy concerning off-road travel has been open unless posted closed. This has allowed users to be able to drive cross-country and has helped contribute to the number and location of roads in the Anderson Mesa area. Due to soil and vegetation disturbance caused by repeated tire tracking in combination with dry conditions on the mesa, it takes a long time for grasses and forbs to cover the tracks created by off-road use and so they remain visible for some time, encouraging others to follow. User created roads lack proper drainage, during wet conditions, water is retained in the tracks, the roads often become impassible. Drivers then move over to an adjacent dry area, and then multiple tracks or a “braiding” effect is created. A high percentage of the roads within the analysis area are user created. Most user created roads do not comply with resource management direction, or consider resource protection in their location. Due to the high number of miles on the forest needing work, most of the maintenance level 3 roads within the landscape area have received minimal maintenance and resurfacing over the last 10 years

We have 823 miles of inventoried roads on Anderson Mesa resulting in a road density of 2.01 miles per square mile. This would further breakdown to 2.4 miles per square mile in the Ponderosa pine/mixed conifer zone and 2.0 miles per square in the woodland type. These figures include the non-systems roads and all miles of the 5 different maintenance levels from the Transportation Atlas. Because many of the closures were either unsuccessful or not yet attempted, we are considering all roads within the analysis area as open.

**System Roads**

After the Forest Plan was signed, the Forest Service identified the open road system that met the target densities in the Resource Access Travel Management Plan (RA/TM). The RA/TM plan gives every road in the Forest Service System a category of open (unimpeded travel). Closed (physical barrier at either end with the road in-between intact), or obliterated (ripped by mechanical means and seeded). Public input was included in the RA/TM decisions.

After the RA/TM category was established, the National Forest engineers gave each Forest Service road a maintenance level.

Listed below are the miles of road, by maintenance level, that are currently in the Forest transportation system on Anderson Mesa.

Maintenance level 1	Maintenance level 2	Maintenance level 3	Maintenance level 4	Maintenance level 5
235.6	383.0	79.1	1.5	0

Many of these system roads begin as user created roads and were incorporated into the roads system in the 1980s, prior to the RA/TM process. They have inadequate drainage, are most often poorly located and many are causing resource damage. “Roads and off-road vehicle use affects wetland sites by compacting soils, which in-turn affects nutrient cycling, changing decomposition rates, and soil physical properties. This change in upland soil condition affects the amount of material that enters wetland sites, thus again affecting the nutrient cycling and changing decomposition rates through increased sediments.” (1)

**Non-System**

There have been 129 miles of non-system roads (also known as unclassified roads or ghost roads) identified at this time. This represents most of the known miles of non-system roads that occur on the Mesa. Some additional work is still required to complete the inventory. It is not anticipated that this will result in an increase in the total miles for the area. These roads currently do not have maintenance levels assigned to them. If any of these roads are incorporated into the road system, maintenance levels would be assigned at that time.

The existing roads can be generally described as in fair to poor condition. Most are user created by ranchers, wood gatherers, hunters or those who drive for recreation, including off highway vehicles (OHVs). The greater availability of 4 wheel drive vehicles has resulted in a larger increase of user created roads in the last few years. This trend is expected to increase.

“The Chief of the Forest Service has identified unmanaged recreation-especially impacts from OHVs as one of the key concerns facing the nation’s forests and grasslands today. Unmanaged OHV use is creating a number of undesirable impacts on National Forest System lands including:

- user-created unplanned roads and trails,
- severely eroded soils,
- damaged wetlands and harm to wetland species,
- habitat destruction,
- degraded water quality,
- the spread of invasive species, plants animals and disease-causing pathogens,
- destruction of cultural sites,
- and disturbance to sites sacred to American Indians.”(3)

### **Road Maintenance and Management:**

The Coconino National Forest Plan and amendments provide direction for roads management. The recommendations in this analysis complement that direction and helps provide for future decisions concerning roads in the analysis area.

“Road densities in the Ponderosa pine/mixed conifer zone will be managed to achieve an average of 2 miles per square mile of open road, and in the woodland zone an average of 1 miles per square mile of open road”.(2)

“Manage off-road driving to provide opportunities while protecting resources and minimizing conflicts with other users”. “Areas are closed to off-road driving when adverse resource impacts occur, when conflicts with the minimum management requirements occur, or if areas are too sensitive to withstand traffic”.(2)

Criteria that determine off-road closures include: loss of soil productivity, steep slopes, Riparian areas or meadows being threatened or damaged, key wildlife areas being threatened or damaged, areas where visual quality objectives are jeopardized and to insure public safety.

Road building in protective activity centers should be avoided. Maintain road densities at the lowest level possible in Northern Goshawk habitats.

