

Summary Report
ROLLING DIP PROJECT 96-3
COYOTE CREEK WATERSHED

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INTRODUCTION

Background

Public Law 95-250 (March 27, 1978) directed that a rehabilitation program be developed for lands that had been timber harvested prior to becoming part of Redwood National Park. Before these lands were added to the park, timber harvesting and related road construction had adversely influenced erosion rates, sediment deposition, and water quality within the entire basin. These problems are being addressed in the rehabilitation program. The purpose of the rehabilitation program is to minimize man-induced erosion within Redwood National and State Parks (RNSP), encourage the return of a natural pattern of vegetation, and protect redwood groves and aquatic communities. Ultimately, these efforts should result in the restoration of natural ecosystems to conditions similar to what would have existed without disturbance by man. (Redwood National Park, Watershed Rehabilitation Plan, 1981)

A rolling dip program was begun in RNSP in 1996 in order to reduce potential erosion from existing roads within the Redwood Creek Watershed. A rolling dip is a dished down section of road within or immediately down road of a stream or swale crossing. The purpose of a rolling dip is to convey surface water across the road prism and back into its natural drainage in the event that the drainage structure under the road fails. The drainage structure, either a culvert, Humboldt crossing, or simply road fill may fail by becoming plugged, crushed, or overwhelmed with runoff. A properly constructed and maintained rolling dip eliminates the possibility of diversion potential at the site and therefore hillslope gully and associated mass movement erosion. Because rolling dips convey overflow water across the road, in the event of drainage structure failure the road fill at the crossing may erode into the creek. The potential erosion volume of crossing failures is considered to be less than that for diversions. Therefore, rolling dips reduce potential erosion overall. Rolling dips are designed to be drivable. They are not a restoration treatment, but a treatment that reduces erosion on roads until the roads can be removed or on long term access roads.

The rolling dip program was begun in 1996 by constructing rolling dips at all necessary sites on roads owned by RNSP in the Coyote Creek Watershed. Rolling dips are planned to be constructed at all necessary sites on all roads on the west side of Redwood Creek in 1997 and on all roads in Lost Man Creek Watershed and any other necessary sites in 1998.

Site Description

The project area is located approximately fifteen miles southeast of Orick below Schoolhouse Peak (Figures 1 and 2). Redwood National Park acquired this property in 1993. Rolling dips were constructed on the following nine roads: Lyons, Ranch, Long Ridge, High Prairie, Mid Basin, Coyote Creek, Rock Fork, Lower Rock Fork, and Coyote Peak. These roads occupy the upper and middle hillslope regions of the Coyote Creek drainage, that is tributary to Redwood Creek.

Total relief in the Coyote Creek watershed is 2697 feet, with elevations ranging from 400 feet at the mouth of Coyote Creek to 3097 feet at Schoolhouse Peak. The area of treatment is prairie and oak woodland, with some mixed Douglas fir and oak forest. Stream valleys are often narrow but not deeply incised.

Geology

The project area is underlain by the Incoherent Coyote Creek Unit of the Franciscan Formation. The Incoherent Unit is comprised primarily of unmetamorphosed mudstones and sandstones with minor amounts of conglomerate, chert, and volcanic rock (Harden and others, 1982). The rocks have a low sandstone/mudstone ratio, contain few massive sandstone beds, are intensely folded and faulted, and are brecciated and sheared, especially in the vicinity of the Grogan Fault Zone. Tectonic blocks of chert, greenstone, and sandstone, as well as isolated bedded sequences of sandstone and chert are common and are usually immersed in a sheared mudstone matrix.

The Incoherent Unit underlies a subdued, rolling landscape with less deeply incised drainage networks than those developed on the Coherent Unit of Lacks Creek. The large, resistant blocks form prominent points on the landscape. Expanses of grass-oak woodland and grass-bracken fern prairies are common within the Incoherent Unit, where as prairies are restricted to ridge tops in areas underlain by the Coherent Unit.

Road Construction History

Based on air photo interpretation, the only roads which existed in 1936 are Bald Hills Road, Lyons Road to Lyons Barn, and Rock Fork Road to the pond. Rock Fork Road was extended to the big curve by 1948 (stream crossing number 1714). By 1948 Long Ridge Barn had been constructed and a faint road is visible from Wooden Gate to Long Ridge Barn. However, this road may not be in exactly the same location as today's Long Ridge Road. The following roads were constructed by 1962: Schoolhouse Pasture, Long Ridge, all of Rock Fork, Ranch from Rock Ranch to crossing 525, T. Bear, Main Stem, Coyote Peak from Spur Road south, and Spur Road. The remaining roads were constructed as follows: Upper Lyons, 1962-64; Mid Basin, 1966-68; Ranch and Upper Spring, 1968-76; Coyote Peak from Rock Fork to Spur Road, after 1978; and High Prairie and Ranch from Lyons Road to crossing number 525, after 1984.

