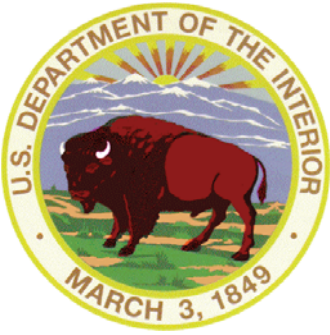




HIGHWAY 89 BOUNDARY TRESPASS MONITORING



2009

WUPATKI NATIONAL MONUMENT

**United States
Department of
Interior**

National Park Service

Flagstaff Group

**Natural Resource Management
Division**

Flagstaff, Arizona 86004

**General Technical Report
FLAG-001-2010**



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Executive Summary

In 2008, in order to facilitate pronghorn movement in the area, the NPS, AGFD, and the Arizona Department of Transportation (ADOT) agreed to cooperatively remove the right-of-way (ROW) fence along both sides of US 89 through Wupatki National Monument (WUPA) for an experimental period of three years. The fence that was removed was located approximately 50 feet from either edge of the shoulder pavement of Highway 89. The project compliance record, under the National Environmental Policy Act (NEPA) and the National Historic Preservation Act (NHPA), includes a commitment to reconstruct the fence if there is an unacceptable level of illegal off-road travel adjacent to the highway or other resource impact issues that may result from the lack of a fence.

In order to determine the extent and level of impacts a monitoring program needed to be devised. This program was developed by National Park Service (NPS) staff to monitor off-road and other activities originating from within the US 89 corridor into WUPA. It is designed as a long-term monitoring program which requires regular seasonal follow-up documentation to record any impacts to natural resources.

Most of the impacts along the established transects at WUPA appear to have occurred during the dismantling of the fence and during some periodic maintenance performed by QWEST ROW Inc. crews on the telephone lines that traverse the study site on the east side of Highway 89. Our first monitoring efforts in the Spring of 2009 recorded many tracks from these activities, but by August of the same year these same tracks were barely evident.

Serious impacts include tracks that head straight into the monument for at least 300 meters but no serious trespass incidents were recorded in 2009. . It appears that any damage to soils or vegetation occurred only during the activities mentioned above and that the general public is not trespassing into the monument. All damage recorded was along the fenceline or limited to temporary emergency pull overs by vehicles in distress.

Since very little persistent impacts were recorded in 2009, recommendations are primarily concerned with ongoing monitoring and resource protection measures.

- 1) As long as the fence is down along the border monitoring should continue. Since minimal serious impacts were recorded in 2009 the frequency of monitoring should be only once during the active seasons of Spring, Summer, and Fall of each year, for a total of 3 surveys per year. If the frequency of impacts increases, monitoring efforts will be augmented as directed by the vegetation ecologist.
- 2) Permanent photopoints should be relocated and rephotographed during the Spring survey every year.
- 3) Wildlife observations should be more precisely recorded with every observation location recorded via GPS and more effort expended in recording quantities. For example, the precise location and number of mounds should be recorded at each prairie dog colony encountered.
- 4) Since most impacts appear to be from QWEST ROW Inc. service trucks maintaining their electric/telephone lines it is recommended that closer coordination and communication be developed with QWEST ROW so that they understand impact causes and know how to minimize damage when working within their Right-of-

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2009

WUPATKI NATIONAL MONUMENT

Report prepared for:

**National Park Service
Flagstaff Group
Natural Resource Management Division
Flagstaff AZ 84004**

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1.0 INTRODUCTION



Off-road use along WUPA west boundary. Fence has been removed.

1.1 BACKGROUND INFORMATION

A number of studies have shown that pronghorn (*Antilocapra americana*) in the vicinity of Wupatki National Monument (WUPA), managed by the National Park Service (NPS), are prevented from moving east and west across U.S. Highway 89 because of the highway and the fences in the vicinity (Ockenfels et al. 1996, Bright and van Riper III 2000, Arizona Game & Fish Department 2009). In response, the Arizona Game and Fish Department (AGFD) proposed a study to determine if removing the fences would facilitate pronghorn movements. Thus, they requested that the NPS remove their fences along Highway 89 that form the approximate west boundary of WUPA. The actual boundary is about .25 miles west of the highway (see **Figure 1**).

During 2008, the NPS, AGFD, and the Arizona Department of Transportation (ADOT) agreed to cooperatively remove the right-of-way (ROW) fence along both sides of US 89 through WUPA for an experimental period of three years. The fence that was removed was located approximately 50 feet from either edge of the shoulder pavement of Highway 89. The project compliance record, under the National Environmental Policy Act (NEPA) and the National Historic Preservation Act (NHPA), includes a commitment to reconstruct the fence if there is an unacceptable level of illegal off-road travel adjacent to the highway or other resource impact issues that may result from the lack of a fence.

In order to determine the extent and level of impacts a monitoring program needed to be devised. This program was developed by National Park Service (NPS) staff to monitor off-road and other activities originating from within the US 89 corridor into WUPA. It is designed as a long-term monitoring program which requires regular seasonal follow-up documentation to record any impacts to natural resources. After testing and establishing protocols, we documented the baseline condition using procedures described in this report. It is the goal of this program to monitor the US 89 corridor with sufficient frequency to detect and measure any new off-road activi-

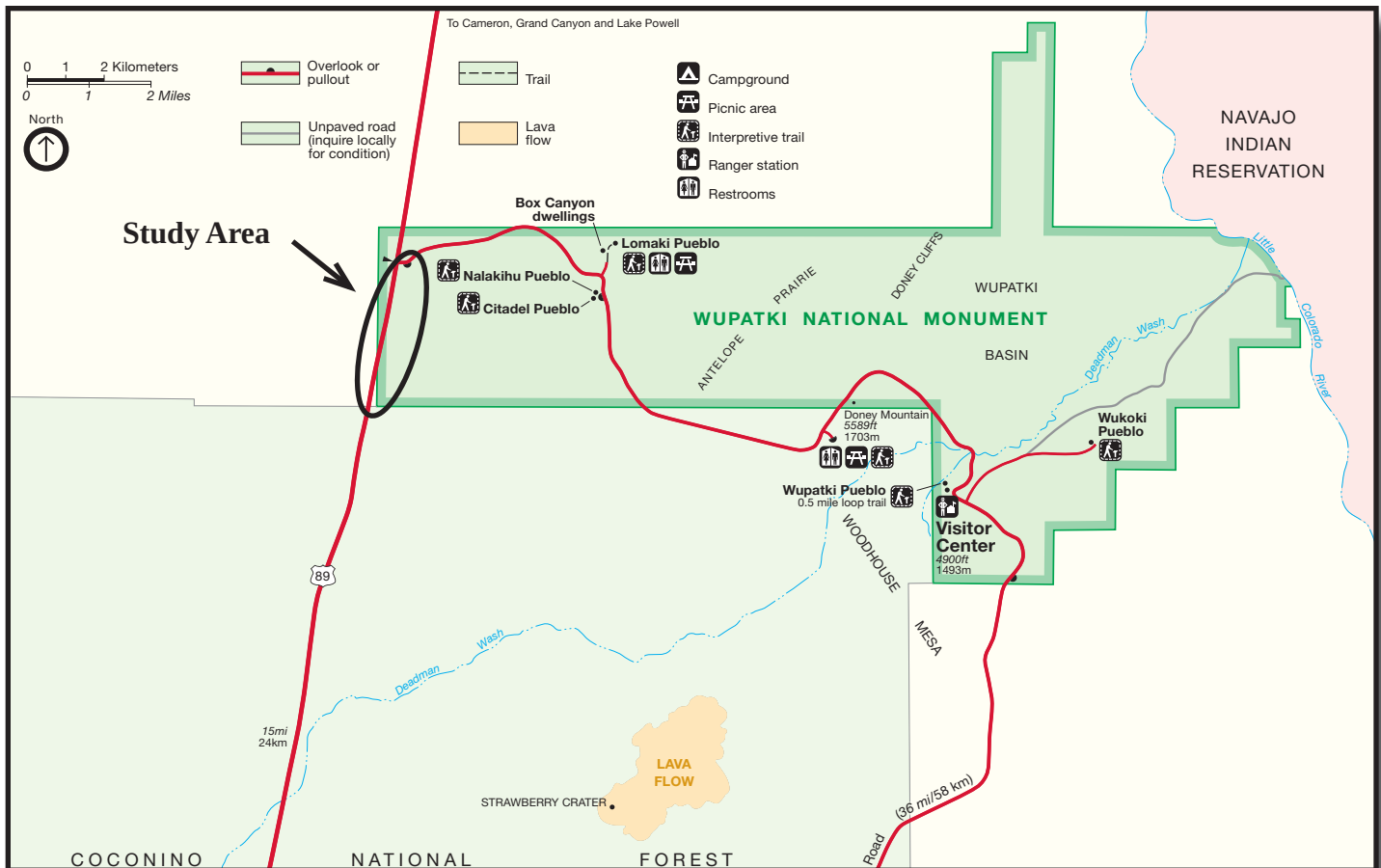


FIGURE 1. Map of Wupatki National Monument, study area is circled.

