

Road 151, Santa Fe National Forest

Observations, Considerations, and Recommendations from the Interagency Transportation Assistance Group (TAG)



September 14-16, 2015

Prepared for:
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13. ABSTRACT (Maximum 200 words) This report for the U.S. Forest Service (USFS) documents the observations and findings of a transportation assistance group (TAG) study of Forest Road 151 on the Santa Fe National Forest near Abiquiu, New Mexico. Over the course of a three day site visit, TAG participants from the USFS, U.S. Department of Transportation Volpe Center, and the Federal Highway Administration Central Federal Lands Division observed conditions and engaged with stakeholders to take a comprehensive look at the entire 13.5 mile road in order to collaboratively think through and prioritize potential management options to address issues and challenges, such as ensuring public safety, improving road conditions, and balancing maintenance needs with the environmental and cultural significance of the corridor. The report concludes with recommended phases and funding options to implement actions.			
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Introduction

From September 14-16, 2015, an interagency transportation assistance group (TAG) conducted a field investigation and discussion focused on the future management options of Forest Road (FR) 151 on the Santa Fe National Forest. The TAG consisted of the U.S. Forest Service (FS), U.S. Department of Transportation Volpe Center (Volpe), and the Federal Highway Administration (FHWA). The FS requested that Volpe facilitate this TAG to help the agency and their planning partners take a comprehensive look at the entire 13.5 road and think through and prioritize potential actions to address issues and challenges such as ensuring visitor safety, accommodating growing visitation, and addressing maintenance costs. Before the site visit, but after discussing particular concerns about safety along FR 151, the FS and Volpe requested the safety engineering expertise of FHWA staff from the Central Federal Lands Highway Division.

This TAG report, developed subsequent to the site visit, documents the observations, conditions, issues, and recommendations arising from the TAG team's analysis.

Background and Conditions

FR 151, located 65 miles northwest of Santa Fe in north central New Mexico, provides access to the Rio Chama River within the Coyote District of the Santa Fe National Forest (NF). FR 151 begins on the Carson NF at the intersection of U.S. Route 84 in Abiquiu, NM, and soon moves into the Santa Fe NF where it runs for about 13.5 miles. A packed gravel and native soil surfaced road, Forest Service staff report that FR 151 has steadily grown in use, attracting people interested in exploring this beautiful canyon and the recreational opportunities it has to offer. Typical activities include rafting down the Rio Chama River, hiking and horseback riding along the Continental Divide Trail (CDT), and camping at Rio Chama Campground.



Figure 1: Relatively straight section of FR 151 between the road's start at U.S. Route 84 and the Rio Chama.

Ownership and Management

FR 151 is owned and managed by the FS but jointly maintained by the FS and Rio Arriba County. The road is an important recreational and tourism asset to the county. Therefore, the FS has an arrangement with the County to share the maintenance costs on a seasonal basis throughout the year.

For this road, and other aggregate and native surfaced roads, a common maintenance activity is surface blading.¹ This is to be completed as needed to ensure proper drainage and public safety, but because of the road's fragile clay underneath and around the gravel aggregate, spot maintenance activities to meet minimum safety requirements are a common occurrence. The impacts of rain can be particularly taxing on road conditions related to public safety and maintenance needs. Vehicles can compact the soil when it is wet, causing divots or slumps that make it more difficult to navigate in the future. Over time, and in the event of large storms, runoff along the corridor can cause culverts and lead-off ditches to clog, which can lead to flooding on the road surface. The largest maintenance costs are associated with clearing culverts, stabilizing the roadbed, and rebuilding drainage ditches after such events. As the road condition deteriorates, this is an increasing maintenance burden on the Forest Service and partners. During the winter, even though the campgrounds and boating facilities are closed, snow removal is necessary on the entire road to provide access to the [Monastery of Christ in the Desert](#) and a few other private residents and businesses that are reliant on the road to access their properties. Rio Arriba County manages the snow removal for FR 151.

In the event of an emergency situation, FS staff typically serve as the first responder and take the appropriate action to pursue additional assistance as needed (e.g., medical, police, etc.). Since access along the road can be limited due to congestion, weather, or road conditions, helicopters from Española (35 miles away) have been able to land in the corridor to provide medical attention when necessary.

While FS staff have been able to temporarily fix problem areas along the road, this TAG is an opportunity to explore more permanent solutions, as well as options to fund these solutions in order to complement a fixed maintenance budget.

Rio Chama Management Plan

Written in 1990, the FS, Bureau of Land Management (BLM) and U.S. Army Corps of Engineers (USACE) jointly developed the [Rio Chama Management Plan](#), with the purpose of guiding “the overall protection, use, and development of the Rio Chama corridor,” which stretches 30.4 miles along the river and includes FR 151. The creation of this document meets the guidance under the Wild and Scenic Rivers Act of 1968, which states that any Wild and Scenic River must prepare a plan within three years of its designation. Although designed to be a ten year plan, this document remains a foundational resource for the management of the corridor today.

The plan provides detailed guidance for the partner agencies to use in several priority areas, including natural resource management, boating management, visitor facility development and management, interpretive services, cultural resources, and land acquisition policies. Since the corridor includes portions of a few different federal land agency jurisdictions, responsibilities for each agency have been divided across three distinct segments, as listed under Public Law 100-633. The FS manages all portions of FR 151.

¹ Surface blading is keeping a native or aggregate surfaced Roadbed in a condition to facilitate traffic and provide proper drainage. It includes maintaining the Crown, Inslope or Outslope of the Traveled Way, Turnouts, and Shoulder; repairing Berms; blending approach road intersections; and cleaning bridge decks, Drainage Dips, and Lead-off Ditches. This work shall be completed with a motor grader ([Road Maintenance Requirements, USDA](#))

The primary goals of the plan are based off of public input and interagency discussions which the FS and partner agencies continue to use as guiding principles for future action along the corridor. These include:

1. Maintain and enhance the natural resources;
2. Preserve the Wild and Scenic character of the river, and the natural and cultural environment;
3. Minimize impacts on land, protecting wildlife and plant habitats;
4. Provide recreational opportunities to enhance the visitor experience on the river corridor; and
5. Improve the safety and enjoyment of visitors.