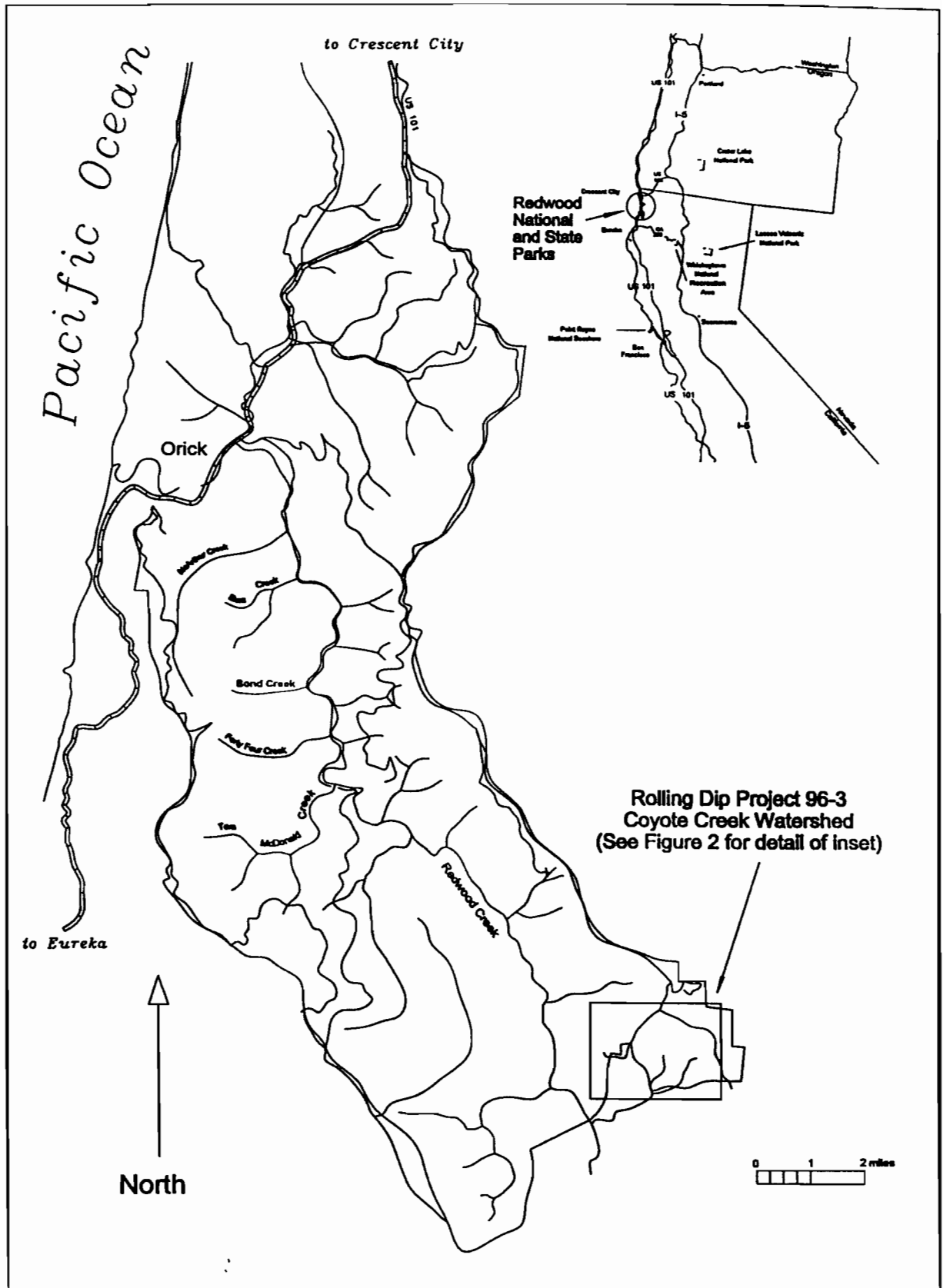


Figure 1. Location of Project Area in Redwood National and State Parks

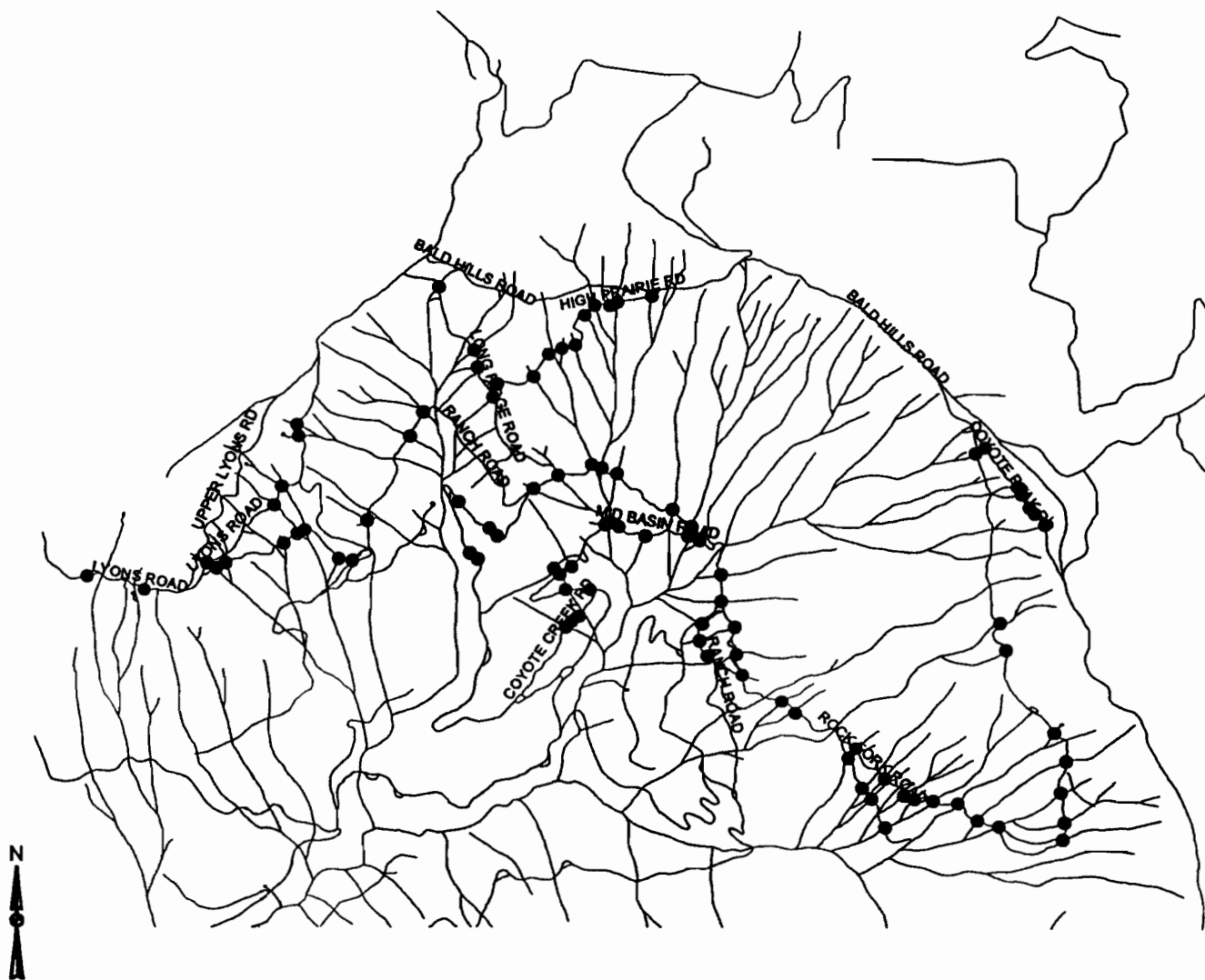


Figure 2. Location of Rolling Dips Constructed in the Project Area

HEAVY EQUIPMENT WORK

Project Implementation

Rolling dip construction focused on reducing erosion, primarily hillslope gully and associated landsliding, caused by roads. This included dishing down road sections within or immediately down road of stream or swale crossings. The purpose of the rolling dips was to convey surface water across the road prism and back into its natural drainage in the event that the drainage structure under the road fails. The drainage structure, either a culvert, Humboldt crossing, or simply road fill may fail by becoming plugged, crushed, or overwhelmed with runoff. A properly constructed and maintained rolling dip eliminates the possibility of diversion potential and therefore hillslope gully and associated mass movement erosion. Rolling dips are designed to be drivable. They are not a restoration treatment, but a treatment that reduces erosion on roads until the roads can be removed or on long term access roads.