ty or impacts. In addition, observations of pronghorn, wildlife, and trespass livestock activity or mortality along the corridor will be documented because these are additional management concerns, and it will be time-efficient for staff to record such observations. Annual summary reports will be provided to the NPS Management Team to support decisions on whether to leave the ROW open or reconstruct the fence. This is the first of annual reports which describe the methodology and results of the baseline condition assessment, taken in April-May 2009, and a followup round of monitoring approximately 3 months later, in August, 2009.

1.2 GENERAL INFORMATION ABOUT WUPATKI NATIONAL MONUMENT

Wupatki National Monument (WUPA) was established by President Calvin Coolidge on December 9, 1924, to preserve Citadel and Wupatki pueblos. Monument boundaries have been adjusted several times since then, which currently include additional nearby pueblos and other archeological resources.

Wupatki National Monument covers approximately 35,400 acres (14,325 hectares) of Colorado Plateau semiarid grassland and shrubland environment located approximately 35 miles (56.33 kilometers) northeast of Flagstaff, Arizona. Wupatki's elevation ranges from 4,200 ft. to 5,600 ft. (1,281 m to 1,707 m) and contains a diverse array of topographical features, geological characteristics, and hydrological regimes creating a wide range of habitats sustaining a variety of distinct vegetation communities. See **Figure 1** for a general map of WUPA.

Wupatki's geology and soils provide diverse substrates for a wide array of plant communities, including arid grassland, one-seed juniper woodland, mixed grassland-shrubland, sparsely vegetated badlands, volcanic cin-

der dune, ephemeral drainage, and riparian vegetation (Bateman 1976, Hansen et al. 2004). While the varied habitats harbor a diverse native flora, many areas are sparsely vegetated and/or dominated by natural aeolian and fluvial depositional processes or frequent fire regimes, which perturb soil and vegetation, and may favor the establishment of invasive plants over native early succession plants. The prevailing southwesterly winds of the area are also of consequence because of their intensity, especially in spring, and their ability to spread seeds over wide expanses in this open desert ecosystem.

At least 29 invasive plant species are known to occur in WUPA (Batemen et al. 1976, Howery 2001, SWEPIC 2008, Schelz 2009). The General Management Plan for Wupatki National Monument (National Park Service 2002) identifies a set of mission goals for the monument, including maintaining the biotic integrity of natural systems. The exclusion of invasive exotic plant species is one of the listed actions for achieving this goal. (Behl et al. 2008)

Less than 800 years ago, Wupatki Pueblo was the largest, tallest, and perhaps the richest and most influential pueblo around, and was home to 85-100 people, and several thousand more lived within a day's walk. Human history at Wupatki spans at least 4,000 years, but only in the 1100s, was the landscape densely populated. This may have been prompted by the eruption of nearby Sunset Crater Volcano a century earlier, where people may have discovered that the cinders blanketing the area held increased nutrients and moisture needed for crops.

As the new agricultural community spread, small scattered homes were replaced by a few large pueblos, each surrounded by many smaller pueblos and pithouses. Wupatki, Wukoki, Lomaki, and other masonry pueblos emerged from bedrock. Trade networks expanded, bringing exotic items like turquoise, hematite, salt, shell jewelry, copper bells, and parrots. Wupatki flourished as a meeting place of different cultures, but by about 1250, the people moved on.

1.3 CLIMATE AT WUPATKI NATIONAL MONUMENT

WUPA is typified by a semi-arid climate that includes hot, moist summers and cool, dry winters. Precipitation events, often in the form of violent thunderstorms, occur from July through September and provide most of the annual moisture. Summer maximum temperatures are often 100 degrees F, while winter minimum temperatures rarely go below freezing (NOAA 2004).

1.4 PURPOSE AND NEED

The purpose of this monitoring effort is to develop an integrated impact monitoring plan for the area where the fence has been removed in WUPA along Highway 89.

This monitoring plan is needed to achieve the following:

- To preserve and protect the natural conditions, ecological processes, and cultural resources;
- To prevent further impacts to WUPA natural and cultural resources by proactively monitoring impacts and reporting these to management so that timely and effective prevention can be devised;
- To establish set protocols that can be repeated on a regular basis that will effectively track any impacts to resources that may result from the lack of a boundary fence.

1.5 POTENTIAL IMPACTS OF CONCERN

Impacts from trespass vehicles are of upmost concern due to the potential destruction of vegetation and compaction impacts to soils, and to easy access to protected cultural sites in the vicinity. Once vehicle tracks have been established, trespass problems can easily accelerate as other vehicles follow. The study area traverses native grassland and shrubland plant communities of Wupatki which are particularly susceptible to damage from off-road vehicular activities. The following resources have been identified as the primary concerns that are susceptible to trespass off-road vehicle use:

Natural Resources

- 1) Geologic and Soil Resources
- 2) Vegetation
- 3) Wildlife
- 4) Special Status Species

Cultural Resources

- 5) Archeological and Historic Resources
- 6) Cultural Landscapes

Native grassland species at WUPA include those common to the Great Basin and Great Plains. Livestock grazing was prevalent in the area before it was eliminated within the monument in the early 1980's (NPS WUPA General Management Plan 2002). The major grass species include black grama (*Bouteloua eriopoda*), galleta (*Pleuraphis jamesii*), needle-and-thread (*Hesperostipa comata*), and alkali sacaton (*Sporobolus airoides*). All of these species occur in pure and mixed stands, and are often the dominant understory species in nearby wooded and shrubby areas.

2.0 OBJECTIVES AND GOALS



Intact Fence at WUPA. Highway 89 is on right side.

2.1 GOALS OF MONITORING PROGRAM

The primary goals of this monitoring effort include:

- Monitor impacts to natural conditions, ecological processes, and cultural resources;
- Prevent further impacts to WUPA natural and cultural resources;
- Establish effective monitoring protocols that can be repeated on a regular basis.

2.2 OBJECTIVES

Specific objectives for impact monitoring along the US 89 corridor include:

- Establishing a valid baseline of all detectable evidence of off-road travel and other impacts at the time the fence was removed.
- Systematically monitor for new off-road travel incidents on a cyclic schedule.
- Detect any new incidents which warrant further investigation, and document any damage to cultural and natural resources.
- Provide reliable information to park management to assess off-road travel activity and impacts, and support decisions if further mitigation or protection strategies are needed.

2.3 ROLES AND RESPONSIBILITIES

The Flagstaff Area Monuments Vegetation Ecologist (currently Charles Schelz) is the Project Manager and coordinates all phases of this project. He and the Natural Resource Manager (currently Paul Whitefield), with the help of seasonal Biological Technicians and Student Conservation Association interns, will complete routine cyclical monitoring in the field; data collection, storage and analysis; and will prepare an annual report in December of each year. This report is intended to be used as a template for future reports.

The Natural Resources Division will immediately report any incidents or impacts that warrant further investigation to all involved, especially to the Cultural Resource Division and the Ranger Activities Division.