“Locate new roads out of stream courses and water-collection features such as swales. Relocate roads out of bottom positions and obliterate poorly located segments as they are identified. Provide adequate road drainage to prevent concentrated flow and sedimentation. Use the following BMP techniques to minimize sedimentation from road construction and reconstruction:

- out sloped road surface;
- leadout ditches and relief culverts;
- energy dissipaters on culverts;
- vegetating cut and fill slopes;
- riprap installation;
- rolling grade”.(2)

“Operate and maintain roads in accordance with objectives as specified in road prescriptions. Roads not needed for industry, public and/or administration of the forest are to be closed or decommissioned”.(2)

“Maintain access roads to the lowest standard and density necessary for two-wheel drive pick-ups for removal of green firewood”.(2)

“Seasonally close roads using gates or barriers where the road structure support is inadequate when the ground is wet and/or for resource protection.”(2)

<b>Potential Management Strategies</b>	<b>Forest Plan Consistency Statement</b>
Keep all roads open. Relocate road. Decommissioning. Conversion to trail, priority given to redundant roads and road affecting wetlands and wildlife habitat. Maintain and/or add roadless areas. Maintain open road system.	Designation of Roads covered in FR,p88

### **Issues and Concerns**

Impacts to wildlife and damage to watershed, riparian and wetlands resources were identified as key issues on the mesa, by both Forest Service specialists and publics during the April, 2003 meetings, Many of these concerns had to do with the number and location of user created roads.

### ***Desired Condition***

The final road network would be at the minimum density needed to satisfy the needs of the key user groups while addressing the resource concerns and management directions identified in the LSA. The final network would provide unroaded patches for wildlife needs, and would take into account wildlife corridors. The system would consider fire risk and potential. Each road would be located out of stream-courses and water collection features where possible and would brought up to and maintained to the lowest standard possible to satisfy these needs and cause the least resource damage possible. ”Roads would provide access to wetland areas to sufficiently accommodate recreational

or other activities. People would take responsibility to use roads in a way that minimizes resource damage. Roads that exist create minimum effects to wetland function. No new roads are allowed within wetland areas”(1) The size of the final system would fit within the financial resources of the agency so that it would receive on going maintenance. Areas would be closed to off-road driving when adverse resource impacts occur. Roads not needed for industry, public and/or administration of the forest would be closed or decommissioned”. (2)Visual quality would play an important role in determining the final road network. The current road system provides ample opportunity to access forest recreation, and provide a source of enjoyment in and of themselves. The design of the final network would take incorporate this value.

“The Forest Service, based on partner and public dialogue, is planning to revise its national policy guiding the use of motorized vehicles to develop a designated-use system on roads and trails to minimize or eliminate the undesirable impacts from unmanaged OHV use. The proposal is to revise CFR.s and prepare a draft CFR for public review and comment by early to mid-year 2004.”(3) This planning effort could affect the desired condition on Anderson Mesa, and would need to be factored in, in any future projects on the mesa.

Listed below are the miles of road, by maintenance level, that are proposed by the Anderson Mesa Landscape Analysis.

Maintenance level 1	Maintenance level 2	Maintenance level 3	Maintenance level 4	Maintenance level 5
392.8	372.0	58.6	3.8	0

This includes the non-system or “social roads”

This will result in an open road density of 1.63 miles per square miles in the Ponderosa pine/mixed conifer zone and 1.03 miles per square miles in the woodland zone. The aggregate open road density in the Anderson Mesa Analysis area will be 1.06 miles per square mile.

## APPENDIX A

Achieving the Desired Condition is not possible at this level but could be accomplished with several project level proposals. As each project is spun off, they would follow the guidelines below.

- 1) Adopt the recommendations of the LSA.
- 2) Adopt the recommendations of the Forest Level Roads Analysis to insure that we maintain continuity of the maintenance level 3+ road throughout the mesa.
- 3) Each road retained in the system has a value/risk assessment done. This assessment followed the procedure designed for the Forest Level Roads Analysis, which is detailed in appendix C. At each new project, verify the value/risk assessment. Each road designated for retention would have a current road management objective (RMO) sheet.
- 4) Due to the high number of user created roads both currently in the system and those that will be added to the system, a reconstruction plan is needed to bring those roads designed for retention up to standard.
- 5) Roads not needed for industry, public and/or administration of the forest will be scheduled to be closed or decommissioned.

## APPENDIX B

### Definitions:

#### Maintenance level:

Maintenance levels define the level of service provided by, and maintained for, a specified road. Several factors are considered when selecting a maintenance level.

1. Resource needs and protection.
2. Road investment protection.
3. Service life.
4. User safety, comfort and convenience.
5. Volume and type of traffic, including travel speed.
6. Surface type
7. Administrative objectives.

Roads may be maintained at one level currently, the operational maintenance level and planned to be maintained at different level at some future date, or the objective level.

#### Maintenance level descriptions:

Level 1. Assigned to roads closed to vehicular traffic during the time they are closed. The closure period must exceed one year. Roads receiving level 1 maintenance may be of any type.

Level 2. Assigned to roads open for use by high clearance vehicles. Passenger cars are not a consideration. Traffic is normally minor. These may have been constructed for a single use, such as log haul.

Level 3. Assigned to roads open and maintained for passenger cars by a prudent driver. Safety is considered but user comfort and convenience are not considered priorities.

Level 4. Assigned to roads open and maintained for passenger cars and designed and maintained to provide a moderate level of user comfort and convenience at moderate speeds.

