

# Predicted Stream Crossings as an Indicator of Road Hazard

## Name of indicator

Predicted stream crossings

## Questions potentially addressed

AQ (1) How and where does the road system modify the surface and subsurface hydrology of the area? AQ (2) How and where does the road system cause surface erosion? AQ (4) How and where do road-stream crossings influence local stream channels and water quality? AQ (9) How does the road system alter physical channel dynamics, including isolation of floodplains, constraints on channel migration, and the movement of large wood, fine organic matter, and sediment? AQ (10) How and where does the road system restrict the migration and movement of aquatic organisms? What aquatic species are affected and to what extent? How and where does the road system contribute to fishing, poaching, or direct habitat loss for at-risk aquatic species? AQ (13) How and where does the road system facilitate the introduction of non-native aquatic species?

## Description of indicator

Predicted stream crossings are the points where roads and streams intersect, based on GIS coverages or topographic maps.

## Units of indicator

The road-stream intersection points can be attributed with stream order, slope position, slope class, or any available GIS polygon coverage.

## Scales

May be useful at all scales.

## Related Indicators

Predicted road-stream crossings are primarily a function of road location. Areas of high road and stream density usually have a higher density of predicted road-stream crossings. There may be areas where roads on ridges are above stream channels and have few intersections with streams.

## Utility

Predicted road-stream crossings provide an estimate of the location and number of actual crossings. They can also be attributed with other data from the road or stream layers or from polygons.

## Acquisition

Road-stream intersections are produced by intersecting the road and stream layers and putting the intersection nodes into a point coverage.

## **Data needs**

Must have a roads and streams coverage for the GIS process. Can be done manually by using topographic maps with roads and streams.

## **Accuracy and precision**

The accuracy of the stream coverage is critical to producing a useful predicted stream-crossing coverage. Streams delineated on topographic maps typically underrepresent the actual stream channels. Crenulated contour coverages may overrepresent stream channels, depending on the rules used and the individual crenulator. Stream channels delineated by using GIS flow-accumulation programs may not reflect actual stream channels.

## **Durability**

Will change over time if roads are dropped or added to the roads coverage.

## **Monitoring value**

Probably not useful for monitoring, although if roads are dropped from the system there will be fewer predicted crossings.

## **Limitations**

The primary limiting factor is the accuracy of the stream-channel coverage. If it overestimates channels, the predicted number of crossings will be high. If the only stream coverage is from the USGS lines on topographic maps, there will probably be significantly fewer predicted crossings than actually exist.

## **Typical availability**

Wherever roads and streams coverages exist.

## **Where applicable**

Predicted stream crossings can be used as an initial estimate of the number and location of crossings. By intersecting other coverages, such as slope position, it may be possible to make an estimate of fill volume or other factors associated with high risk crossings.

## **Examples**

An intersection of roads and blue-line streams for the Bluff Creek watershed (figure 2-39) has 36 intersection points (predicted crossings). The intersection of roads and stream channels from a crenulated-contour coverage (figure 2-40) has 469 predicted crossings. This is more than 13 times the number of crossings predicted by using the blue-line streams. The Bluff Creek watershed was subdivided into an upper, middle, and lower areas that are about equal. The crossing density (crossings/mile of road) was calculated for each area (figure 2-41). The upper area has a lower crossing density than the middle and lower because most of the roads in the upper area were built on ridges. Many of the crossings in the Bluff Creek watershed were inventoried and compared to the predicted crossings (figure 2-42).

Predicted crossings that were on roads that were not inventoried are not shown. The remaining predicted crossings more than 25 meters from an inventoried crossing were assumed not to be actual crossings. A total of 134 predicted crossings were more than 25 meters from an inventoried crossing. There were 358 predicted crossings and 224 inventoried crossings.