3.0 METHODS



Transect Marker and Some Equipment for Fieldwork.

3.1 MONITORING INDICATORS

Monitoring will consist of three datasets that will be recorded concurrently. These include:

- (1) Off-road Vehicle Track Counts and Locations;
- (2) Significant Wildlife/Livestock Observations; and
- (3) Baseline Photos and Repeat Photography

The primary measure of off-road travel activity will be the total number of incidents where vehicles leave the highway and cross the original Right-of-Way (ROW) fence alignment into WUPA. Vehicle track sets will be systematically recorded on both sides of US 89 where the ROW fence has been removed. If a trespass route is found, the entire off-road travel route will be documented using Global Positioning System units (GPS) and photography. The priority will be documenting the first 30 meters/100 feet of travel beyond the ROW line. If field time is constrained, mapping entire travel routes may be deferred until follow-up resource damage assessments can be conducted. These will be done as soon as possible after discovery in order to prevent any further damage.

In addition, notable observations of pronghorn or other wildlife movements, trespass livestock, or animal mortality will also be recorded. Based on past experience in this area, it is not anticipated that this will take a lot of extra field and recording time, but will provide invaluable information because of the dearth of knowledge concerning movements of pronghorn. There is also the possibility of discovering special status species, such as the burrowing owl (*Athene cunicularia*), which was observed during initial surveys in the Spring of 2009.

Lastly, a set of permanent photopoints will be established. These will serve as qualitative evidence of long-term groundcover change due to disturbance and other factors along the US 89 corridor. At a minimum, a pair

of photopoints will be established at the beginning and end of each transect segment, looking north and south along the original fence alignment. Intermediate photopoints and/or panorama points may be added from other good landscape vantage points along the transects, or as needed if problem areas are detected. Photos will be retaken annually as long as the monitoring program continues, and the photo-sets will be managed so they may be retaken in the future for long-term monitoring purposes.

3.2 FREQUENCY OF SURVEYS

Monitoring surveys will be scheduled and completed three times per year – Spring (April), Summer(July), and Fall (October). Depending upon results and weather vicissitudes, the timing and frequency of surveys may be adjusted to focus on specific seasons or time periods.

3.3 EQUIPMENT

The following equipment is needed for each field visit:

- 1) Radio hand-set or cell phone
- 2) Orange safety vest
- 3) Clip board and pencil or permanent ink pen
- 4) Hardcopy map of ROW monitoring segments (**This report**)
- 5) Description and UTM coordinates of monitoring segment endpoints (This report)
- 6) Blank monitoring record forms and field instructions (**Appendix 1**)
- 7) Blank photo-log forms (**Appendix 2**)
- 8) Hardcopy map of track-ways and table of GPS coordinates for track locations recorded during previous surveys (project file)
- 9) GPS unit with extra batteries
- 8) Digital camera (8 megapixel or greater), extra battery
- 9) Compass
- 10) Measuring tape (100 feet/30 meter)
- 11) Survey flagging

3.4 FIELD PROCEDURES

The US 89 corridor traverses approximately north-south for 2 miles along the western boundary of WUPA. Field observations will be recorded while walking along linear transects along the east (E) and west (W) sides of the US 89 ROW. The E Transect follows the two-track service road along the QWEST ROW telephone poles, and the W Transect follows an obvious dozer-line along the ROW fence that was cleared when the highway and fence were constructed. The E and W transects are further broken into four paired, segments, each approximately ½ mile long, and numbered in sequence from south to north (see **Figure 2**).

The use of the shorter segments allows partial/sequential surveys if fieldwork is disrupted for unforeseen reasons and must be spread across multiple field days. It allows a parked vehicle to be “leapfrogged” more frequently, so the observer remains closer to the vehicle to simplify field logistics and in consideration of employee safety. It will also accommodate targeted monitoring of segments where persistent off-road travel problems are identified. The GPS UTM coordinates, location descriptions, and photos for all transect segment endpoints are included in the Results section of this report. Most of the intermediate endpoints for the monitoring segments are located where the original fence braces were installed. Because the concrete footings for the braces were not removed, they are relatively permanent and easy to find.

3.4.1. Vehicle Track Counts

The following procedure is written so fieldwork is completed on one side of the road first, progressing from south to north on the E segment, then returning from north to south on the W segment.

- (a) Park in a safe location along the east side of the US 89 shoulder near the southern endpoints for the selected E-W pair of segments.
- (b) Walk to the south endpoint of the E transect segment. Initiate a GPS file and enter the requisite information on the field monitoring form (observer, date, time, segment number, etc.).
- (c) Proceed walking from south to north along the E transect segment.
- (d) If you encounter vehicle or foot tracks that cross the transect line from the highway ROW onto the WUPA side:
 1. Document each set of tracks made by a single vehicle pass as one event, regardless of the number of axles or wheels.
 2. GPS at the mid-point where the tracks cross the transect segment
 3. Document the track-set with the requisite information on the monitoring form (**Appendix 1**).
 4. Take at least one photograph of the track-set, framing a good view of the tracks crossing the transect line, with US 89 behind you and WUPA in the field of view. Take additional photos as needed to document the tracks and any impacts close to the transect. Record additional information for all photographs on the Photo-Log (**Appendix 2**).
 5. Initiate a GPS line file and map each track-way into WUPA, up to the first 100 feet. On the E Transect, also map the track-way between the QWEST ROW service road and the approximate alignment of the former ROW fence line.
 6. Stop the GPS line file and return to the point where the tracks first crossed the transect.
 7. If a vehicle traverses more than 100 feet into the Monument and exits at a different location, document the exit tracks with a second GPS point, line, and photographs – note this on the comments row on the form.
 8. Use good judgment whether to expend additional field time to fully or more extensively map off-road travel routes.
- (e) Return to the transect segment and proceed walking until another track-set is encountered. Repeat the steps under (d).
- (f) GPS the north endpoint of the E segment, then close the GPS file. Note: If you must stop work before reaching the end of the transect segment, record a GPS point and/or temporarily mark the location with survey flagging so you can relocate it later.
- (g) Safely walk across to the west side of US 89, and find the north end point for the opposing W transect segment. Start a new field form, and GPS the north endpoint of the W transect segment.
- (h) Survey the W segment from north to south, documenting any track-sets with the steps listed under (d).
- (i) GPS the south endpoint of the W segment, then close the GPS file. Note: If you must stop work before reaching the end of the transect segment, record a GPS point and temporarily mark the location with survey flagging so you may find it and resume later.
- (j) Safely walk back across to the east side of US 89. Drive to the southern end of the next segment pair to be surveyed, parking on the E side of the ROW. Repeat the entire procedure, recording observations on a separate form.

3.4.2 Significant Wildlife/livestock Observations

Record and GPS locations of all significant wildlife/livestock observations, such as:

1. Pronghorn near the US 89 shoulder or crossing the highway (that is, inside the former ROW fences)
2. Loose livestock within WUPA
3. Carcasses of dead pronghorn or other noteworthy animal mortality from a vehicle collision
4. Record any species of interest
5. Count prairie dog mounds within 20 meters of either side of the transect, GPS the approximate colony center.

Do not approach and alarm any wildlife or stand on the highway to GPS a carcass – if necessary GPS your location as the observer, and give your azimuth and estimate distance to the animal. Record the GPS coordinates and describe in the next available row on the monitoring form.

3.4.3 Repeat Photography

1. Take a baseline set of photos at the start and end of every transect segment during the Spring monitoring run.. If this is a new photopoint, record the GPS coordinates. Take a photo of the photographer's location with background location features. If baseline photos have already been established, use those to line up new photos.
2. Take a series of photographs that starts with a shot looking north along the highway ROW, and then pans 360 degrees to the original shot. Be sure to overlap slightly between photos, and to include as little sky as possible in order to more effectively assess ground conditions.
3. Record each photo and enter the requisite information on the photo-log form (**Appendix 2**).
4. If there are other good landscape vantage points along the transects or problem areas with frequent off-road travel, establish additional monitoring photopoints as field time allows.