Level 5. Assigned to roads open and maintained for passenger cars and designed and maintained to provide a high level of user comfort and convenience. These roads are normally double lane and paved.

System roads: Those roads which have been inventoried and incorporated into the Forest transportation system and assigned maintenance levels.

Non-System: These roads are user-created, often referred to as social roads. They are not part of the Forest transportation system. They have not been assigned

maintenance levels and they need to be evaluated for incorporation into the system or obliteration. They are also called unclassified roads.

**Decommission Road:** The road prism and structures have been altered and/or removed where necessary to restore basic drainage patterns and return the land to the underlying resource allocation. The road is removed from the Forest road category. Conversion to trail may be appropriate. This term replaces the old term “obliteration”.

## APPENDIX C ROAD RISKS

### *Mule Deer Habitat*

#### **Description of Indicator**

Mule deer habitat is comprised of Terrestrial Ecosystem Map Units that have the presence of Cliffrose (*Cowania neomexicana*)--map units 434,435,436,437,455 and 490, respectively and the presence of buskbrush/Gambel oak (*Ceanothus fendleri/Quercus gambelli*) –map units 565,567,575, 578,579,582, 584, and 585, respectively. Additional mule deer habitat was added to the northwest portion of the analysis area after review by District biologist.

A numerical score of 2 is assigned to each road segment that intersects the habitat type:

- 0 = road does not intersect the habitat
- 2 = road intersects the habitat

#### **Units of Indicator**

Units are expressed as road/acre of habitat.

#### **Data Sources**

Roads data from Forest GIS road layer, clipped to the Anderson Mesa Landscape Scale Assessment (LSA) boundary and includes approximately 350 additional road arcs from two separate gps activities within the LSA boundary (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/road).

Mule deer habitat clipped from Forest GIS terrestrial ecosystem layer (TES) clipped to the Anderson Mesa Landscape Scale Assessment (LSA) boundary. Layer location is at the following: (fsfiles/ref/library/gis/projects/forest\_wide/am/library/tes). TES map units 434,435,436,437,455,490,565,567,575, 578,579,582, 584, and 585 were selected from the clipped TES layer. Additional habitat was added to this base layer from paper map copies of habitat. Layer location is at the following: (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/mule\_hab).

Final clipped layer of roads and mule deer habitat is located at : (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/rd\_deer).

#### **Data Limitations**

Road layer not completely field verified. Mule deer habitat based solely on habitat components of Cliffrose, buckbrush, and gambel oak. Additional habitat locations added by biologist not field verified, but does provide connectivity between patches.

## ***Meadow/Grassland Road Location***

### **Description of indicator**

The Meadow/Grassland Road Location Risk Factor is a measure of road interactions with meadow systems in the analysis area. Rating is designed to determine the relative effect to water movement (water interruption and redirection), and soil condition of meadow systems (compaction). Values are generated from GIS based on a portion of the road segment that intersects meadow systems. A numerical rating for meadows is assigned to each road segment using the following criteria:

- 0 = not in meadow
- 1 = less than .1 mile of road in the meadow
- 2 = at least .1 mile of road in the meadow
- 3 = at least .5 mile of road in the meadow

### **Units of indicator**

This indicator is based on the presence of road segments within meadows/grasslands in the analysis area.

### **Data Sources**

Roads data from Forest GIS road layer, clipped to the Anderson Mesa Landscape Scale Assessment (LSA) boundary and includes approximately 350 additional road arcs from two separate gps activities within the LSA boundary (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/road).

Meadows/grasslands clipped from Forest GIS terrestrial ecosystem layer (TES) clipped to the Anderson Mesa Landscape Scale Assessment (LSA) boundary. Layer location is at the following: (fsfiles/ref/library/gis/projects/forest\_wide/am/library/tes).

TES map units 41, 50, 53, and 55 were selected from the clipped TES layer. Layer location is at the following: (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/meadow).

Final clipped layer of roads and meadows is located at : (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/rd\_meadow).

### **Data Limitations**

Not all road segments were field verified.

## **Wetland Road Location**

### **Description of indicator**

The Wetland Road Location Risk Factor is a measure of road interactions with wetland systems in the analysis area. Rating is designed to determine the relative effect to water movement (water interruption and redirection), plant disturbance and soil condition of wetland systems (compaction). Values are generated from GIS based on a portion of the road segment that intersects wetland systems, by wetland type. Rating for roads are weighted higher for wetland types that have more permanent water. No rating is given for reservoir wetlands because roads here are often associated with recreation access. A numerical rating for each wetland type is assigned to each road segment using the following criteria:

- 0 = not in wetland
- 1 = in ephemeral wetland
- 2 = in temporary wetland
- 3 = reservoir
- 4 = in seasonal wetland
- 5 = in semi-permanent

### **Units of indicator**

Units are miles/acre of road by wetland type.

### **Data Sources**

Roads data from Forest GIS road layer, clipped to the Anderson Mesa Landscape Scale Assessment (LSA) boundary and includes approximately 350 additional road arcs from two separate gps activities within the LSA boundary (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/road).