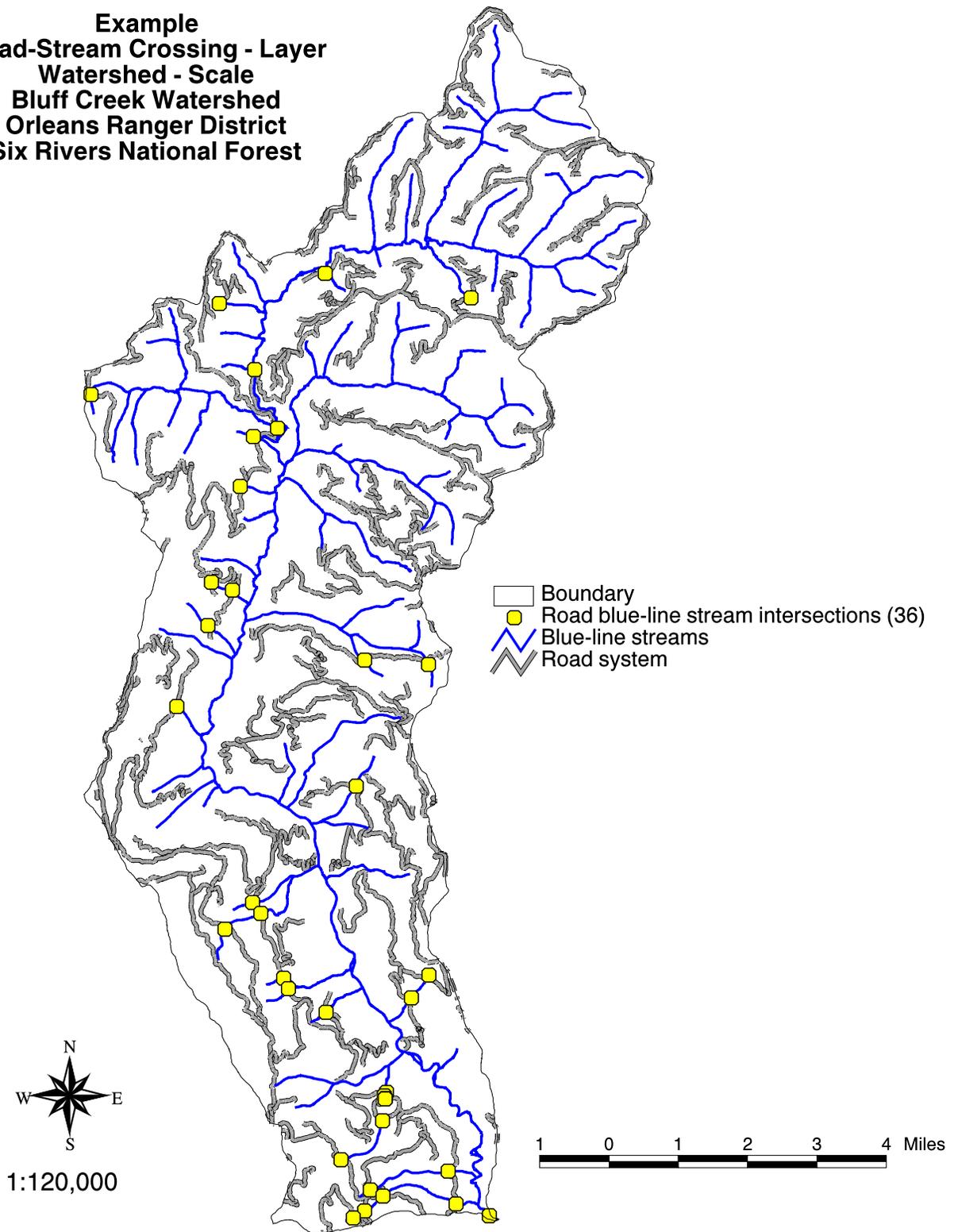
### **Development needs**

The macro for intersecting road and stream coverages to predict stream crossings will be incorporated in a software package. It will also allow attributes from either the road or stream coverage to be applied to the crossing points.