3.5 REPORTING

Cultural resources staff will be notified immediately of any new off-road travel activity in order to allow follow-up mapping and more detailed investigation for resource impacts. The Chief of Natural Resources will be briefed on the survey results after each round of field work, who in turn will brief the management team. A summary of the monitoring results will be prepared as soon as possible after each survey, or more frequently if unusual levels of activity are observed. Summaries will be based upon a review of the GPS data files, after they have been incorporated into the GIS. Each summary will include: the monitoring period; field work date(s); the number of off-road travel incidents for each transect segment; and any notable wildlife/mortality observations. A map of GPS points/routes, completed field forms, and prints of photographs will be included in appendices. The summary report will be routed to the Management Team to review. As the field data accumulates, the monitoring records and GIS files may be utilized to calculate the total number of off-road travel incidents and the cumulative length of off-road travel over the entire monitoring period.

3.6. DATA MANAGEMENT

All original field forms, summary reports, and relevant data from off-road travel monitoring will be maintained in the Natural Resources Division files and the GIS. Metadata will be created for GIS files for all GPS information which is to be retained for long-term monitoring. The baseline repeat photopoints will be printed on archival quality paper, properly labeled, stored in archival plastic sheets, bound, and maintained in separate files as a landscape-level, repeat photography monitoring program is established for WUPA.

4.0 RESULTS

The fenceline was monitored two complete times in 2009, during April-May and August. We always started at the southeast starting point (E0) of the transects. Five points and four transects were established along the transect (former fenceline) on each each side of the road for a total of eight transects, see **Figure 2** below.

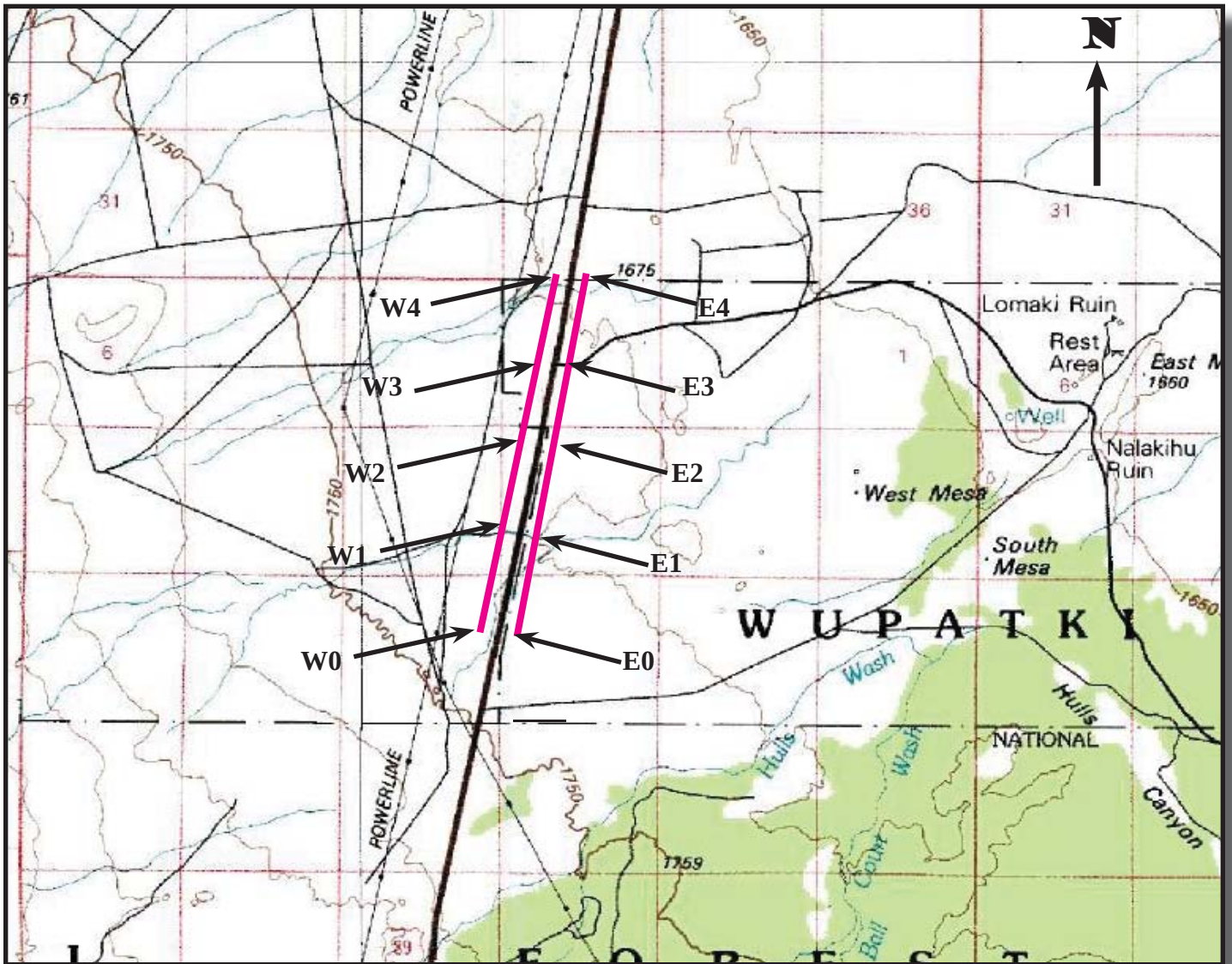


FIGURE 2 Map of East boundary of Wupatki National Monument with transect lines in red. Points are marked with arrows.

Transect E1 starts at point E0 and proceeds north to point E1 and is thus composed of points E0 to E1. Likewise transect E2 (points E1-E2) starts at point E1 and proceeds north to E2. Locations of each transect are shown in **Figure 2** and listed in **Table 1**.

TABLE 1. Location, Ground Cover, and Surface Geology at each Point along the East and West Transects

Transect Point	Location UTM East	Location UTM North	Ground Cover	Geology
E0	12 S 451397	3934397	Galleta Mixed Grassland	Alluvial Fan Deposit
E1	12 S 451565	3935146	Rabbitbrush Shrubland	Alluvial Fan Deposit
E2	12 S 451716	3935914	Rabbitbrush Shrubland	Black Point Basalt
E3	12 S 451872	3936683	Galleta Mixed Grassland	Black Point Basalt
E4	12 S 452025	3937542	Needle and Thread Grassland	Alluvial Fan Deposits
W0	12 S 451379	3934490	Black Grama Grassland	Alluvial Fan Deposit
W1	12 S 451518	3935159	Galleta Mixed Grassland	Alluvial Fan Deposit
W2	12 S 451684	3935960	Black Grama Grassland	Basalt Flow
W3	12 S 451839	3936744	Rabbitbrush Shrubland	Black Point Basalt
W4	12 S 451977	3937542	Galleta Mixed Grassland	Alluvial Fan Deposits

4.1 TRANSECT DESCRIPTION, LOCATION, AND RESULTS

4.1.1. Transect E1

Transect E1 starts at the south end of the east transect line at Point E0 and proceeds northeast to point E1. Point E0 is at the end of the standing fence. Vegetation is galleta mixed grassland with rabbitbrush shrubland on cinder soils derived from an alluvial fan deposit. Latitude: 35.5520377052762, Longitude: -111.536249782806. In May, 2009, we found numerous impacts from service vehicles that were entering the monument to maintain the electric lines, see photo 782-2009 below.



Photo # 782-2009. Point E0 facing south, note tire tracks accessing monument



Photo # 783-2009 View from Point E0 facing north along Transect E1

4.1.1.1 Trespass Vehicle Impacts at Transect E1

In May, 2009, many fresh tracks were found but most were a result of NPS fence dismantling activities and the QWEST maintenance trucks servicing their electric lines. By August, 2009, the tracks were virtually gone due to natural weathering. **Table 2** is a synopsis of our survey findings during April-May and August of 2009.

TABLE 2. Incident Reports for Transect E1, between points E0 and E1.