Wetlands clipped from Forest GIS waterbody layer clipped to the Anderson Mesa Landscape Scale Assessment (LSA) boundary. The wetland attribute table was populated with information from the Forest wetland inventory. Layer location is at the following: (fsfiles/ref/library/gis/projects/forest\_wide/am/library/wetland). Final clipped layer of roads and wetland is located at: (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/rd\_wetland).

### **Data Limitations**

Not all road segments were field verified.

## ***Threatened, Endangered, and Sensitive Species***

### **Description of Indicators**

The factor focuses on the following species: Mexican spotted owl and northern goshawk. Road segments are assigned a numerical rating based on the following criteria:

- 0 = road segment outside of PAC or PFA
- 4 = road segment in PAC or PFA, but outside of 400 meter nest buffer
- 4 = road segment in 400 meter nest buffer of Mexican spotted owl or northern goshawk (no road segments occur in nest buffers)

### **Units of indicator**

This indicator is based on the presence of road segments within PAC's, PFA's, or 400 meter nest buffer.

### **Data Sources**

This is an aggregate of multiple layers. Roads data from Forest GIS road layer, clipped to the Anderson Mesa Landscape Scale Assessment (LSA) boundary and includes approximately 350 additional road arcs from two separate gps activities within the LSA boundary (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/road).

Goshawk PFA's clipped from Forest GIS waterbody layer clipped to the Anderson Mesa Landscape Scale Assessment (LSA) boundary. Layer location is at the following: (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/goshawk). No goshawk nest sites occur within the LSA boundary. Final clipped layer of roads and goshawk pfa's is located at : (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/rd\_gospfa).

Mexican spotted owl PFA's clipped from Forest GIS waterbody layer clipped to the Anderson Mesa Landscape Scale Assessment (LSA) boundary. Layer location is at the following: (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/mso\_ma). Mexican spotted owl PAC's clipped from Forest GIS waterbody layer clipped to the Anderson Mesa Landscape Scale Assessment (LSA) boundary. Layer location is at the following: (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/mso\_ma).

Final clipped layer of roads and Mexican spotted owl pacs is located at : (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/rd\_mso). Mexican spotted owl nest sites clipped from Forest GIS waterbody layer clipped to the Anderson Mesa Landscape Scale Assessment (LSA) boundary. Layer location is at the following: (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/mso\_nest). This layer was buffered at 400 meters and is located at: (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/mso\_nest4) No roads intersected this layer.

### **Data Limitations**

No field verification of data.

## ***Antelope Habitat***

### **Description of Indicator**

This indicator describes the impact of vehicular traffic on antelope, especially during the fawning ( approximately May 1 to June 30) and breeding (approximately August 15 to September 15) seasons. Antelope habitat is comprised of Terrestrial Ecosystem Map Units that are currently pushed sites or meadow sites--map units 41, 50, 53, 55,436, 453, 454,and 515, respectively. Additional polygons of antelope habitat were added to the initial layer that display use areas from antelope collar data.

A numerical score of 2 is assigned to each road segment that intersects the habitat type:

0 = road does not intersect the habitat

2 = road intersects the habitat

4 = road intersects in high use radio collar area.

### **Units of Indicator**

Units are expressed as road/acre of habitat.

### **Data Sources**

Roads data from Forest GIS road layer, clipped to the Anderson Mesa Landscape Scale Assessment (LSA) boundary and includes approximately 350 additional road arcs from two separate gps activities within the LSA boundary (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/road).

Antelope habitat clipped from Forest GIS terrestrial ecosystem layer (TES) clipped to the Anderson Mesa Landscape Scale Assessment (LSA) boundary. Layer location is at the following: (fsfiles/ref/library/gis/projects/forest\_wide/am/library/tes).

TES map units 41, 50, 53, 55,436, 453, 454, and 515 were selected from the clipped TES layer. Layer location is at the following:

(fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/ant\_fawn\_hab).

Final clipped layer of roads and potential antelope habitat is located at:

(fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/rd\_ant\_hab).

Final clipped layer of roads and high use radio collar data is located at:

(fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/rd\_ant\_collar).

### **Data Limitations**

Road layer not completely field verified.

## ***Native Fish Habitat***

No native fish habitat interacts with roads in this analysis.

## ***Amphibians and Reptiles***

### **Description of Indicators**

This focuses on road intersections with water features, and includes stock tanks, wetland, springs, and riparian stream reaches. The risk from roads to these habitat types is through habitat destruction, decrease water quality through sediments, and direct mortality. Road segments are assigned a numerical rating based on the following criteria:

- 0 = road segment does not intersect with stock tank, wetland, spring or riparian reach or intersects with a closed basin
- 1 = road segment intersects with stock tank
- 1 = road intersects with riparian reach
- 1 = road segment intersects with ephemeral, temporary, or reservoir wetland
- 2 = road segment intersects with seasonal or semi-permanent wetland
- 4 = road segment intersects with spring

### **Units of indicator**

Unit is miles of road per acre of habitat.

### **Data Sources**

This is an aggregate of multiple data layers. Roads data from Forest GIS road layer, clipped to the Anderson Mesa Landscape Scale Assessment (LSA) boundary and includes approximately 350 additional road arcs from two separate gps activities within the LSA boundary (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/road).