### **Tools references**

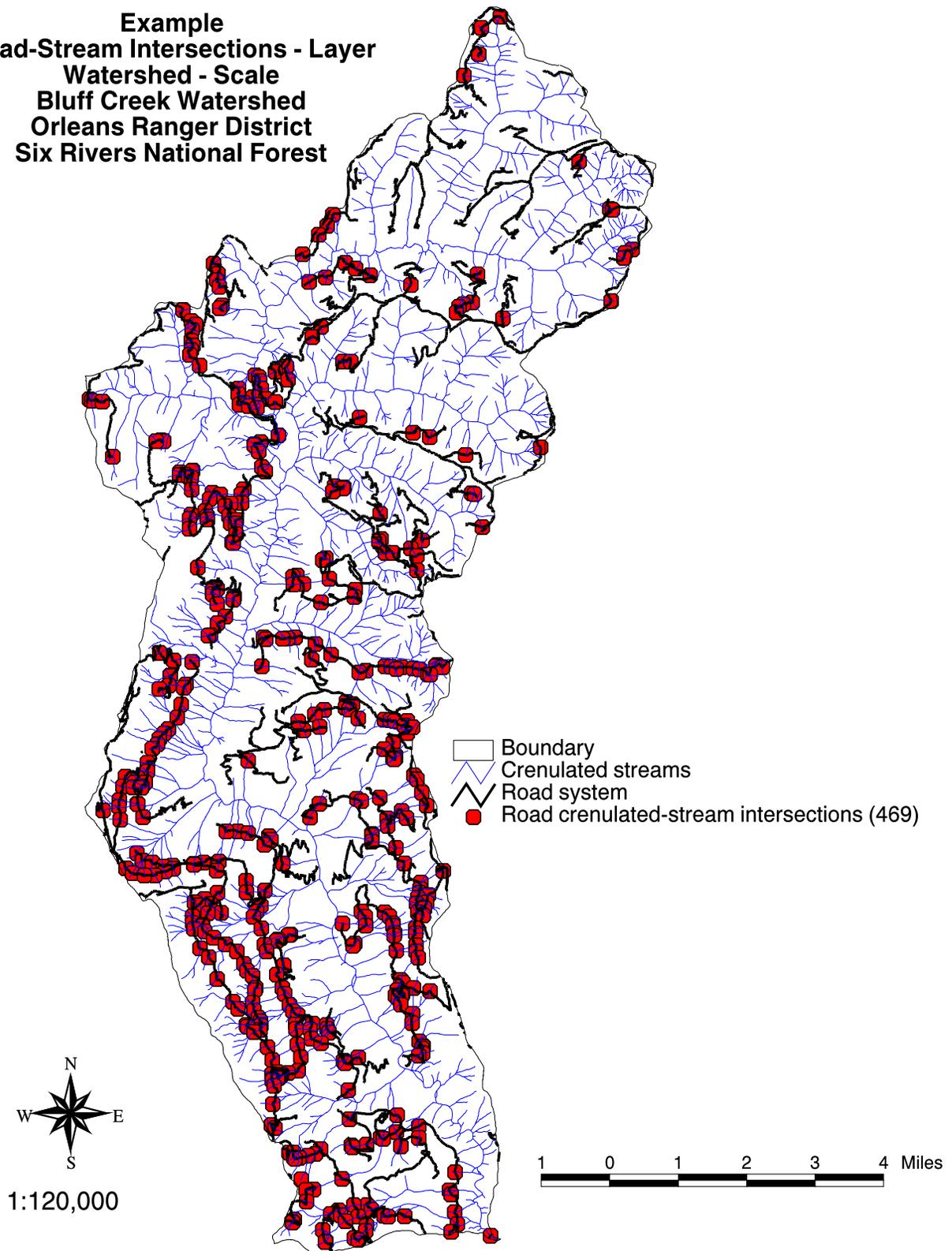
Hydrologic Condition Assessment Tools – Module of Indicators for Roads Analysis (See Appendix 3)

**Example  
Road-Stream Crossing - Layer  
Watershed - Scale  
Bluff Creek Watershed  
Orleans Ranger District  
Six Rivers National Forest**