This framework is needed given the environmental sensitivity of the corridor and the presence of heritage sites such as the burial ground near Skull Bridge. However, it adds complexity to improvements on FR 151. Since the exact boundaries are not clearly defined, the FS, as well as its partner agencies identified above, must take steps to prevent disturbance of any of the archaeological sites. Oftentimes, however, this limits the options that the FS can consider to enhance the road.

After the plan was adopted in 1990, the FS developed its own guidelines and performance measures to meet the rules established in the new guiding document. The following is a list of proposed goals derived from the 1990 plan:

- Mitigate the negative environmental impacts along the river corridor by eliminating dispersed boat launch sites while improving accessibility and capacity at targeted existing sites;
- Increase the number of safety pullouts along the roadway to accommodate oncoming traffic;
- Recondition the road with new gravel and natural material to improve its physical and environmental integrity;
- Increase awareness of FR 151 by adding more signs along U.S. Route 84 and enhancing the information provided;
- Obliterate or close unauthorized and unplanned roads throughout the FR 151 corridor;
- Address conflicts with abutting landowners and grazing permittees to foster good community and working relationships.

Rio Chama Corridor

The increase in visitation over the years is consistent with population growth in the region, but also related to the fact that a significant portion of this corridor has been protected for its scenic beauty and ecological significance. In 1978, the same year that New Mexico designated the Rio Chama as a State Scenic and Pastoral River, the U.S Congress authorized portions of the Santa Fe and Carson NFs as the Chama Canyon Wilderness Area under the [U.S. Wilderness Act of 1964](#). Shortly following, in 1980, additional abutting property of the BLM was declared a Wilderness Study Area under the [1976 Federal Land Policy and Management Act](#). The main purpose of these designations is “to assure that an increasing population, accompanied by expanding settlement and growing mechanization, does not occupy all areas within the United States” and “to secure for the American people of present and future generations the benefits of an enduring resource of wilderness,”² and one that has ecological, geological, historical, or scenic significance.

Ten years later, in 1988, thirty-one miles of the river were further protected under the National Wild and Scenic Rivers System. Under this 1968 Act passed by Congress, “certain selected rivers of the Nation which, with their immediate environments, possess outstandingly remarkable scenic, recreational,

² <http://www.wilderness.net/NWPS/legisact>

geologic, fish and wildlife, historic, cultural or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations”.³ Today, the FS and BLM co-manage thousands of acres in this Wild and Scenic River corridor.

Forest Road 151

Due to the significance of both the Rio Chama River and abutting corridor, FR 151 is a destination, providing the sole access point to the corridor for vehicular traffic. Because of this, Road 151 can become crowded, particularly during peak recreation seasons. Traffic at the head of the road averages around 70 vehicles per day in the fall, but this number can be as high as 200 vehicles per day on major holidays. The 13.5 mile single-lane native road meanders through a sensitive landscape, abutted on either side by federally protected property, ending at the Monastery (Mile 13.5), which is about midway along the Rio Chama Corridor. The Monastery accommodates between fifty and sixty monks at one time, and attracts day and overnight guests throughout the year.

Even in ideal driving conditions, FR 151 can be challenging to navigate. The narrow road includes limited sight distance curves, fragile terrain, and steep grades. The addition of multiple users and inclement weather can quickly heighten navigation complexity, and create hazardous driving conditions along the road. The base material is gravel, but over time it blends together with the natural, clay-like soil. While the gravel helps stabilize the road surface, the clay material can create slippery driving conditions during wet weather.

FR 151 has been growing in popularity for the last few decades; recreational boating grew by 300 percent throughout the 1980s alone. The steady increase in visitation has led to concerns around congestion, safety, and environmental and infrastructure degradation. During the high recreation season each year, which begins around Easter and lasts through early fall, there is an influx of vehicular traffic that produces recreational cyclists along the entire road, as well as pedestrian use along the Continental Divide Trail (Mile 8) and at the various camp and day-use sties.. Summer weekends and holidays attract the most use, and visitors with varying familiarity with the landscape must drive safely in a road that does not easily accommodate large numbers of drivers (e.g., there are narrow sections with limited space to pass oncoming traffic, including oversized vehicles). It is also typical for campgrounds to be full throughout this time and for recreational boaters to wait up to an hour to take-out from the river.

According to the experiences of FS staff, visitation to FR 151 continues to increase, with between 75-100 vehicles accessing the road each day on average. However, while overall visitation continues to grow, traffic counts show that fewer vehicles are traveling to the end of the road, perhaps indicating increased recreation visitation to sites closer to the head of the road. Even given the road’s constraints, large vehicles do need to travel on it throughout the year. Large vehicle users include cattle or horse trailers, recreational vehicles going to a campground, and trucks making deliveries to the Monastery.

The surface of FR 151 is generally in good condition. The FS and Rio Arriba County conduct maintenance as required to sustain a safe and passable roadway. However, improvements are needed to enhance and accommodate growing and changing use patterns. Though the road has many pullouts to accommodate passing traffic, an insufficient number of them means that there are often not safe ways to pass without damaging the road or its ditches. Prior to the establishment of the *Rio Chama Management Plan*, road users created 17 unauthorized two-track roads directly off FR 151, leading to

³ <http://www.rivers.gov/wsr-act.php>

the river's edge or dispersed campsites and causing significant erosion. The FS closed many of these roads and created authorized dispersed sites to balance the camping demand. Even with these additional resources, campgrounds are showing signs of overuse, and vehicles continue to harm vegetation and worsen erosion by driving off the existing road surface. FS staff report that this is because existing roads in and around campgrounds can become impassable for certain vehicles due to flooding and saturated roadway conditions after rain and snow events.

