

**AN EVALUATION OF RED SHOULDERS
AS A BICYCLE AND PEDESTRIAN FACILITY**

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Overview

A scenic road in Lake County, Florida is the subject of this evaluation. Lakeshore Drive is about five miles in length and lies between Mount Dora and Tavares, a pair of communities located about 35 miles northwest of Orlando. The road is under both city and county jurisdiction, although maintenance is performed by the county. The location is popular with bicyclists and walkers. Lake County has some hilly terrain and is frequented by bicyclists riding for physical fitness or preparing for races. Bicycling groups from the Orlando area often ride on Lakeshore Drive as part of longer bike rides. The route is also used extensively during the Mount Dora Bicycle Festival each fall.

In the early 1990s the road was scheduled to receive shoulders. This was opposed by the residents who feared

that speeds would increase with the addition of shoulders.

The Florida DOT suggested that painting the shoulders might be a treatment that could be adapted from Europe. Even though the travel lanes would remain at approximately 9.5

feet, adding shoulders would physically

widen the cross

section. The painting of the shoulders was intended to offset the widening in a visual sense (i.e., make the road appear no wider).

In the summer of 1996, a 1.1 mile section of the road was widened with three-foot



Figure 1. A view of the red shoulders

shoulders. The shoulders were colored red with a paint that is used on tennis courts (Figure 1). This treatment has produced a non-slippery surface that has maintained its appearance rather well since the initial painting. The most obvious discolorations occur at locations with frequent motor vehicle traffic, such as mail trucks stopping at mail boxes. Public opinion has been excellent, and residents have been asking when the treatment will be extended to their neighborhoods.

The cost of painting the one-mile section of red shoulders (both travel directions) was approximately \$6,600. The widening and resurfacing costs amounted to \$173,000.

The one-mile treated section of road has a 35 mph speed limit and is primarily a two-lane rural roadway with approximately 1,700 vehicles per day. There are two main intersections along the section where the shoulders have been painted red. In one area a railroad divides the road into two one-lane sections. At the end of this section a roundabout has been added, with the railroad extending through the roundabout and the colored shoulders ending at the entry to the roundabout. Several more intersections (stop-sign-controlled) intersect Lakeshore Drive along the red shoulder section.

Plans are to eventually add painted shoulders to another four miles of the roadway between Mount Dora and Tavares. This section also has numerous traditional three- and four-way intersections. Other traffic calming techniques may also be employed.

Evaluation Issues

The evaluation examined several items. *Speed data* were collected before and after the addition of the red shoulders to determine if motor vehicle speeds had changed. Video was taken of bicyclists traveling along the roadway at sections with and without red shoulders and used to acquire several variables. Besides determining whether the *shoulder was used* by bicyclists, the *lateral positioning* of bicyclists being passed by motor vehicles was determined, along with the *amount and severity of vehicular encroachment* into the opposing lane of travel. If encroachment occurred, *conflicts* between the passing and oncoming motor vehicles were recorded. In addition, any *conflicts* between motor vehicles and bicycles were recorded. A questionnaire was also administered to obtain bicyclist feedback concerning the red shoulders.

Methods

Video

Video was taken of bicyclists traveling along Lakeshore Drive at several locations. These included sections of roadway with and without red shoulders. Figure 2 is a sketch of the area that shows the data collection sites. On the red shoulder section, there were three sites on Lakeshore Drive used for the videotaping: (1) the roundabout near the business district of Tavares (labeled as Site 1 on Figure 2), (2) an adjacent newly designed intersection (Site 2) about 1/4 mile east of