Incident #	Start Location UTM	End Location UTM	Date	Comments
Point at E0	12S 451397	3934397		Mixed Grass on Cinder
Point at E1	12S 451565	3935146		
E1-001	12S 451397 3934397		4/28 2009	Many dual-wheel truck tracks around fence post, part of QWEST ROW Service operations. See Photo # 782-2009.
E1-001	12S 451410 3934410	12S 451407 3934388	5/4 2009	Tracks Fresh. Multiple sets at beginning of transect. Probably maintenance trucks for QWEST. See photos on page 34.
E1-002	12S 451418 3934419	12S 451410 3934372	5/4 2009	Tracks not fresh. Only between QWEST ROW and Hwy 89
E1-003	12S 451464 3934519	12S 451433 3934518	5/4 2009	Tracks Fresh. Only between QWEST ROW and Hwy 89.
E1-004	12S 451466 3934576	12S 451447 3934567	5/4 2009	Tracks very fresh.
E1-005	12S 451462 3934612	12S 451461 3934642	5/4 2009	Tracks Fresh. Same vehicle as E1-004.
E1-006	12S 451501 3934743	12S 451502 3934757	5/4 2009	Tracks not Fresh. Vehicle short turnaround.
None			8/18 2009	No tracks observed throughout transect

4.1.1.2 Wildlife Incident Report at Transect E1

In May, 2009, fresh pronghorn tracks were found. There were no signs of pronghorn during the August, 2009 survey. **Table 3** shows results of 2009 wildlife surveys in Transect E1.

TABLE 3. Wildlife Incident Reports for Transect E1, between points E0 and E1.

Wildlife Incident #	Start Location UTM	End Location UTM	Date	Type	Species/Comments
Point at E0 Point at E1	12S 451397 12S 451565	3934397 3935146			
Wild E1-001			4/28/2009	Tracks	Pronghorn tracks
None			8/18/2009/		

4.1.1.3 Photopoints at Transect E1

In May, 2009, photopoints were established throughout the transect but primarily at the beginning and end points. Wherever photopoints were established a complete panoramic was taken from that point. All photos have been archived in the files for this project in the vegetation ecologists office. A digital report (**WUPA 89 Monitoring Base Photos E1**) in MSWord with all photographs has also been created.

4.1.2 Transect E2

Transect E2 includes the transect section between points E1 and E2. Vegetation is galleta mixed grassland on soils derived from an alluvial fan deposit. Point at E1 location is Latitude: 35.5588079036812, Longitude: -111.534485284429.



Photo # 851-2009. View of Point E1 (next to clipboard) facing north along transect E2.



Photo # 851-2009. View from Point E1 facing south along transect E1

4.1.2.1 Trespass Vehicle Impacts at Transect E2

No impacts were found in 2009. **Table 4** below shows survey dates and results.

TABLE 4. Incident Reports for Transect E2, between points E1 and E2.

Incident #	Start Location UTM E	End Location UTM N	Date	Comments
Point at E1 Point at E2	12S 451565 12S 451716	3935146 3935914		
None			4/28/ 2009	No off-road impacts noted along this transect. Some old prairie dog burrows.
None			5/13 2009	No off-road impacts noted
None			8/18 2009	No tracks observed throughout transect

4.1.2.2 Wildlife Incident Report at Transect E2

During 2009, no wildlife sign was found on this transect. An inactive prairie dog colony was located and will be monitored in the future. No prairie dog activity was noted in 2009. **Table 5** shows dates of surveys and results.

TABLE 5. Wildlife Incident Reports for Transect E2, between points E1 and E2.

Wildlife Incident #	Start Location UTM	End Location UTM	Date	Type	Species/Comments
Point at E1 Point at E2	12S 451565 12S 451716	3935146 3935914			
Wild E2-001			4/28/2009		Inactive Prairie dog colony
None			8/18/2009		

4.1.2.3 Photopoints at Transect E2

In April and May, 2009, photopoints were established at the transect, primarily at the beginning and end points. Wherever photopoints were established a complete panoramic was taken from that point. All photos have been archived in the files for this project in the vegetation ecologists office. A digital report (**WUPA 89 Monitoring Base Photos E2**) in MSWord with all photographs has also been created.

4.1.3 Transect E3

Transect E3 starts at Point E2 and proceeds northeast to point E3. Vegetation is Rabbitbrush shrubland on soils derived from Black Point basalt. Latitude: 35.5520377052762, Longitude: -111.536249782806. Points E2 and E3 are concrete fencepost bases.



Photo # 874-2009. Point E2 facing north along Transect E3



Photo # 879-2009. View from Point E2 facing south along Transect E2

4.1.3.1 Trespass Vehicle Impacts at Transect E3

Impacts found in 2009 were primarily vehicle turnaround and maintenance activities. **Table 6** below shows survey dates and results.

TABLE 6. Incident Reports for Transect E3, between points E2 and E3.

Incident #	Start Location UTM E	End Location UTM N	Date	Comments
Point at E2 Point at E3	12S 451716 12S 451872	3935914 3936683		
None			4/28 2009	No off-road impacts noted along this transect
E3-001	12S 451725 3935882	12S 451731 3935912	5/13 2009	Tracks not fresh. Service truck tracks to QWEST ROW and not far off. Most tracks associated with fence removal and QWEST phone line service. See photos below.
E3-002	12S 451739 3935950		5/13 2009	Short turn-around loop just east of QWEST ROW. Tracks not fresh. See photos on next page.
E4-003	12S 451743 3935970		5/13 2009	Tracks to east run parallel to QWEST ROW maintenance tracks and then join again. See photos on next page.
None			8/18 2009	No tracks observed throughout transect



Photo # 918-2009. E3-001 tracks headed to the northeast



Photo # 919-2009. E3-001 tracks facing south



Photo # 921-2009. E3-002 tracks headed to the northeast



Photo # 922-2009. E3-002 tracks headed to the southeast



Photo # 923-2009. E3-003 tracks headed to the northeast

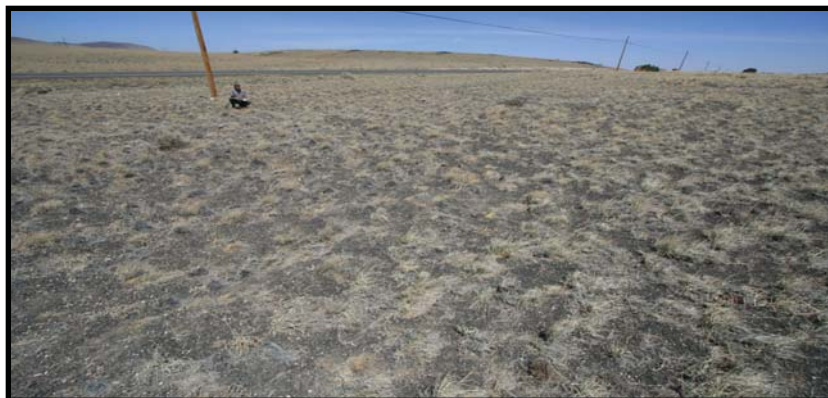


Photo # 924-2009. E3-003 tracks headed to the southeast

4.1.3.2 Wildlife Incident Report at Transect E3

During 2009, no wildlife sign was found along this transect. An inactive prairie dog colony was located and will be monitored in the future. No prairie dog activity was noted in 2009. **Table 7** below shows dates of surveys and results.

TABLE 7. Wildlife Incident Reports for Transect E3 (between points E2 and E3)

Wildlife Incident #	Start Location UTM	End Location UTM	Date	Type	Species/Comments
Point at E2 Point at E3	12S 451716 12S 451872	3935914 3936683			
Wild E3-001			4/28/2009	Mounds	Prairie Dog Burrows - inactive
Wild E3-001			8/18/2009	Mounds	Prairie Dog Burrows - inactive

4.1.3.3 Photopoints at Transect E3

In April and May, 2009, photopoints were established at the transect, primarily at the beginning and end points. Wherever photopoints were established a complete panoramic was taken from that point. All photos have been archived in the files for this project in the vegetation ecologists office. A digital report (**WUPA 89 Monitoring Base Photos E3**) in MSWord with all photographs has also been created.