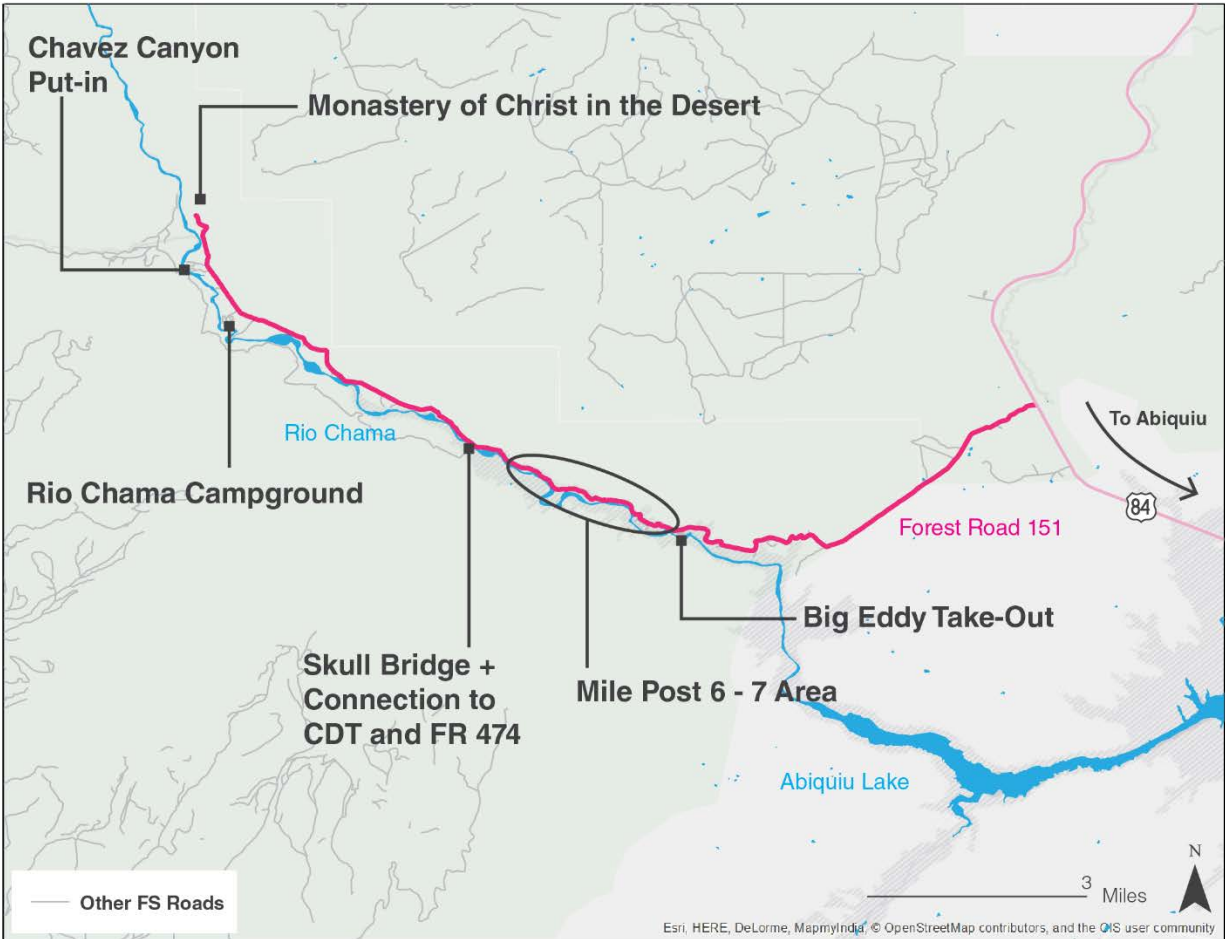


Figure 2: Map of Forest Road 151 and the Rio Chama corridor near Abiquiu Lake.
Other forest roads are shown in grey.

The following sites are key destination points along FR 151, also identified in Figure 2:

Big Eddy River Access (Mile 5)

Parking for 100 vehicles is available at this major take-out point along FR 151 for boaters. This site is the terminus for all boaters along the river, so this is one of the most popular sites along the road, often congested during peak season weekends with vehicles waiting to use one of the two boat ramps available. Trash receptacles and restrooms are available.

Mile Post 6-7 Area (Mile 6-7)

The landscape around Mile Post 6 is particularly striking, attracting road users to observe the natural beauty of the Rio Chama River from the cliffs of the adjacent canyon. However, as illustrated in Figure 3, road conditions around Mile Post 6 are particularly challenging, including narrowing road width, steep

grade changes, tight blind curves, and few areas to pull over. Many recreational visitors need to pass through this section of the road to access the sites listed below.



Figure 3: FR 151 Conditions at Mile Post 6, one of the steepest sections of the road.

Skull Bridge/Continental Divide Trail Connection (Mile 8)

Located about halfway along FR 151, Skull Bridge is on the only river crossing along the road, providing restricted vehicular access to FR 474, as well as a non-motorized link to the Continental Divide Trail. Down river from the bridge, a linear parking area abuts the road providing ten parking spaces for hiking, equestrian use, and other recreational opportunities.

Rio Chama Campground (Mile 11)

This campground has 11 drive-in campsites for public use. The unpaved, two-track loop road provides access to the camp sites, which each contain a parking area, leveled tent pad area, grill, and picnic table. Restrooms and trash receptacles are centrally located for use by all campsites. While Rio Chama is the only group campground along FR 151, there are multiple dispersed campsites along the corridor as well.

Chavez Canyon River Access (Mile 12.5)

With a parking area serving 20 vehicles, this site is the only area along FR 151 that provides put-in access for boat recreation along the lower portion of the Rio Chama River. Additionally, this site serves as an optional take-out point for those boaters putting in further north at El Vado Ranch, which is accessible by NM Route 112. This site also includes a staging area for vehicles preparing to put-in or take-out, as well as restrooms. Figure 4 provides a view of the lower portion of the Rio Chama River.

Monastery of Christ in the Desert (Mile 13.5)

Located at the end of FR 151, the Monastery was founded in 1964. It is home to about forty monks who live and work on site. This monastic community welcomes day and overnight guests to participate in services, meals, as well as visit their gift shop or tour their brewery, Abbey Brewing Company, which opened in 2005. FR 151 serves as the only road for monks, visitors, and any service vehicles that need to access the property on a regular basis.

In addition to these sites, there are several dispersed campsites and pullouts along the road. Unauthorized, user-created roads have been closed or decommissioned.



Figure 4: View of the Rio Chama River looking south from FR 151

Issues and Challenges

During the TAG site visit, the core team composed of staff from the FS, Volpe, and FHWA drove the extent of FR 151, met with public and private stakeholders, and discussed each organization's experiences and insights with the road. The full list of participants is listed in the Appendix: List of TAG Participants. As a result of the TAG, the team identified several key issues, organized under three main categories:

- User Awareness and Public Safety;
- Road Conditions; and
- Heritage and Environmental Protection.