Stock tank clipped from Forest GIS waterbody layer clipped to the Anderson Mesa Landscape Scale Assessment (LSA) boundary and stock tanks selected out from the polygon layer. Layer location is at the following:  
(fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/fs\_tank). Final clipped layer of roads and stock tanks is located at :  
(fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/rd\_tanks).

Wetlands clipped from Forest GIS waterbody layer clipped to the Anderson Mesa Landscape Scale Assessment (LSA) boundary. The wetland attribute table was populated with information from the Forest wetland inventory. Layer location is at the following:  
(fsfiles/ref/library/gis/projects/forest\_wide/am/library/wetland). Final clipped layer of roads and wetland is located at :  
(fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/rd\_wetland).

Springs clipped from Forest GIS waterpoint layer clipped to the Anderson Mesa Landscape Scale Assessment (LSA) boundary. Layer location is at the following:

(fsfiles/ref/library/gis/projects/forest\_wide/am/library/am\_spring). Final clipped layer of roads and springs is located at :

(fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/rd\_spring).

Riparian reaches are clipped from Forest GIS stream layer clipped to the Anderson Mesa Landscape Scale Assessment (LSA) boundary. The stream layer was further refined to include only riparian reaches within the analysis area—these are Sawmill Springs, Jacks Canyon and East Clear Creek. The wetland attribute table was populated with information from the district proper functioning condition assessment inventory. Layer location is at the following:

(fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/am\_pfc). Final clipped layer of roads and wetland is located at :

(fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/rd\_riparian).

### **Data Limitations**

Field verification is limited to less than 10% of total data items.

## ***Semi-Primitive non-motorized (ROS) criteria***

### **Indicator description**

This indicator describes the intersection of roads in areas designated as semi-primitive, non-motorized (SPNM) ROS class. The presence of a road indicates either a need to change the ROS class to a roaded condition, or the possibility to remove the road to maintain the ROS designation as is. The presence of a road within the SPNM designated areas will have a numeric value assigned to it.

0 = road not in SPNM designated area

3 = road in SPNM designated area

### **Data Sources**

Roads data from Forest GIS road layer, clipped to the Anderson Mesa Landscape Scale Assessment (LSA) boundary and includes approximately 350 additional road arcs from two separate gps activities within the LSA boundary (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/road).

ROS clipped from Forest GIS ROS layer clipped to the Anderson Mesa Landscape Scale Assessment (LSA) boundary.. Layer location is at the following: (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/ros). SPNM clipped from ROS to create file (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/spnm), which was clipped with roads layer above. Final clipped layer of roads for SPNM is located at : (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/rd\_spmn).

### **Data Limitations**

ROS class data has not been updated since the Forest Plan.

## **Designated Roadless Areas**

### **Description of Indicator**

Three designated roadless areas occur within the analysis area, Padre Canyon, Jacks Canyon and Lower Jacks Canyon. This indicator notes the presence of any roads within these designated roadless area

A numerical score of 5 is assigned to each road segment that intersects a Roadless Area:

0 = road does not intersect a Roadless Area

5 = road intersects a Roadless Area

### **Units of Indicator**

Units are expressed as road/acre of Roadless Area.

### **Data Sources**

Roads data from Forest GIS road layer, clipped to the Anderson Mesa Landscape Scale Assessment (LSA) boundary and includes approximately 350 additional road arcs from two separate gps activities within the LSA boundary (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/road).

Roadless area clipped from Forest GIS special management areas clipped to the Anderson Mesa Landscape Scale Assessment (LSA) boundary. Layer location is at the following: (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/roadless).

Final clipped layer of roads and Roadless Areas is located at : (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/rd\_roadless).

### **Data Limitations**

Roads that have not been recently gps'ed have not been field verified. All other roads are field verified (approximately 90% of road miles in roadless areas).

## ***Noxious Weeds***

### **Description of Indicator**

This is a description of noxious weed presence adjacent to roads. A numerical score of 2 is assigned to each road segment that intersects a known population of noxious weeds:

- 0 = road does not intersect a known population of noxious weeds
- 2 = road intersects a known population of noxious weeds

### **Units of Indicator**

Units are expressed as road/population of noxious weeds.

### **Data Sources**

Roads data from Forest GIS road layer, clipped to the Anderson Mesa Landscape Scale Assessment (LSA) boundary and includes approximately 350 additional road arcs from two separate gps activities within the LSA boundary (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/road).

Noxious weeds area clipped from Forest GIS noxious weed layer (swemp03) clipped to the Anderson Mesa Landscape Scale Assessment (LSA) boundary. Layer location is at the following: (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/nox\_weed).

Final clipped layer of roads and Roadless Areas is located at : (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/rd\_noxweed).

### **Data Limitations**

The entire area has not been surveyed, so there may be more noxious weeds on site than this indicates.