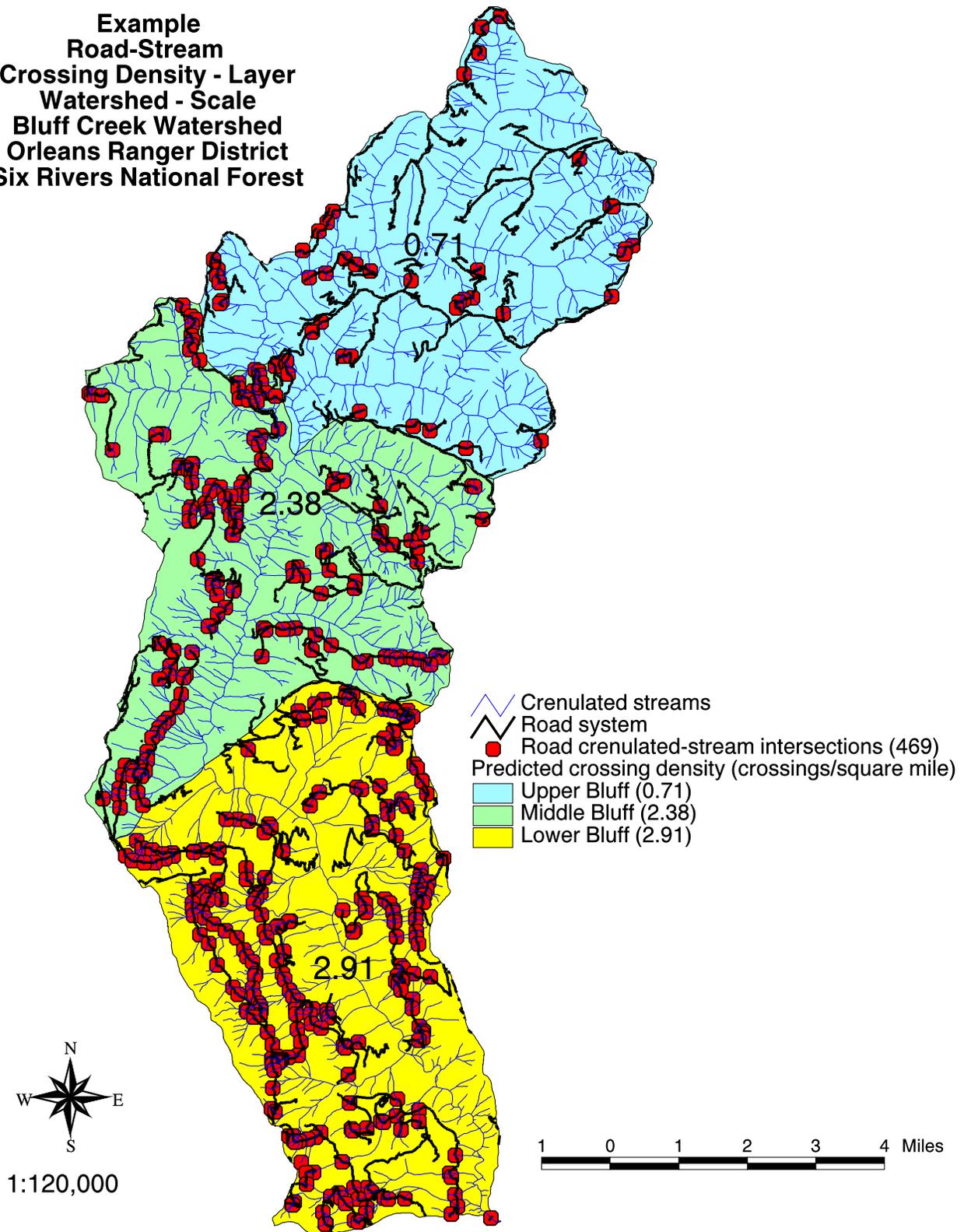
**Figure 2-39. Intersections of roads and blue-line (USGS) streams from the Bluff Creek watershed. There are a total of 36 predicted road-stream crossings.**

**Example  
Road-Stream Intersections - Layer  
Watershed - Scale  
Bluff Creek Watershed  
Orleans Ranger District  
Six Rivers National Forest**