The rolling dip program can be divided into three work phases: 1) evaluation; 2) heavy equipment; and 3) documentation.

Evaluation Phase

The evaluation phase included planning which area of the park to treat first, field determination of where to construct rolling dips, and flagging of worksites. A summary of project costs is shown in Table 1.

The Coyote Creek watershed is underlain by highly erodible bedrock and soil which is prone to gully. Stream diversions down roads have caused gullies in this area in the past, eroding up to 5000 yds³ in a single gully. Much of the watershed is prairie, so the gullies can be seen from long distances. This is a visitor use area and a trail runs along Lyons Road from the Bald Hills Road to Lyons barn. For these reasons, Coyote Creek was selected as the first watershed for rolling dip construction.

Field reconnaissance identified the accessibility of roads and the diversion potential of sites. Roads that had blown out and needed major rebuilding (such as rebuilding crossings or benches across landslides) were not considered for treatment. All stream crossing or swale sites on accessible roads which had diversion potential were considered for treatment, regardless of whether they had a culvert or not. Rolling dips were constructed at nearly all diversion potential sites on accessible roads. Dips were not constructed if there was a rolling dip immediately down road which made construction of a dip at the site impracticable. In general, dips were not constructed at ditch relief pipes, where the flow was outletting onto a hillslope rather than a natural stream channel. Stakes were placed along the roads at the approximate "inlet" and "outlet" of each rolling dip.

TABLE 1 WORK COST SUMMARY FOR ROLLING DIP PROJECT 96-3, COYOTE CREEK WATERSHED					
TREATMENT	QUANTITY (hrs)	# OF JOBS	TOTAL COSTS	% OF GRAND TOTAL	AVERAGE UNIT COSTS
HEAVY EQUIPMENT					
Rolling Dip Construction	63.00	91	\$1,198.89	11	\$13.17/dip
Inboard Ditch Improvement	17.75	unknown	\$357.25	3	\$20.13/hr
Cleaning Culvert Inlets	47.00	unknown	\$975.72	9	\$20.76/hr
Grading Roads	37.25	unknown	\$708.87	6	\$19.03/hr
Misc. Earth Moving Work	6.25	3	\$127.16	1	\$20.35/hr
Misc. Non-Earth Moving Items	159.75	---	\$3,107.08	27	\$19.45/hr
Sub-total:	331.00	94	\$6,474.97	57	\$19.56/hr
PROJECT IMPLEMENTATION					
Planning	16.50	---	\$313.22	3	
Mapping	16.50	---	\$304.74	3	
Layout	61.50	---	\$1,183.26	10	
Environmental Compliance	23.75	---	\$459.99	4	
Heavy Equipment Supervision	124.00	---	\$2,385.76	21	
Report Writing	15.00	---	\$300.60	3	
Sub-total:	257.25	---	\$4,947.57	43	
GRAND TOTAL			\$11,422.54		

Heavy Equipment Phase

The heavy equipment phase included construction of the rolling dips and associated road work. In addition to constructing rolling dips, culvert inlets and inboard ditches were cleaned out where necessary. Some roads were graded in order to remove vegetation from them so they could be used as effective fire breaks during the prescribed burns in the fall of 1996. The total cost for the heavy equipment work

was \$6,475. The heavy equipment work is summarized in Table 2. The times for the tasks listed in Table 2 are based on daily time sheets that the equipment operators recorded themselves.

The heavy equipment phase was done in-house using Redwood National Park equipment and operators. Donny Fraizer was temporarily promoted on an appointment not to exceed 120 days to run the D7 dozer. The dozer was used to construct all the rolling dips, grade the roads, and improve some of the inboard ditches. The backhoe was run by a park equipment operator as part of his regular job duties, so a temporary promotion was not necessary. The backhoe was used to clean culvert inlets and improve some inboard ditches.

A total of 91 rolling dips were constructed on approximately 11 miles of road. On the average, rolling dip construction took 0.69 hours per dip and cost \$13.17 per dip.

As the heavy equipment work was continuing, Becca Smith re-evaluated the erosion potential of each site and filled out road inventory forms. These forms were subsequently used to update the road inventory database.

Documentation Phase

The documentation process includes time and cost data compilation and writing the project report. This work was done by Becca Smith, and was completed in July, 1997.