## ***Redundant Roads***

### **Description of Indicator**

This is a description of road segments that are redundant—i.e., roads that are either braided, two (or more) roads that end at the same spot, or short road segments (generally less than .2 miles) that are redundant to the road they are originating from. These are road segments that have been user created. The roads are said to be redundant because they often parallel a similar road and the beginning and endpoint are the same. A numerical score of 2 is assigned to each road segment that gps data indicates a redundant condition:

- 0 = road is not redundant
- 2 = road is redundant

### **Units of Indicator**

Units are expressed as braided road.

### **Data Sources**

Roads data from Forest GIS road layer, clipped to the Anderson Mesa Landscape Scale Assessment (LSA) boundary and includes approximately 350 additional road arcs from two separate gps activities within the LSA boundary (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/road).

Braided roads were identified when a gps'ed road segment had multiple line segments between starting and endpoints of the road segment. Roads that are said to be redundant because they often parallel a similar road and the beginning and endpoint are the same were identified through reviewing the road system on maps.

### **Data Limitations**

Braided roads occur only on recently gps'ed roads. It is thought that many more braided roads occur, but the data has not been collected on these.

## ***Cinnamon Teal Road Location***

### **Description of indicator**

The Cinnamon Teal Risk Factor is a measure of road interactions during nesting season (May 1 to July 15) with seasonal and semi-permanent wetland basin systems in the analysis area. Rating is designed to determine the relative effect to nesting habitat within 100 meters of seasonal and semi-permanent wetlands. The two wetland types are the only chosen because they are the only wetlands that produce abundant emergent vegetation. A numerical rating for each wetland type is assigned to each road segment using the following criteria:

- 0 = not in wetland
- 2 = in seasonal wetland
- 2 = in semi-permanent wetland

### **Units of indicator**

This indicator is based on the presence of road segments within wetland and buffers in the analysis area.

### **Data Sources**

Roads data from Forest GIS road layer, clipped to the Anderson Mesa Landscape Scale Assessment (LSA) boundary and includes approximately 350 additional road arcs from two separate gps activities within the LSA boundary (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/road).

Wetlands clipped from Forest GIS waterbody layer clipped to the Anderson Mesa Landscape Scale Assessment (LSA) boundary. The wetland attribute table was populated with information from the Forest wetland inventory. Layer location is at the following: (fsfiles/ref/library/gis/projects/forest\_wide/am/library/wetland). Seasonal and semi-permanent wetlands were then selected out using the reselect command in arc (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/semi\_seas), and then buffered with a 100 meter buffer (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/teal\_hab). The buffer layer was clipped to the road layer to determine road intersections in these habitat types. This final layer is located at (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/rd\_tealhab).

### **Data Limitations**

Not all road segments were field verified.

## ***Birding Disturbance Road Location***

### **Description of indicator**

The Birding disturbance road location Risk Factor is a measure of road interactions with reservoir, semi-permanent, and seasonal wetlands where roads in these wetland features provide disturbance to birding opportunities in the analysis area. Values are generated from GIS based on a portion of the road segment that intersects wetland systems, by wetland type. A numerical rating for each wetland type is assigned to each road segment using the following criteria:

0 = not in seasonal, semi-permanent, or reservoir wetland basin

1 = in seasonal, semi-permanent, or reservoir wetland basin

### **Units of indicator**

Units are miles per acre of wetland.

### **Data Sources**

Roads data from Forest GIS road layer, clipped to the Anderson Mesa Landscape Scale Assessment (LSA) boundary and includes approximately 350 additional road arcs from two separate gps activities within the LSA boundary (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/road).

Wetlands clipped from Forest GIS waterbody layer clipped to the Anderson Mesa Landscape Scale Assessment (LSA) boundary. The wetland attribute table was populated with information from the Forest wetland inventory. Layer location is at the following: (fsfiles/ref/library/gis/projects/forest\_wide/am/library/wetland). Seasonal, semi-permanent, or reservoir were selected out from the base layer and then clipped to the road layer to find intersections of roads within these wetland types. Final clipped layer of roads and wetland is located at : (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/rd\_birddist).

### **Data Limitations**

Not all road segments were field verified.

## **Cultural Resources**

### **Description of indicator**

The cultural resources Risk Factor is a measure of road interactions with known cultural resource sites. Where road/trail intersections occur, then the potential for damage to the sites is increased. Values are generated from GIS based on a portion of the road segment that intersects with a buffered known cultural resource site. The cultural resource site layer is a point layer, therefore a buffer of 50 meters around the site point was used for the polygon layer for cultural resource sites. A value will be assigned for each road segment that intersects with a trail that is not a trailhead:

- 0 = no road interaction with known cultural resource site
- 3 = road interaction with known cultural resource site.

### **Units of indicator**

Units are miles of road/cultural resource site.

### **Data Sources**

Roads data from Forest GIS road layer, clipped to the Anderson Mesa Landscape Scale Assessment (LSA) boundary and includes approximately 350 additional road arcs from two separate gps activities within the LSA boundary (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/road).

Cultural resource sites are a point layer that represents where the site tag is located on any given cultural resource site. The individual site points were clipped to the Anderson Mesa boundary layer from the forest cultural resource site layer and then buffered at 50 meters. Due to site confidentiality, the site location layer is not included in this layer. (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/site\_buf). Road segments were selected from the road layer above where intersections with the buffered sites occur. Final clipped layer of roads and cultural resource sites is located at : (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/rd\_sites).