Many of these issues are of particular concern around Mile Post 6 section of the road, which is detailed below.

User Awareness and Public Safety

Limited Signage

Across the length of the road, there is limited signage to warn visitors of the challenging terrain, limited sight distance curves, steep drop-offs, and the need to share the narrow road with multiple users and oncoming traffic. Chevrons do exist along the road, but placement is inconsistent and sometimes inappropriately positioned. Between Mile Post 6-7, the road's curves are especially challenging, with the narrowest portions abutting eroding steep cliffs. There is no suitable signage to warn drivers of the dangerous conditions or to slow down. Overall, safety and signage are major concerns along the entire road. In addition, there is only limited signage informing drivers on FR 151 and U.S. Route 84 about recreation destinations along this part of the Rio Chama corridor.

Excess Speed

Even though FR 151 is unpaved and built in a way that should calm traffic, it is common for drivers to speed along the road, causing dust to be picked up in its path, putting themselves and others at risk, especially around the many sharp, narrow curves. This is true for both of those familiar and unfamiliar with the road and its challenging characteristics.

Increased Visitation

According to FS staff and recent vehicle counts, visitation has risen since the Wild and Scenic River designation in 1988, bringing more vehicles to the road and increasing the potential for crashes and the general wear and tear on the road and the abutting recreation sites. The Monastery has also drawn increased traffic, for example through Abbey Brewing Company tastings.

Mixed Vehicle Use

Beyond standard passenger cars, FR 151 attracts a variety of vehicle types. Regular year-round users include large trucks providing routine services to the Monastery (e.g., waste removal, propane delivery, etc.). Personal RVs and trailers for horseback riding, as seen in Figure 5, use the road throughout the year, but traffic is concentrated during the spring and summer seasons. Yet during the traditional off-season, large trailers for grazing frequent the road between November 1 and May 15. Additionally, since white water rafting has become a popular recreational activity, there are large commercial vehicles that use the road to haul boats and other equipment from around April through October. The addition of these vehicles heightens safety concerns along the road.

Congestion at Big Eddy River Access

While parking throughout the site has expanded, parking at the staging areas to take-out boats is limited and is oftentimes congested during summer weekends and holidays throughout the peak season, between mid-spring and early fall. The current staging area is designed to accommodate three to four groups, but more than six groups tend to take-out at a time according to FS staff. Even with this over use in practice, it is typical for groups to wait up to one hour to take out boats.

Communication with the Public

It is a priority for FS staff to improve public safety and user awareness along FR 151. However, there is no clear method to present information to visitors about road conditions. While there are a couple kiosks along the road, there is no information to warn unfamiliar users about road conditions, particularly at the head of the road, which would be an ideal location. The Monastery provides regularly updated road conditions information on its website, which could be a resource for visitors. Beyond safety, interpretive information to illustrate the significance of the corridor exists but is limited.



Figure 5: Sharing the road with large vehicles on FR 151

Road Conditions

Challenging Conditions between Mile Post 6 and 7

One of the more hazardous sections of the road is between Mile Post 6 and 7. This portion of the road is particularly narrow, contains tight turns (see Figure 6), abuts steep drop offs (see Figure 7) with an eroding roadbed (see Figure 8), and changes grade very quickly. During wet weather, when vehicles do not have enough momentum coming off of the tight curves on the road, they can become stuck trying to climb the hill. The issues highlighted below concerning narrow roads and blind curves are particularly relevant to this section of the road.



Figure 6: FR 151 adjacent to the cliffs near Mile Post 6



Figure 7: Limited sight distance curve near Mile Post 6



Figure 8: Existing delineators along the edge of eroding roadbed near Mile Post 6

Steep Cliffs and Lack of Guardrails

FR 151 follows the route of the Rio Chama River, meandering with the natural design of the canyon and its quickly changing grades and sharp turns. Steep terrain also means that there are often tightly abutting steep drop-offs along the road. Areas of the road around Mile Post 6 and 7 are particularly narrow and contain hairpin turns but have no guardrails or shoulder buffers to protect drivers or allow passing.

Lack of Safe Places to Pull Over

FR 151 contains pullout areas to accommodate oncoming traffic and those wishing to pull over to appreciate the scenic beauty of the corridor. However, there are stretches of the road where there is a need for pullouts that currently do not exist. When passing with no available pullouts, vehicles are forced to navigate into the roadside ditches which can exacerbate erosion and drainage issues. Depending on the grade of the shoulder, width of the road, and weather conditions, drivers, particularly those who are towing RVs or trailers, put themselves in danger of getting stuck along the roadway, causing safety and congestion issues. In particular, there is a lack of pullout areas between Mile Posts 7 and 9.

Stranded Vehicles

Vehicles occasionally become stuck along FR 151, especially due to the inability to navigate through the snow, ice, or slick clay soil that can become slippery even with a small amount of rain or snow. In these cases, because of the lack of cellular reception in this area, motorists have been unable to request assistance and need to spend the night to wait for help. In the cases when visitors have cellular reception, staff at the nearby [Ghost Ranch](#), an education and retreat center two miles south of the road's head on US-84, stated that they have provided assistance.

Poor Accessibility for Emergency Vehicles

Due to their size and the road conditions, emergency vehicles can face challenges accessing the site of a crash or other emergency in a timely manner. However, helicopters from Española have been able to land along the corridor in the rare need for immediate medical attention.

Limited Parking at Skull Bridge

While parking for about ten passenger vehicles does exist just south of Skull Bridge, primarily for those accessing the CDT trailhead, there is a concern that there will not be enough space to balance the growing demand of horseback riders and regular hikers of the CDT.

Road Degradation at Rio Chama Campground and Day Use Site

Road conditions at some of the day use sites have degraded to the point where they have become impassable. A combination of flooding and poor drainage have caused vehicles to form large tracks and divots along the access roads, forcing drivers to move off the roads onto sensitive terrain, which makes conditions worse and threatens adjacent heritage sites. Figure 9 provides an example of wet road conditions at the day use site.