4.1.4 Transect E4

Transect E4 starts at Point E3 and proceeds northeast to point E4 at the end of the east transect. Vegetation is Needle and Thread grassland on soils derived from alluvial fan deposits. Latitude: 35.5520377052762, Longitude: -111.536249782806. Point E3 is a concrete fencepost footing at ground level, see bottom center of Photo # 864-2009, and Point E4 is the fencepost at the end of the transect.



Photo # 864-2009. Point E3 facing north along Transect E4



Photo # 869-2009. View from Point E3 facing south along Transect E2

4.1.4.1 Trespass Vehicle Impacts at Transect E4

Impacts found in 2009 were primarily QWEST Inc. and NPS vehicle turnaround and maintenance activities.

Table 8 below shows survey dates and results.

TABLE 8. Incident Reports for Transect E4 (between points E3 and E4)

Incident #	Start Location UTM	End Location UTM N	Date	Comments
Point at E3	12S 451872	3936683		
Point at E4	12S 452025	3937542		
E4-001	12 S 452009 3937409		4/28 2009	Tracks coming off of Highway 89, 2 sets of tracks - one on each side of power lines.
E4-002	12S 451890 3936715	12S 451892 3936728	5/13 2009	Tracks not fresh. Short turn loop just east of QWEST ROW.
E4-003	12S 451935 3936883	12S 451946 3936909	5/13 2009	Tracks not fresh. Multiple track sets.
E4-004	12S 451949 3936921	12S 451950 3936944	5/13 2009	Tracks not fresh. Multiple track sets.
E4-005	12S 451954 3936986		5/13 2009	Tracks not fresh. Short turn-around loop.
E4-006	12S 451968 3937146		5/13 2009	Tracks not fresh. Evolving 2-track
E4-007	12S 451975 3937195		5/13 2009	Tracks not fresh. QWEST ROW parallel route east of phone line.
E4-008	12S 452024 3937405		5/13 2009	Tracks not fresh. Multiple turn around track sets near phone pole.
E4-009	12S 452024 3937446	12S 452044 3937616	5/13 2009	Tracks not fresh. Multiple track sets
None			8/18 2009	No tracks observed throughout transect

4.1.4.2 Wildlife Incident Report at Transect E4

During 2009, no wildlife sign was found along this transect. **Table 9** below shows dates of surveys and results.

TABLE 9. Wildlife Incident Reports for Transect E4 (between points E3 and E4)

Wildlife Incident #	Start Location UTM	End Location UTM	Date	Type	Species/Comments
Point at E3	12S 451872	3936683			
Point at E4	12S 452025	3937542			
None			4/28/2009		
None			8/18/2009		

4.1.4.3 Photopoints at Transect E4

In April and May, 2009, photopoints were established at the transect, primarily at the beginning and end points. Wherever photopoints were established a complete panoramic was taken from that point. All photos have been archived in the files for this project in the vegetation ecologists office. A digital report (**WUPA 89 Monitoring Base Photos E4**) in MSWord with all photographs has also been created.

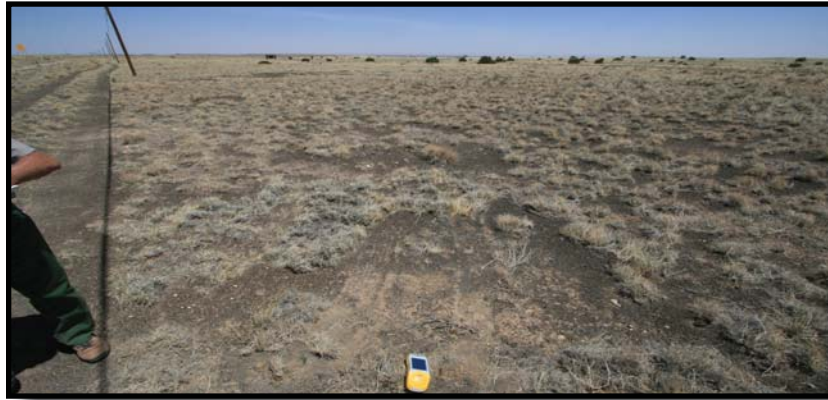


Photo # 925-2009. E4-002.1 tracks headed to the northeast



Photo # 926-2009. E4-002.2 tracks, view southwest



Photo # 930-2009. E4-003.2 tracks headed to the southwest



Photo # 935-2009. E4-003.7 tracks headed to the northeast



Photo # 939-2009. E4-004.2 tracks to the northeast

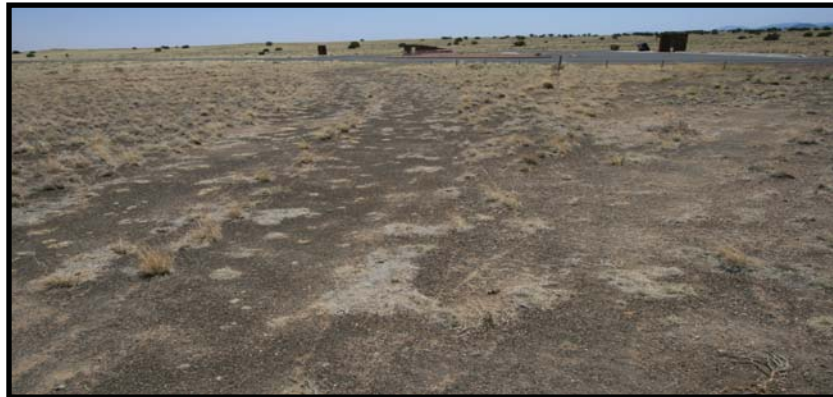


Photo # 942-2009. E4-004.5 tracks, view southwest



Photo # 944-2009. E4-005.1 tracks headed to the southwest



Photo # 945-2009. E4-005.2 track, view is northeast



Photo # 949-2009. E4-006.1 tracks to the northeast



Photo # 950-2009. E4-006.2 tracks, view southwest



Photo # 951-2009. E4-007.1 tracks headed to the northeast



Photo # 952-2009. E4-007.2 track, view is southwest



Photo # 955-2009. E4-008.3 tracks to the southwest



Photo # 953-2009. E4-008.1 tracks, view north



Photo # 959-2009. E4-009.1 tracks headed to the northeast



Photo # 961-2009. E4-009.3 track, view is southwest

4.1.5 Transect W1

Transect W1 starts at Point W0 and proceeds northeast to Point W1. Point W0 is at end of standing fence and Point W1 is located on center of three concrete fence brace bases. Vegetation is galleta mixed grassland on soils derived from alluvial fan deposits. Latitude: 35.5520377052762, Longitude: -111.536249782806.



Photo # 884-2009. Point W0 facing north along Transect W1



Photo # 889-2009. View from Point W0 facing south along intact fenceline

4.1.5.1 Trespass Vehicle Impacts at Transect W1

No vehicle or other impacts were encountered in 2009 along this transect. Only disturbance is from original fence removal activities and from past highway expansion construction activities. **Table 10** below shows survey dates and results.

TABLE 10. Incident Reports for Transect W1, between points W0 and W1.

Incident #	Start Location UTM	End Location UTM	Date	Comments
Point at W0 Point at W1	12S 451379 12S 451518	3934490 3935159		
None			4/28 2009	No unusual impacts along this transect.
None			8/18 2009	No tracks observed throughout transect

4.1.5.2 Wildlife Incident Report at Transect W1

During 2009, the survey along this transect found no wildlife sign except an inactive prairie dog colony. **Table 11** below shows dates of surveys and results. A collared lizard (*Crotaphytus collaris*) was observed within this transect and a photograph is on file.

TABLE 11. Wildlife Incident Reports for Transect W1, between points W0 and W1.