### **Data Limitations**

Not all road segments were field verified. The entire Mesa has not been surveyed, so more sites may occur than are generated here. The 50 meter buffer may be too large on some sites and too small on other sites.

## **Road/Trail Conflict**

### **Description of indicator**

The Road/trail conflict Risk Factor is a measure of road interactions with designated trails. Where road/trail intersections occur, then the potential for vehicle non/motorized recreation user is increased, with a potential decrease in non-vehicle recreation experience. Values are generated from GIS based on a portion of the road segment that intersects designated trail systems. A value will be assigned for each road segment that intersects with a trail that is not a trailhead:

0 = no road interaction with trail

1 = road interaction with trail

### **Units of indicator**

Units are miles of road/miles of trail.

### **Data Sources**

Roads data from Forest GIS road layer, clipped to the Anderson Mesa Landscape Scale Assessment (LSA) boundary and includes approximately 350 additional road arcs from two separate gps activities within the LSA boundary (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/road).

Trail segments were clipped from the Forest trails layer to the analysis area boundary and can be found at (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/trails). Road segments were selected from the road layer above where intersections with trails occur. Final clipped layer of roads and wetland is located at : (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/rd\_trail).

### **Data Limitations**

Not all road segments were field verified. Most trail road conflict areas are just outside of the analysis area.

# ROAD VALUES

## ***Private Access***

### **Description of Indicators**

The road system provides access to many different types of landowners, hydroelectric facilities, power lines, and other special use permit sites. Some roads are included in cost-share agreements. The Forest Service recognizes the need for access for a variety of uses. A numeric value is assigned to each road segment based on the following criteria:

0 = Road segment does not contribute in any way for access to non-Forest Service managed land, a special use permit, and is not included in a cost share agreement.

4 = Road segment serves as a primary access to non-Forest Service managed land, a special use permit, and is not included in a cost share agreement.

### **Units of indicator**

This indicator is based on the presence of road segments with access to private holdings or cost share roads.

### **Data Sources**

Roads data from Forest GIS road layer, clipped to the Anderson Mesa Landscape Scale Assessment (LSA) boundary and includes approximately 350 additional road arcs from two separate gis activities within the LSA boundary (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/road).

Individual road segments that access private land were selected from the road layer above (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/rd\_private).

### **Data Limitations**

The choice of main access routes does not include all possible routes to and from private lands.

## ***Administrative Site Access***

No Forest Service administrative sites occur within the analysis area, therefore, this layer is not germane.

## ***Developed Recreation Access***

### **Description of Indicators**

The factor is based on the ability to access to developed recreation sites (any developed campsites (eg Forked Pine campsites), developed trailheads/or trails, or any developed recreation lake (eg Long Lake )

0 = road does not access any developed recreation site

3 = road serves as a primary access to a major developed recreation sites.

### **Units of indicator**

This indicator is based on the presence of road segments with access to developed recreation sites.

### **Data Sources**

(Roads data from Forest GIS road layer, clipped to the Anderson Mesa Landscape Scale Assessment (LSA) boundary and includes approximately 350 additional road arcs from two separate gps activities within the LSA boundary  
(fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/road).

Individual road segments that access developed recreation sites land were selected from the road layer above where they intersect with developed recreation sites and/or trails  
(fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/rd\_devrec).

### **Data Limitations**

No alternative routes chose, just main travel routes.

## ***Vegetation Treatment Access***

### **Description of Indicators**

The factor is based on the ability to access to planned or possible treatments sites. Possible treatments include—currently planned pinyon-juniper removal projects in NEPA, either vegetation removal or prescribed fire; possible treatments of mollisol soil types

0 = road does not access any possible treatment areas.

1 = road serves as an access point for possible mollisol treatments in mollisol types with less than 50% mollisol.

2= road serves as an access point for possible mollisol treatments in mollisol types greater than 75% mollisols.

3= road serves as an access point for currently planned treatments in NEPA, either vegetation removal (cutting) or prescribed fire.

### **Units of indicator**

This indicator is based on the presence of road segments with access to treatment sites and is weighted heavier for roads that currently have site specific NEPA.

### **Data Sources**

(Roads data from Forest GIS road layer, clipped to the Anderson Mesa Landscape Scale Assessment (LSA) boundary and includes approximately 350 additional road arcs from two separate gps activities within the LSA boundary  
(fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/road).