Flooding and Poor Drainage

Due to the character of the terrain, heavy rains can cause flash floods along the corridor. Runoff from the adjacent arroyos, which often is diverted into the many culverts spread along the road, can bring natural debris that clogs the culverts. Figure 10 provides an example of a typical culvert along the road. Flooding is a constant concern, creating slick roadways and worsening erosion. Safety concerns are heightened at low-water crossings, which are low points along the roadway where drainage is directed over the roadway, which can create slick conditions when there is considerable clay or sediment on the roadway surface. Clogged culverts are a regular occurrence near Mile Post 4 and Mile Post 12. Issues

with low water crossings exist at Mile Post 5, as well as on the interior and access roads at the Rio Chama Campground and day use sites.



Figure 9: Wet two-track road at a day use site.



Figure 10: An example of a culvert along FR 151

Narrow Road Width and Blind Curves

FR 151 is designed to be a single lane road, but there is no outlet at the end of the road (therefore assuring returning traffic) and vehicles often have to navigate around oncoming traffic. While existing pullouts assist with these situations, there are particularly narrow parts of the roadway along fragile terrain where the addition of pullouts is not an option. Additionally, oncoming traffic around tight curves can be extremely dangerous, particularly for large vehicles.

Heritage and Environmental Protection

Balancing Maintenance Needs with Wilderness Protection

Due to the natural character of the roadway, its close proximity to heritage sites, and its connection to a Wild and Scenic River, all road work must take into consideration the guidelines set by the management plan. The geography of the roadway makes it difficult for vehicles needing to address emergency maintenance needs.

Vegetation Encroachment

There are portions of the road close to the river where overgrown vegetation negatively impacts the driver's line of sight. For a road that is naturally narrow, this hinders safety, particularly around sharp curves.

Considering Visual Integrity

Any decisions around improving the road should balance this desired work with the unique scenic qualities of the roadway and the adjacent corridor. The natural roadway is a major contributor to scenic character of the corridor and should be preserved.

Endangered Species

Endangered species were recently identified outside of the corridor, but in nearby FS locations. Under the [Endangered Species Act of 1973](#), the agency must protect endangered and threatened species, as well as critical habitats. Any future actions in the corridor must take this into consideration.

Managing Unauthorized Uses

Private landowners regularly use FR 151 to access their abutting properties to the corridor, which is an authorized use (e.g., individuals use Skull Bridge to access private land off of FR 474). However, there are environmentally and culturally sensitive areas that can be accessed from FR 151, such as wilderness areas and burial sites. The FS must continue to monitor any unauthorized uses that could damage these areas.

Interaction with Grazing Permittees

Between November 1 and May 15, use of grazing allotments increase throughout the corridor. During this time, large vehicles frequent all portions of FR 151 to move and monitor cattle. Grazing overlaps with the beginning of the popular recreation season, which has caused conflicts for permittees trying to navigate the road with their large trucks and trailers alongside the recreation traffic.

Potential Actions

To help address the challenges on FR 151 outlined above, the TAG Team discussed potential actions based on past experience with the road, the TAG site visits, and input from stakeholders during TAG discussions. This section briefly describes the advantages and disadvantages of each of these actions, whereas the next section recommends a priority set of actions and discusses how these could be funded and advanced.

The FR 151 TAG Team identified the following overarching goals for all potential road improvements specific to the TAG, yet building off of previously cited goals and principles: improve the safety of users while maintaining the scenic visual integrity of the road and respecting its location along a Wild and Scenic River and a wilderness area. The potential improvements are outlined in four primary categories, although there is a great deal of overlap in how the actions would affect the road. For example, creating scenic overlooks along the road would add a recreational visitor amenity while also serving as an engineering enhancement by providing safe places for vehicles to pull over. The four categories are:

- Engineering Improvements
- Hydrology Improvements
- Recreation Improvements
- Awareness and Policy
- Maintenance Activities

Engineering Improvements

Widen Curves at Mile Post 6

Widening the roadway near Mile Post 6 could help address environmental and safety concerns at this key location along the route. Due to the surrounding terrain, widening the road area or adding space for guardrails around curves would likely require additional cutting, filling, and a retaining wall to prevent further erosion into the Rio Chama.

- **Advantages:** Improved safety through visibility, guardrails, or pullover areas on a potentially hazardous portion of the road. A retaining wall could reduce erosion and aggregate runoff into the Rio Chama.
- **Disadvantages:** Expensive. Although a retaining wall, in particular, can include an aesthetic treatment to reduce the visual impacts, this infrastructure addition could diminish the scenic view of the river and corridor from FR 151 as well as the overall natural character of the roadway. The conditions of the hillside, including existing archaeological sites near Mile Post 6, would have to be analyzed for potential impacts or risks.

Guardrail at Mile Post 6

A guardrail could be installed at Mile Post 6 in locations that are deemed to have enough existing width in the roadway to accommodate them or as part of a broader effort to widen and improve the curves at Mile Post 6. Test Level 2 guardrails, which are [designed for crashes up to 44 mph](#), are available with finishes and materials that match the scenic character of FR 151.⁴

- **Advantages:** Improved safety, especially around curves and steep embankment areas.
- **Disadvantages:** To be effective at the most important curves, the roadway would likely need to be widened (see above). The addition of a guardrail could have a negative visual impact on the roadway, and could diminish the scenic view of the river and corridor.

Selective Paving at Mile Post 6

Limited paving at key points near Mile Post 6 could help both reduce aggregate runoff into the river and improve safety and traction. The paving method could range from asphalt wearing course to the application of a high friction surface treatment (HSFT).⁵

- **Advantages:** Improved traction and safety along curves, especially when the road is wet or during storm events. Reduced aggregate runoff into the Rio Chama.
- **Disadvantages:** Expensive. External stakeholders expressed concern that any paving could change the character of the road and encourage speeding.

Signage Plan

Signage on the road is currently limited, and many signs do not meet current guidelines for retroreflectivity. While external stakeholders (see Appendix) noted a desire not to overwhelm visitors

⁴ See http://safety.fhwa.dot.gov/roadway_dept/policy_guide/road_hardware/ctrmeasures/bridge_railings/

⁵ See <https://www.fhwa.dot.gov/publications/research/safety/14065/004.cfm>

with signs, appropriately placed and designed signage could improve safety and awareness. In addition to standard road safety signage, information signs about popular visitor destinations and road conditions would be useful to visitors. A sign plan would identify the optimal locations for signs of different types. Signing for reduced regulatory speed along the route requires an engineering study.