Wildlife Incident #	Start Location UTM	End Location UTM	Date	Type	Species/Comments
Point at W0 Point at W1	12S 451379 12S 451518	3934490 3935159			
Wild W1-001			4/28 2009	Mounds	Inactive Prairie Dog colony. Collared Lizard.
Wild W1-001			8/18 2009	Mounds	Inactive Prairie Dog colony.

4.1.5.3 Photopoints at Transect W1

In April and May, 2009, photopoints were established at the transect, primarily at the beginning and end points. Wherever photopoints were established a complete panoramic was taken from that point. All photos have been archived in the files for this project in the vegetation ecologists office. A digital report (**WUPA 89 Monitoring Base Photos W1**) in MSWord with all photographs has also been created.

4.1.6 Transect W2

Transect W2 starts at Point W1 and proceeds northeast to point Point W2. Vegetation is black grama grass-land on soils derived from an alluvial fan deposit and basalt flow. Latitude: 35.5520377052762, Longitude: -111.536249782806. Point W1 is located in the center of the middle of three fence brace concrete footers. There is a large rock in the ground nearby, see photo 841-2009 below.



Photo # 841-2009. Point W1 facing north along Transect W2



Photo # 846-2009. View from Point W1 facing south along Transect W1

4.1.6.1 Trespass Vehicle Impacts at Transect W2

No vehicle or other impacts were encountered in 2009 along this transect. Only disturbance is from original fence removal activities and from past highway expansion construction activities. **Table 12** below shows survey dates and results.

TABLE 12. Incident Reports for Transect W2, between points W1 and W2.

Incident #	Start Location UTM	End Location UTM	Date	Comments
Point at W1 Point at W2	12S 451518 12S 451684	3935159 3935960		
None			4/28 2009	Slight residual impacts from NPS fence removal activities. Prairie dog mounds.
None			5/13 2009	No off-road impacts noted
None			8/18 2009	No tracks observed throughout transect

4.1.6.2 Wildlife Incident Report at Transect W2

During 2009, no wildlife sign was found along this transect. An inactive prairie dog colony was observed. **Table 13** below shows dates of surveys and results.

TABLE 13. Wildlife Incident Reports for Transect W2, between points W1 and W2.

Wildlife Incident #	Start Location UTM	End Location UTM	Date	Type	Species/Comments
Point at W1 Point at W2	12S 451518 12S 451684	3935159 3935960			
Wild W2-001			4/28 2009	Mounds	Inactive Prairie Dog colony.
Wild W2-001			8/18 2009	Mounds	Inactive Prairie Dog colony.

4.1.6.3 Photopoints at Transect W2

In April and May, 2009, photopoints were established at the transect, primarily at the beginning and end points. Wherever photopoints were established a complete panoramic was taken from that point. All photos have been archived in the files for this project in the vegetation ecologists office. A digital report (**WUPA 89 Monitoring Base Photos W2**) in MSWord with all photographs has also been created.

4.1.7 Transect W3

Transect W3 starts at Point W2 and proceeds northeast to point W3. Vegetation is galleta mixed grassland on soils derived from an alluvial fan deposit. Latitude: 35.5520377052762, Longitude: -111.536249782806. Point W2 is located at the middle of three concrete bases at ground level



Photo # 830-2009. Point W2 facing north along Transect W3



Photo # 836-2009. View from Point W2 facing south along Transect W2

4.1.7.1 Trespass Vehicle Impacts at Transect W3

No vehicle or other impacts were encountered in 2009 along this transect. Only disturbance is from original fence removal activities and from past highway expansion construction activities. **Table 14** below shows survey dates and results.

TABLE 14. Incident Reports for Section W3, between points W2 and W3.

Incident #	Start Location UTM	End Location UTM	Date	Comments
Point at W2 Point at W3	12S 451684 12S 451839	3935960 3936744		
None			4/28 2009	Slight residual impacts from NPS fence removal activities.
None			5/13 2009	Slight residual impacts from NPS fence removal activities.
None			8/18 2009	No tracks observed throughout transect

4.1.7.2 Wildlife Incident Report at Transect W3

During 2009, no wildlife sign was found along this transect. An inactive prairie dog colony was observed. **Table 15** below shows dates of surveys and results.

TABLE 15. Wildlife Incident Reports for Transect W3, between points W2 and W3.

Wildlife Incident #	Start Location UTM	End Location UTM	Date	Type	Species/Comments
Point at W2 Point at W3	12S 451684 12S 451839	3935960 3936744			
Wild W3-001			4/28 2009	Mounds	Inactive Prairie Dog colony.
Wild W3-001			8/18 2009	Mounds	Inactive Prairie Dog colony.

4.1.7.3 Photopoints at Transect W3

In April and May, 2009, photopoints were established at the transect, primarily at the beginning and end points. Wherever photopoints were established a complete panoramic was taken from that point. All photos have been archived in the files for this project in the vegetation ecologists office. A digital report (**WUPA 89 Monitoring Base Photos W3**) in MSWord with each photograph has also been created.

4.1.8 Transect W4

Transect W4 includes the transect section between points W3 and W4. Vegetation is galleta mixed grassland on soils derived from an alluvial fan deposit. Latitude: 35.5520377052762, Longitude: -111.536249782806. Point W4 as on northwest corner at end of intact fence. Area between fenceline and road was bladed during original highway expansion. All fence supports have been cut to the ground.



Photo # 820-2009. Point W3 facing north along Transect W3



Photo # 825-2009. View from Point W3 facing south along Transect W2

4.1.8.1 Trespass Vehicle Impacts at Transect W4

During 2009, no vehicle impacts were found along this transect. Only impacts are residual from NPS fence removal activities and past highway expansion work. **Table 16** below shows dates of surveys and results.

TABLE 16. Incident Reports for Section W4, between points W3 and W4.

Incident #	Start Location UTM	End Location UTM	Date	Comments
Point at W3 Point at W4	12S 451839 12S 451977	3936744 3937542		
None			4/28 2009	No trespass tracks. About 20 meters of disturbed land between road and fence line. Only small evidence of tracks from NPS trucks taking fence down within past year.
None			5/13 2009	No off-road impacts noted
None			8/18 2009	No tracks observed throughout transect

4.1.8.2 Wildlife Incident Report at Transect W4

During 2009, no wildlife sign was found along this transect. **Table 17** below shows dates of surveys and results.

TABLE 17. Wildlife Incident Reports for Transect W4, between points W3 and W4.

Wildlife Incident #	Start Location UTM	End Location UTM	Date	Type	Species/Comments
Point at W3 Point at W4	12S 451839 12S 451977	3936744 3937542			
None			4/28/2009		
None			8/18/2009		

4.1.8.3 Photopoints at Transect W4

In April and May, 2009, photopoints were established at the transect, primarily at the beginning and end points. Wherever photopoints were established a complete panoramic was taken from that point. All photos have been archived in the files for this project in the vegetation ecologists office. A digital report (**WUPA 89 Monitoring Base Photos W4**) in MSWord with all photographs has also been created.

5.0 DISCUSSION

Most of the impacts along the transects at WUPA appear to have occurred during the dismantling of the fence and during periodic maintenance performed by QWEST Inc. crews on the telephone lines that traverse the study site on the east side of Highway 89. Our first monitoring efforts in the Spring of 2009 recorded many tracks from these activities, but by August of the same year these same tracks were barely evident.

No serious trespass incidents were recorded in 2009. By serious, we mean tracks that head straight into the monument for at least 300 meters. It appears that any damage to soils or vegetation occurred only during the activities mentioned above and that the general public is not trespassing into the monument. All damage recorded was along the fenceline or limited to temporary emergency pull-overs by vehicles in distress.

5.1 Summary of Impacts

Impacts were found exclusively along the east Transect in transects E1, E3, and E4. **Figure 3** below indicates the number of vehicle impact incidences for each of the 8 transects surveyed in 2009. It quickly becomes obvious that impacts were concentrated on the east side transects. This is more an indication of where the electric/telephone lines are located since most recorded incidences appear to be from QWEST Inc. maintenance trucks servicing their lines.