TABLE 2
HEAVY EQUIPMENT COSTS FOR ROLLING DIP PROJECT 96-3,
COYOTE CREEK WATERSHED

JOB	HEAVY EQUIPMENT HOURS		TOTAL HOURS	PERCENT OF TOTAL	TOTAL COSTS
	D7	BACKHOE			
Erosion Control Work					
Rolling Dip Construction	63.00	0	63.00	19	\$1,198.89
Cleaning Culvert Inlets	0	47.00	47.00	15	\$975.72
Inboard Ditch Improvement	6.50	11.25	17.75	6	\$357.25
Grading Roads for Firelines	37.25	0	37.25	11	\$708.87
Filling in Crossing 525	0	4.25	4.25	1	\$88.23
Work around Long Ridge Barn	1.50	0	1.50	0	\$28.55
Moving Rocks to Wooden Gate	0	0.50	0.50	0	\$10.38
Subtotal	108.25	63.00	171.25	52	\$3,367.89
Miscellaneous					
Move In	4.50	2.50	7.00	2	\$137.54
Driving to Work Site	84.00	28.25	112.25	34	\$2,184.99
Warm Up and Maintenance	6.75	2.00	8.75	3	\$169.97
Fueling	3.25	0.25	3.50	1	\$67.04
Walking Equipment between Work Sites	6.50	0.75	7.25	2	\$139.27
Discussion	15.00	0	15.00	4	\$285.45
Idle	0.25	0	0.25	0	\$4.76
Paid Breaks	0.75	5.00	5.75	2	\$118.07
Subtotal	121.00	38.75	159.75	48	\$3,107.09
GRAND TOTAL	229.25	101.75	331.00	100	\$6,474.98

Summary

This project met the goals of the rolling dip program by minimizing erosion from roads caused by stream diversions. A total of 91 rolling dips were constructed at most stream or swale crossings with diversion potential on all accessible park roads in the Coyote Creek Watershed. Culvert inlets were cleaned to reduce the possibility of the culverts becoming plugged. Inboard ditches were cleaned where necessary to maintain flow to the culverts.

Performing this Work In-House

This project was preformed using Redwood National Park equipment and operators. Doing the work in-house had several advantages. A significant amount of time was saved by not having to write and administer a contract. Worksites did not have to be precisely staked in the field or surveyed. Contract specifications were not written, the contracting officer was not involved, bids were not received, we did not work with contractors or pay them. The operators could be given instructions while the work was progressing without worrying if the instructions coincided with a contract or having to do contract modifications.

Using Redwood National Park employees did create some challenges. Thirty-four percent of the heavy equipment expense went toward paying the operator's salaries while they drove to and from their duty stations to the work site. This was the single largest expense during the heavy equipment work. The dozer operator, who was duty stationed at Requa, spent an average of 3.7 hours a day driving. The backhoe operator, who was duty stationed at South Operations Center, spent an average of 2.6 hours a day driving.

Donny Fraizer enjoyed operating the dozer and worked hard. He was proud of his work and made every effort to make the finished product as good as possible. He provided valuable suggestions which increased the efficiency and quality of the work. He also followed instructions well and was willing to take on additional tasks without complaint. He was a conscientious employee who did not have to be closely supervised. With the locations of the inlets and outlets of the dips marked, Donny could work efficiently without supervision.

The backhoe work was not as efficient as hoped. Each culvert inlet that needed to be cleaned out was flagged so the operator could find it. The work was monitored to ensure the culvert inlets were free of debris. The backhoe was requested to go back to several locations to clean debris from culverts that had been missed or to remove remaining debris from inlets which had been incompletely cleaned.

There was no profit motive for the operators to work as efficiently as possible since they get paid equally regardless of the efficiency of the work.

Post Heavy Equipment Monitoring

The winter of 1996-97 had above average rainfall, especially between October and January. The winter was a good test of the effectiveness of the rolling dips.

Several of the culverts were plugged or overwhelmed with runoff, causing the water to divert around the culvert. Where this happened at sites where the dips had been installed, the water flowed through the dips and back into the natural drainage. The dips that had water flowing through them functioned as designed. Minor erosion occurred in a few of the dips that had water flowing through them. None of the dips failed during this winter, but some of the dips which were constructed on the steepest sections of Rock Fork Road look like they may not function as designed if tested. Before and during dip construction, there were a lot of in-park concerns regarding archeological sites, aesthetics, and drivability. Therefore, the dips were constructed to create as little disturbance as possible while performing their function to reduce erosion. In addition, they were constructed to maintain drivability. The dips needed to be deeper on the steeper sections of road in order to be effective in conveying runoff across the road. These dips may not have been constructed deep enough due to concerns over drivability.