- **Advantages:** Increased awareness of road conditions from the beginning of the road. Retroreflective materials will improve safety along the road under low light and night conditions.
- **Disadvantages:** There are few disadvantages to conducting a signage plan, although potential constraints to consider are avoiding “sign fatigue” or “sign clutter” and how to account for sign vandalism.

New Gravel Aggregate

Rehabilitating the gravel surface of the full length of FR 151 and adding new material would improve overall safety and user comfort. External stakeholders stated that they would prefer new gravel aggregate instead of full depth pavement or chip sealing due to concerns about speed and the road’s character.

- **Advantages:** Possible improved traction and safety along curves, especially when the road is wet or during storm events; integration with the natural character of the road and landscape; and reduced aggregate runoff into the Rio Chama.
- **Disadvantages:** Material pits near the road would need to be developed or re-established. Alternatively, the FS could purchase and haul materials from another location, but this would increase the cost.

Hydrology Improvements

Concrete Low-Water Crossings

To help address drainage issues and sediment build-up in culverts, the FS could install concrete low-water crossings at certain arroyos at high risk of overtopping the road during storm events. Some arroyos along the road already have concrete or other hard-surface high-water crossings. Other culverts have intentionally been filled because of frequency and extent of maintenance was becoming a burden for FS staff; these may be particularly good candidates for the installation of low-water crossings.

- **Advantages:** Flood water could pass over the top of the road with less damage to the road surface and sediment entering the water flow. Could reduce maintenance load since there would be fewer culverts that require regular sediment removal.
- **Disadvantages:** Concrete crossings have an initially high cost. Flooding would still deposit sediment on the concrete surface, which could become a safety hazard if it is not cleared off after flood events.

Enlarged Drainage Crossings

Another action that could help address drainage issues is to expand and improve culverts to reduce the amount of sediment accumulation. Whether an enlarged culvert or a low-water crossing is appropriate may depend on the particular drainage crossing.

- **Advantages:** Improved culverts could reduce the likelihood of sediment clogging, reducing maintenance load since there would be fewer culverts that require regular sediment removal.
- **Disadvantages:** Improving and enlarging drainage crossings would be expensive.

Retaining Wall at Mile Post 6

As part of a widening project or independently, the FS could install a retaining wall to prevent road erosion and aggregate runoff into the Rio Chama.

- **Advantages:** Reduced erosion and aggregate runoff into the Rio Chama. Can be constructed with an aesthetic surfacing design.
- **Disadvantages:** Could negatively affect the scenic view of the river from FR 151. Construction could potentially risk encroachment on wilderness areas, which have boundaries that come very close to the edge of the roadway.

Hydrology Study

An in-depth hydrology study analyzing how water flows and patterns of flooding affect the road could identify the actions most likely to reduce runoff into the Rio Chama and limit flooding of the road surface. This could include prioritizing the water-related actions above and identifying the specific points on the road where they would be most appropriate.

- **Advantages:** Would enable the FS to make drainage investments based on performance measures.
- **Disadvantages:** Additional time and expense to conduct the study.

Maintenance Activities

Apply a Chemical Gravel Stabilizer

A chemical stabilizer applied to an aggregate road can provide some of the benefits of paving or a chip seal without the large capital expense and road modification. There are a variety of traditional chemical stabilizers as well as commercial “non-traditional” stabilizers that may be appropriate based on different needs and situations.⁶

- **Advantages:** Reduced aggregate runoff into the Rio Chama, reduced aggregate accumulation in drainage ditches, reduced dust, improved traction.
- **Disadvantages:** A stabilizer would require regular reapplication to remain effective, and would have to be analyzed for its compatibility with the soil, resiliency in winter and flood conditions, and whether it is environmentally safe to use in close proximity to the Rio Chama.

Vegetation Removal

The FS could establish a vegetation removal clear zone around the heavily-vegetated portions of the road towards the Rio Chama. Based on the low volume and low speed conditions on FR 151, the Federal Lands Highway’s [Barrier Guide For Low Volume and Low Speed Roads](#) can be used as a guide for determining an appropriate clear zone.⁷ Generally, the prevailing speed along FR 151 is 25-30 mph. At these speeds, with traffic volumes of less than 750 vehicles per day, and existing foreslopes of 1:4, the *Barrier Guide* recommends a clear zone of 5-8 feet. The 5-8’ clear zone should be provided as much as

⁶ See the FS Technology & Development Center’s 2009 report, “Stabilization Selection Guide for Aggregate and Native-Surfaced Low Volume Roads,” <http://www.fs.fed.us/t-d/pubs/pdf/08771805.pdf>

⁷ Clear zone is term used to define the area outside the road traveled way that is free of hazards, such as fixed objects and steep slopes. The *Barrier Guide* is an extension of the American Association of State Highway and Transportation Officials (AASHTO) [Roadside Design Guide](#) in that it addresses clear zone as a function of design speed, side slopes and horizontal curvature in conjunction with recognizing that lower volume roads will most likely result in lower crash probability.

possible along the alignment. When the 5-8' clear zone is not practical given the environment and other constraints, a 1' clear zone can be considered.

- **Advantages:** Improved safety through longer sight distances. Improved clear zone increases driver expectancy and provides recoverable area for errant vehicles.
- **Disadvantages:** Requires regular maintenance and attention to vegetation encroachment on the clear zone.

Recreation Improvements

Expand trailer parking at Skull Bridge

As seen in Figure 11, there appears to be space at Skull Bridge to expand the existing roadside parking by about 3,000 square feet to better accommodate horse trailers. However, monks at the Monastery reported that they did not often see equestrian users on the adjoining CDT, which is consistent with FS field staff's observation that no more than two trailers or four passenger cars are parked at one time. While the parking is not currently at capacity, expanding the roadside parking could accommodate future use as well as other users, including Land Grant users who maintain the nearby cemetery.

- **Advantages:** Improved access for CDT visitors and other users to this part of the road.
- **Disadvantages:** Requires extending cleared area into lightly vegetated land.



Figure 11: Satellite view of Skull Bridge. The small existing parking area is located on the north side of the river directly east of the bridge.