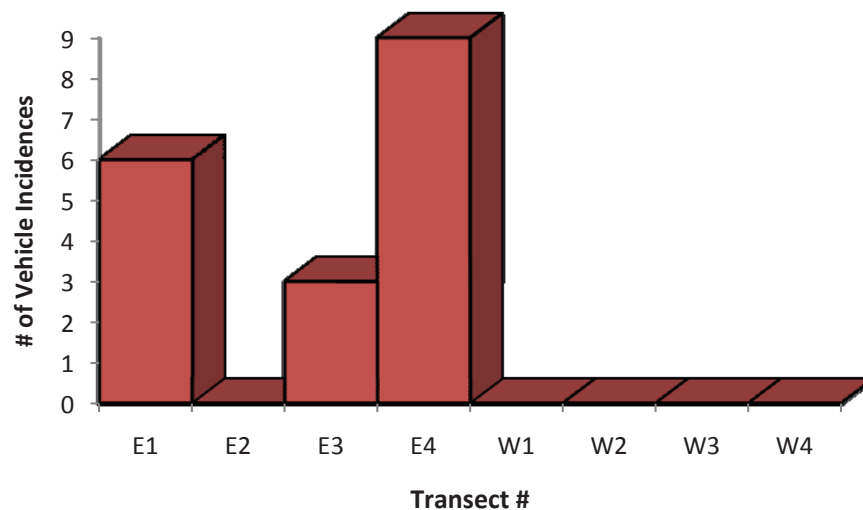


FIGURE 3. Number of Vehicle Incidences located at each Transect.

As expected, initial impacts declined from the first survey in April to the last survey in August. What was not expected was the fact that no new impacts could be discovered between May or 2009 and August of the same year. **Table 18** on the following page shows that there is a precipitous decline in impacts as the year progressed, indicating that the area is able to recover as long as additional impacts do not continue.

It appears that the public may be so accustomed to the boundary fence that they do not even notice that it is down. Fortunately, any interesting sites that may catch someones eye are few and far between along Highway 89.

TABLE 18. Percent Change in Vehicle Impact Incidences over Time during 2009.

Transect #	# of Incidences Spring 2009	# of Incidences Summer/Fall 2009	Change	% Change*
E1	6	0	-6	-100%
E2	0	0	0	0
E3	3	0	-3	-100%
E4	9	0	-9	-100%
W1	0	0	0	0
W2	0	0	0	0
W3	0	0	0	0
W4	0	0	0	0

* negative percent change indicates improvement in the resources.

5.0 RECOMMENDATIONS

Since very little persistent impacts were recorded in 2009, recommendations will be primarily concerned with ongoing monitoring and resource protection measures.

- 1) As long as the fence is down along the border monitoring should continue. Since minimal serious impacts were recorded in 2009 the frequency of monitoring should be only once during the active seasons of Spring, Summer, and Fall of each year, for a total of 3 surveys per year. If the frequency of impacts increases, monitoring efforts will be augmented as directed by the vegetation ecologist.
- 2) Permanent photopoints should be relocated and rephotographed during the Spring survey every year.
- 3) Wildlife observations should be more precisely recorded with every observation location recorded via GPS and more effort expended in recording quantities. For example, the precise location and number of mounds should be recorded at each prairie dog colony encountered.
- 4) Since most impacts appear to be from QWEST Inc. service trucks maintaining their electric/telephone lines it is recommended that closer coordination and communication be developed with QWEST so that they understand impact causes and know how to minimize damage when working within their Right-of-Way along the monument border.

7.0 LITERATURE

- Arizona Game and Fish Department. 2009. Wildlife movements north of Interstate-40 in Arizona: Assessment of pronghorn permeability, U.S. Highway 89 (JPA 07-004T). April 7, 2009 Progress Report, prepared by the Research Branch, Arizona Game and Fish Department.
- Bateman, Gary C. 1976. Natural Resource Survey and Analysis of Sunset Crater Volcano and Wupatki National Monuments. Report prepared by Northern Arizona University, Contract No. 950134. Ms. on file, Wupatki National Monument, Flagstaff, Arizona.
- Behl, Mark, Cindy Parker, and Paul Whitefield. 2008. Non-Native Invasive plant Survey and Recommendations 2003-2005, Wupatki National Monument. National Park Service Technical Report, Flagstaff Area Monuments, Flagstaff, AZ.
- Bright, J.L., and C. van Riper III. 2000. Pronghorn home ranges, habitat selection and distribution around water sources in northern Arizona. Technical Report USGSFRESC/COPL/2000/18; US Geological Survey, Forest and Rangeland Ecosystem Science Center, Biological Resources Division, Colorado Plateau Field Station. Flagstaff, Arizona.
- Hansen, M. J. Coles, K.A. Thomas, D. Cogan, M. Reid, J. Von Loh, and K. Shulz. 2004. USGS-NPS National Vegetation Mapping Program: Wupatki National Monument, Arizona, Vegetation Classification and Distribution. Final Report, U.S. Geological Survey, Southwest Biological Center, Flagstaff, Arizona.
- Howery, L.D., G. Ramos, Editors. 2001. Arizona's Invasive Weeds. Arizona Cooperative Extension. University of Arizona, Tucson.
- NOAA [National Oceanic Atmospheric Administration]. 2004. Internet Site: National Climatic Data Center weather data. <http://www.ncdc.noaa.gov/ol/climate/online/coop-precip.html>. Accessed 1997-2004.
- National Park Service. 2002. General Management Plan and Final Environmental Impact Statement, Wupatki National Monument.
- Ockenfels, R.A., C.L. Ticer, A. Alexander, and J.A. Wennerlund. 1996. A landscape-level pronghorn habitat evaluation model for Arizona. Arizona Game & Fish Dept. Tech. Rep. 19, Phoenix. 50pp.
- Schelz, Charles. 2009. Flagstaff Area Monuments Invasive Plant Management Plan. National Park Service, Flagstaff Area Monuments, Flagstaff AZ 86001. 280 pp.
- Southwest Exotic Plant Information Clearinghouse (SWEPIC) 2008. The URL of this page is <http://sbsc.wr.usgs.gov/research/projects/swepic/swepic.asp>

APPENDICES

Appendix 1. Sample Data Sheet for Field Surveys

WUPATKI NATIONAL MONUMENT
U.S. HIGHWAY 89 Off-Road Travel Field Monitoring Form, Version 1.4

Observer(s): _____ Date: _____ Transect #: _____

Start Time: _____ Transect Start Location: _____ UTM E: _____ UTM N: _____

End Time: _____ Transect End Location: _____ UTM E: _____ UTM N: _____

Track Set #	UTM N	UTM E	Track Count	Track Type	Fresh Y/N	Ground Cover	Ground Cond.	Full/ Partial	Photo Information
Endpoint									
Comments:									
Endpoint									
Comments:									
Endpoint									
Comments:									
Endpoint									
Comments:									
Endpoint									
Comments:									
Endpoint									
Comments:									
Endpoint									
Comments:									
Endpoint									
Comments:									
Endpoint									
Comments:									
ADDITIONAL COMMENTS:									

Appendix 2. Sample Photo Log for Field Surveys



**FLAGSTAFF AREA MONUMENTS
PHOTO-POINTS**

PHOTO FILE NAME: _____ SET #: _____
DATE: _____ TIME: _____ DATE OF ORIGINAL PHOTO: _____
LOCATION: _____
PARK/DISTRICT: _____ PHOTOGRAPHER: _____
QUADRANGLE MAP NAME: _____ ELEVATION: _____
UTM East: _____ UTM North: _____ NAD #: _____
ESTIMATED TIME OF ORIGINAL PHOTO: _____ AZIMUTH OF ORIGINAL PHOTO: _____

PHOTO #	AZIMUTH	CAMERA TYPE	FILM/DIGITAL	LENSE (mm)	FILTER	TIME

DESCRIPTION OF IMPACTS AND DAMAGE ASSESSMENT _____

VEGETATION COMMUNITY TYPES (Describe location in photo): _____

GENERAL NOTES AND COMMENTS: _____