Roads were clipped to four current treatment layers that are located in (fsfiles/ref/library/gis/projects/forest\_wide/am/library/) and include the following covers:  
diablotrt\_as = proposed treatments on Anderson Springs allotment  
diablotrt\_btb = proposed treatments on Bar T Bar allotment  
burn\_blocks = proposed burn treatments on Anderson Mesa  
and proposed treatments in pickett allotment, with the layer located at (fsfiles/ref/library/gis/projects/fcntr/range/pickett/pickett\_trt)

Final clipped outputs are located in (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap) with the following output files:  
rd\_as\_trt =roads that intersect proposed treatments on Anderson Springs allotment  
rd\_btb\_trt = roads that intersect proposed treatments on Bar T Bar allotment  
rd\_burn = roads that intersect proposed prescribed burn treatments  
rd\_pp\_trt = roads that intersect with proposed treatments on Pickett allotment

Roads were also clipped to two possible treatment layers for mollisol soil types as defined by soil types greater than 75% mollisol as defined by the Coconino NF Terrestrial Ecosystem Survey

(fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/mol\_gt75) and soil types that contain mollisols less than 50% as defined by the Coconino NF Terrestrial Ecosystem Survey (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/mol\_lt50).

Final clipped outputs to roads layer are located in (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap) with the following output files: rd\_mol\_gt75 =roads that intersect proposed treatments on soil types with greater than 75% mollic component  
rd\_mol\_lt505 =roads that intersect proposed treatments on soil types with less than 50% mollic component

**Data Limitations**

Not all possible treatments are included due to lack of site-specific NEPA for the entire Mesa. Site specific NEPA may change this RAP output.

## ***Birding Access***

### **Description of indicator**

The birding access factor is a measure of road interactions with wetland basin systems in the analysis area where birding opportunities exist, where most birding opportunity exists (seasonal, semi-permanent, and reservoir wetlands). This layer displays access roads to wetlands and is assigned to each road segment using the following criteria:

- 0 = road does not access wetland where birding opportunities exist
- 1 = road accesses wetlands where birding opportunities exist

### **Units of indicator**

This indicator is based on the presence of road segments within wetland and buffers in the analysis area that may provide birding opportunities.

### **Data Sources**

Roads data from Forest GIS road layer, clipped to the Anderson Mesa Landscape Scale Assessment (LSA) boundary and includes approximately 350 additional road arcs from two separate gps activities within the LSA boundary:  
(fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/road).

Wetlands clipped from Forest GIS waterbody layer clipped to the Anderson Mesa Landscape Scale Assessment (LSA) boundary. The wetland attribute table was populated with information from the Forest wetland inventory. Layer location is at the following:  
(fsfiles/ref/library/gis/projects/forest\_wide/am/library/wetland). Seasonal, semi-permanent, and reservoir wetlands were selected from this layer  
(fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/sem\_res\_sea). This layer was underplayed to the road layer above, and individual road segments were selected that access the wetland types above. This final layer is located at  
(fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/rd\_birdacc).

### **Data Limitations**

Assumes birding opportunities exist only at wetlands.

## ***Hunting Access***

### **Description of indicator**

The hunting access factor is a measure of road interactions outside of a ¼ mile buffer away from private inholdings the analysis area, This layer uses a ¼ mile buffer around private land as the intersect point for hunting opportunities and a numeric rating is assigned to each road segment using the following criteria:

- 0 = in ¼ mile buffer of private land
- 1 = outside ¼ mile buffer of private land

### **Units of indicator**

Roads/mile

### **Data Sources**

Roads data from Forest GIS road layer, clipped to the Anderson Mesa Landscape Scale Assessment (LSA) boundary and includes approximately 350 additional road arcs from two separate gps activities within the LSA boundary (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/road).

Private land clipped from Forest GIS owner layer clipped to the Anderson Mesa Landscape Scale Assessment (LSA) boundary. Layer location is at the following: (fsfiles/ref/library/gis/projects/forest\_wide/am/library/owner). Owners were buffered with a 400 meter buffer (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/priv\_400). The buffer layer was clipped to the road layer to determine road intersections in these potential hunting sites. This final layer is located at (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/rd\_huntacc).

### **Data Limitations**

None.

## **Trail Access**

### **Description of indicator**

The trail access factor is a measure of road interactions to trails, as a means to access the trail system. A numeric rating is assigned to each road segment that intersects a trail using the following criteria:

0 = does not intersect a trail

1 = intersects a trail

### **Units of indicator**

This indicator is based on the presence of road segments as a means to access the existing trail system.

### **Data Sources**

Roads data from Forest GIS road layer, clipped to the Anderson Mesa Landscape Scale Assessment (LSA) boundary and includes approximately 350 additional road arcs from two separate gps activities within the LSA boundary (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/road).

Traikl locations clipped from Forest GIS trailr layer clipped to the Anderson Mesa Landscape Scale Assessment (LSA) boundary. Layer location is at the following: (fsfiles/ref/library/gis/projects/forest\_wide/am/library/trail). The layer was clipped to the road layer to determine road intersections on trail sites. This final layer is located at (fsfiles/ref/library/gis/projects/forest\_wide/am/working/rap/rd\_trailacc).

### **Data Limitations**

No proposed trails around subdivisions for ATV use are included and may need to be added at a later date. Also, several road segments that are directly adjacent to the analysis area are not included in this layer.

## **Bibliography**

- (1) Taken from the specialists report “Existing and desired conditions of riparian-wetlands” prepared for the Anderson Mesa Project by the “Wetlands collaborate Team”
- (2) Taken from the Coconino Forest Plan
- (3) OHV background paper