Expand Boat Ramps at the Take-out and Put-in

Expanding the ramps at the [Chavez Canyon put-in](#) and the [Big Eddy take-out](#) (see Figure 12) would enable additional river users to put in or take out non-motorized boats. Since additional put-ins are located on BLM land further upstream, this action should be coordinated with the BLM and other stakeholders consistent with the overall management strategy for the Rio Chama. Currently, the FS does not collect boating fees; implementing a fee system to support this maintenance and operations could be considered.

- **Advantages:** Reduced congestion at put-in and take-out areas, increased convenience for visitors.
- **Disadvantages:** Expanding capacity at Chavez Canyon put-in in particular could increase the total number of boat users on the river. The FS and its partners could analyze whether additional river users are sustainable along the Rio Chama.



Figure 12: Ramps and parking area at Big Eddy Take-out.

Repairs/Improvements to Campground, Day Use Areas, and Access Roads

The access road to Rio Chama Campground and connectors to other public day use areas and administrative sites are degraded and susceptible to flooding during storm events. Improvements to sites along the road could be prioritized. For example, the access road to the river gauging station maintained by the USACE and the U.S. Geological Survey was washed out in December 2014 according to FS staff. However, the gauging station is a less than five-minute walk from the main road so depending on how partners and the public use this site, repairs may not be necessary.

- **Advantages:** Improvements to sites that are central to the experience of many visitors. Flooding on access roads is a safety hazard that can limit visitor access or egress from recreation areas.
- **Disadvantages:** Cost and potential disruption to recreation area use.

Create New Pullouts

Adding new pullouts along FR 151 could help improve the road in multiple ways. In narrow sections of the road, pullouts allow drivers to pass each other while travelling in opposite directions, generally without requiring the FS to widen the road; they also prevent an individual driver from pulling over into a roadside ditch, potentially damaging it. This prevention is especially important for vehicles with

trailers, including range permittees. Pullouts also provide a safe area for visitors to pull over damaged vehicles or to admire the scenery.

Pullouts could be created without recreational features such as signs, but these features could encourage recreation visitors to more frequently use these pullouts rather than stopping in the road. The interval of pullouts could vary, but the TAG team identified every 0.5 miles as an initial suggestion.

- **Advantages:** Improved safety due to easier passing and the road's improved ability to accommodate emergency response vehicles and scenic viewing without vehicles stopping in the travel lanes.
- **Disadvantages:** In addition to cost, there may be logistical challenges to expanding the roadway to accommodate pullouts, especially on narrow, curvy sections of road where they would be most useful.

Awareness and Policy



Figure 13: Information kiosk by Skull Bridge

New Kiosk at Road Entrance

There is not currently an entrance kiosk at the beginning of FR 151 where it meets US 84. Since new visitors may not be familiar with the road and how conditions can change by season or during storm events, this would be an important location for providing information about the road. A FS unstaffed

kiosk/signboard similar to the existing one at Skull Bridge (see Figure 13) could improve safety awareness and inform visitors about recreation opportunities farther along the road.

- **Advantages:** Improved safety and recreation information sharing with all road users.
- **Disadvantages:** As with new signage, a kiosk would be vulnerable to vandalism, especially since it would be located closer to the highway than the existing Skull Bridge kiosk. It would be difficult to provide current information on road conditions, as someone would need to manually update the sign. In addition, staff stated that the University of New Mexico has a real property interest in the land where FR 151 meets US 81, so adding a kiosk may require consent from the University.

Variable Message Sign

One potential solution for sharing current information about road conditions is to—temporarily or permanently—place a variable message sign (VMS) near the beginning of the road. The sign could inform users of travel conditions and be updated remotely to reflect current conditions. Another potential application for a VMS would be to set up a temporary radar speed messaging system to alert drivers of their speed against the current speed limit.

- **Advantages:** Provides information to road users while also allowing for remote updating with current information and conditions. Units are solar powered, and could be deployed only during peak season or other key events when needed. The temporary units are designed to be easily moved.
- **Disadvantages:** Would need to ensure that there is sufficient cellular connection for the sign to be remotely updated. The sign must be oriented to maximize solar power. An electronic sign would be particularly vulnerable to damage from vandalism or theft. Could detract from the natural character of the roadway and scenic corridor.

Online information sharing

Another way of sharing current conditions that requires less infrastructure is to direct visitors to check online. The Monastery already provides current road conditions on the [front page of its website](#) (see Figure 14), and the Monastery stated to the TAG team that it would be willing to work with the FS to make that information more broadly available.

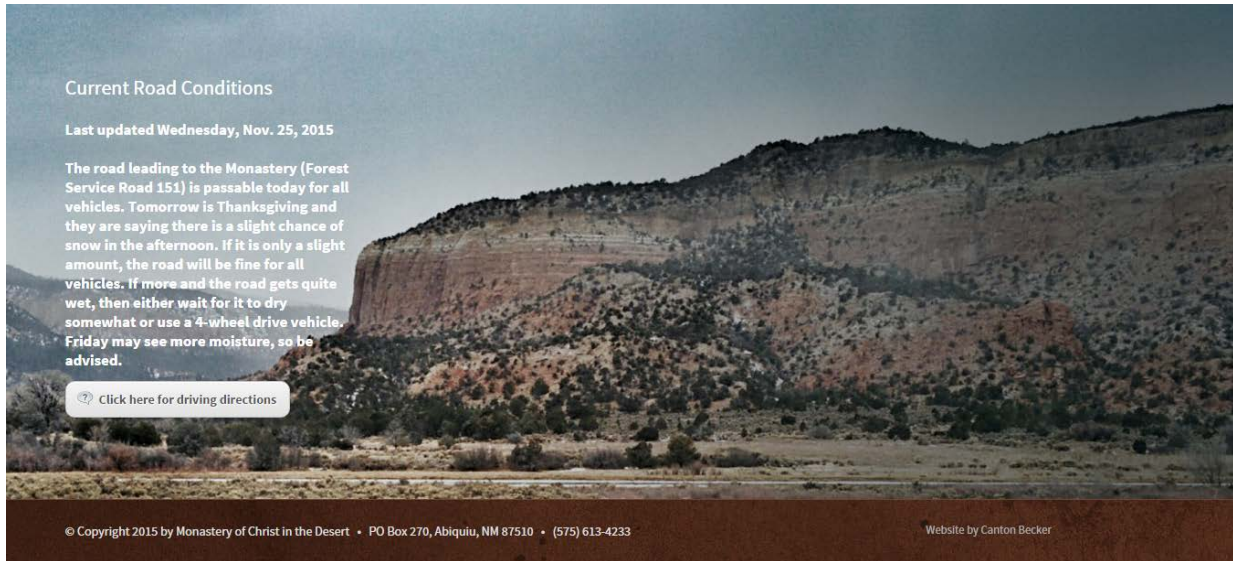


Figure 14: Screenshot of the current road conditions on the Monastery of Christ in the Desert website

A link to the condition information could be provided on the physical kiosk and/or on either a standard or VMS sign.