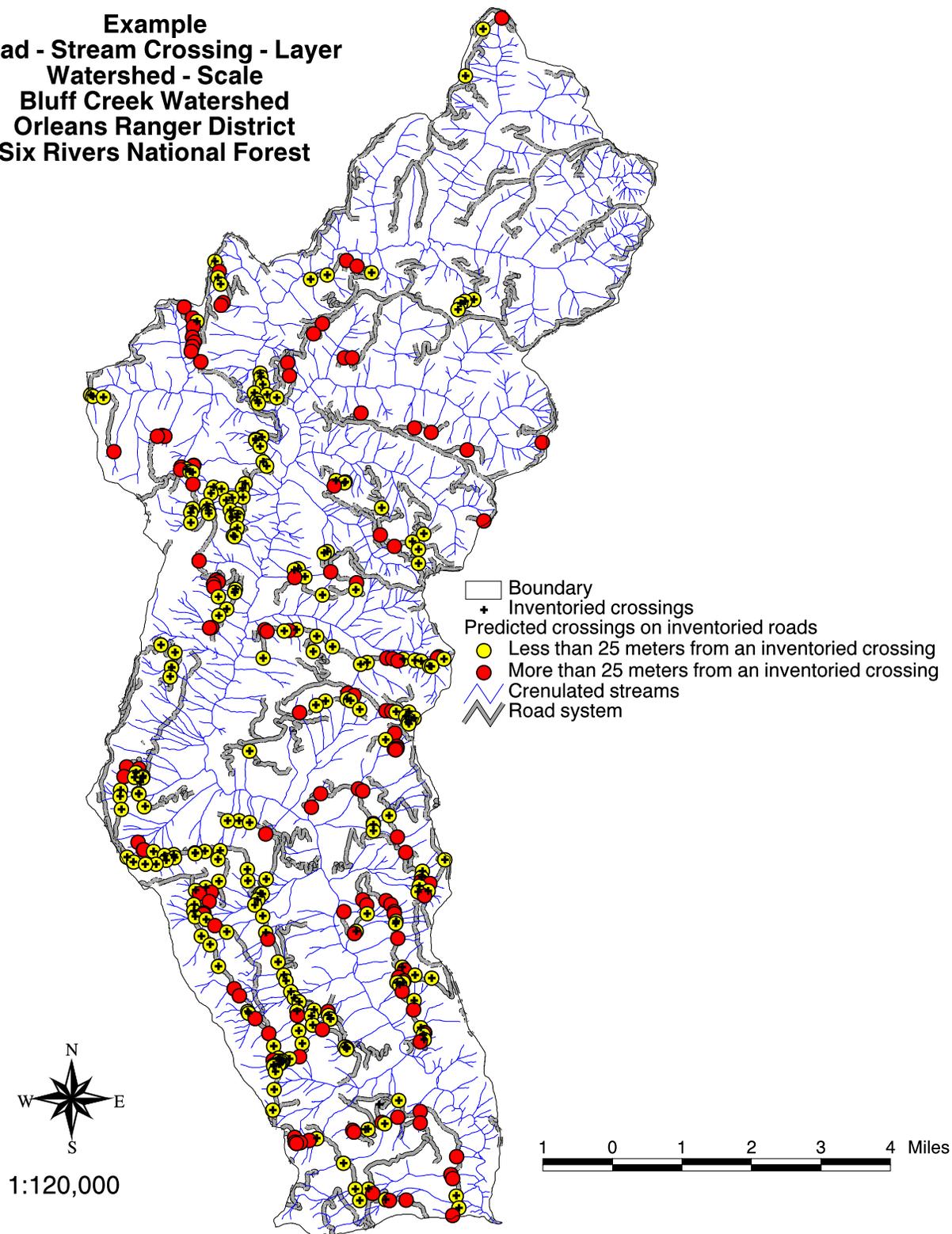
**Figure 2-40. Intersections of roads and crenulated-contour coverage for the Bluff Creek watershed. There are 469 predicted crossings compared to the 36 predicted by using the blue-line streams.**

**Example**  
**Road-Stream**  
**Crossing Density - Layer**  
**Watershed - Scale**  
**Bluff Creek Watershed**  
**Orleans Ranger District**  
**Six Rivers National Forest**



**Figure 2-41. Predicted road-stream crossing density for the upper, middle, and lower areas of the Bluff Creek watershed. The density in the upper area of the watershed is 0.71 crossings/mile compared to 2.91 in the lower area**

**Example  
 Road - Stream Crossing - Layer  
 Watershed - Scale  
 Bluff Creek Watershed  
 Orleans Ranger District  
 Six Rivers National Forest**



**Figure 2-42. Comparison of predicted road-stream crossings (from intersection of road and crenulated-contour coverages) and inventoried crossings. There are 1.6 times as many predicted crossings than inventoried.**