- **Advantages:** Low-cost way of sharing conditions with visitors, potentially from a source that is already being updated on a regular basis.
- **Disadvantages:** Cellular internet coverage on the road is poor, although it is best at the beginning of the road where the information would be particularly important to share.

Recommendations

In response to the issues and actions identified above, as well as the discussions held during the TAG site visit, Volpe developed a recommendation for advancing improvements to FR 151. This recommendation, outlined in Table 1, packages together potential actions developed by the TAG team into a coherent package, but is intended to be easily modifiable by the FS based on its own priorities and circumstances.

This chapter groups priority actions into three distinct “phases”:

Table 1: Recommended Phases and Funding Sources for FR 151 Improvements

Phase	Potential Funding Source
1. Follow-up studies	FS funds
2. Implement information sharing	FS funds
3. Implement infrastructure actions	FLTP

Phases 1 and 2 would be near-term actions using the FS’s own funding while Phase 3 would implement infrastructure improvements along FR 151 using Federal Lands Transportation Program (FLTP) funds. The targeted studies in Phase 1 and the information sharing system in Phase 2 would help the FS and its partners implement the most effective improvements and communicate about these improvements with visitors.

Phase I: Follow-up Studies

A key initial next step would be to initiate one or more targeted studies to inform Road 151 improvements. These could be performed individually or together as part of a larger study.

- A **signage plan** to determine the appropriate placement of hazard signs, information signs, reflectors, and other roadside signage.
- A **hydrology study** to examine how seasonal storms and water flow interact with FR 151 and identify which of the hydrology improvements identified in the previous section (or other improvements) would be most effective in reducing erosion, aggregate contamination into the Rio Chama, and sediment deposits in culverts and on the road itself.
- A **speed study** to determine the appropriate regulatory speed for the route, including areas where speeds might be lowered. This could be conducted in conjunction with a capacity study above and would be needed if the FS was interested in posting a regulatory speed along the road or at particular areas, especially those that pose a safety concern.
- A **capacity study** to identify recreation areas that commonly become congested. The extent of the study can vary, either targeting key recreation destinations (e.g., campgrounds, river access areas) or more broadly the entire roadway to determine segments that are prone to bottlenecks.

Since the FS has been focusing its FLTP funds on implementation projects, it may make sense for the agency to use its own appropriated funds for these activities if available. Depending on local priorities, partners such as Rio Arriba County may be willing to assist in implementing these follow-ups.

Phase 2: Implement Information Sharing

Simultaneously with Phase 1, the FS should begin to implement low-cost actions that will increase awareness about driving on FR 151 and current conditions. Of the three awareness options discussed in the preceding section, a visitor kiosk at the beginning of the road and an online information sharing portal would be the easiest to implement in the short term.

As the Forest Serve works with the University of New Mexico to determine what agreement—if any—needs to be reached to place a new kiosk at the beginning of the road, the agency and its partners should discuss with the Monastery how to more widely share their regular updates on road conditions. With a few small tweaks to the Monastery’s website code, it would be possible to provide visitors with a link (for example, at the entrance kiosk or on a sign) that would take them directly to the section of the Monastery website with the latest information. A member of a FS enterprise team, Volpe, or another partner could likely work with the Monastery to program a script that would automatically pull the data from the Monastery’s site into other, external systems. Examples outcomes could include:

- A **“Twitter bot,”** that pushes daily road conditions tweets to a dedicated Twitter account. On particularly challenging days, [the forest](#) or its partners could “retweet” these tweets on their own accounts to reach a larger audience. Example: [Massachusetts Bay Transportation Authority transit alerts twitter bot](#) (separate from the agency’s main account).
- Integration with the Santa Fe NF website’s **“Alerts and Notices”** system. This would require coordination with FS staff, perhaps including the FS web enterprise team.

Establishing and promoting this information sharing system in place as the follow-up studies are implemented will allow the FS and its partners to more effectively communicate with the public about construction schedules and travel disruptions as physical improvements occur.

The key next step for this action would be a conversation between the forest, the Monastery, and someone familiar with web information sharing technology (potentially someone on the FS staff, FS enterprise team, or Volpe) to discuss what is feasible.

Phase 3: Implement infrastructure actions

The remaining, infrastructure actions could be implemented as part of a single or multi-part FLTP project. One potential list of improvements, selected from the full list in the previous section, could include:

- New signage based on the sign plan from Phase 1
- Hydrology improvements based on the Phase 1 hydrology plan
- New gravel aggregate placement
- Widening of curves at Mile Post 6 to improve safety and accommodate guardrails
- Establishing a consistent roadside vegetation clear zone
- Expanded parking at Skull Bridge
- New pullouts at approximately 0.5 mile intervals, except at and around Mile Post 6⁸
- Improvements to campground and day use area access roads

⁸ Adding pullouts around MP 6 is likely impractical, due to the narrow road width and the fragile condition of the abutting landscape. If pullouts were added in this MP 6 corridor, the retaining wall or hillside cuts that would be needed would likely have negative environmental impacts and/or encroach on heritage sites.

Funding these improvements through FLTP would be consistent with that program's focus on investments that improve access to high-use recreation sites and economic generators. The FS programs FLTP funds at the regional level, and these investments could consume a majority of one year of the Southwestern Region's FLTP allocation, or more. However, knowing the full scope of work on the road in advance will allow the region to package work projects across one or more years, enabling construction crews to make multiple improvements as part of a larger project.

Appendix: List of TAG Participants

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