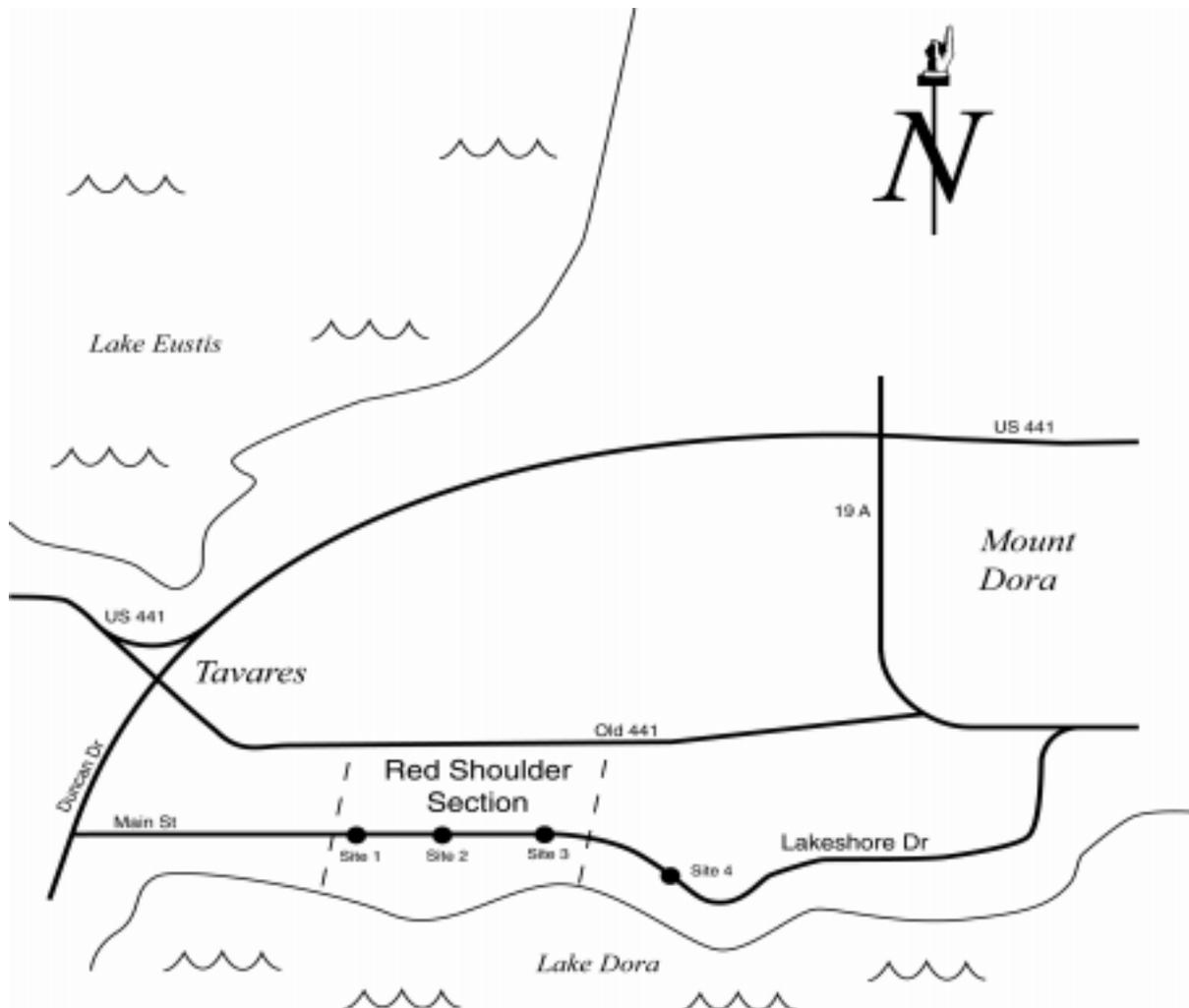


Figure 2. Map of the area

the roundabout where railroad tracks lie in the middle of the road, and (3) a non-intersection location (Site 3) about another 1/4 mile east of the newly designed intersection. A non-intersection location on Lakeshore Drive without any shoulders (Site 4) was also videotaped. This site was about 1/2 mile east from the red shoulder non-intersection location mentioned above. Figures 3-6 show views of the four sites.

Videotaping was done by persons hired locally and started in October 1997 and ended in June 1998. At first videotaping was attempted both during the week and on weekends. However, bicycle traffic on the road was so sparse during the week that videotaping was shifted exclusively to weekends, when more recreational and touring riders were present. The typical pattern was to videotape for four hours on both Saturday and Sunday mornings. The videotapes were sent to the Highway Safety Research Center for review and analysis. Bicycle and motor vehicle data (discussed later in detail) were then coded directly to a computerized database to obtain the variables of interest for the analysis.

Speed Data

Speed data were gathered by the Lake County Department of Public Services before and after the installation of the shoulders. Data were obtained using pneumatic tubes and digital counters at locations with and without the red shoulders.

Mailback Questionnaire

A mailback questionnaire developed by the Lake County Department of Public works was administered to bicyclists riding along Lakeshore Drive near Sites 3 and 4. Three questions were posed:

1. Do you feel that widening Lakeshore Drive and adding the painted red shoulders has resulted in:

- a. Slower speeds for cars and trucks
- b. Faster speeds for cars and trucks
- c. No change in the speeds of cars and trucks

2. As a result of adding the painted red shoulders, do you feel that there is:

- a. More space between bicyclists and passing vehicles
- b. Less space between bicyclists and passing vehicles
- c. No change in the space between bicyclists and passing vehicles



Figure 3. View of Site 1.



Figure 4. View of Site 2.



Figure 5. View of Site 3.



Figure 6. View of Site 4.

3. Compared to ordinary unpainted paved shoulders, do the painted red shoulders:
- _____ a. Make you feel more safe
 - _____ b. Make you feel less safe
 - _____ c. Make no difference in how safe you feel

Space was also given for additional comments.

Analysis and Results

Bicyclist Characteristics

Overall, data were coded for 757 bicyclists videotaped while traveling through the four sites shown on Figure 2. Across all sites, the estimated ages of the cyclists were distributed as the following:

•	Less than age 16	n=31	4.2%
•	16-24	n=22	3.0%
•	25-64	n=668	90.3%
•	65+	n=19	2.6%

The vast majority of the cyclists were ages 25-64. Age of cyclist could not be determined for 17 riders, and these are excluded from the totals above. Missing values are treated this way in all subsequent tables.

Gender of the cyclists was also coded, and about 2/3 were male:

•	Male	n=505	67.3%
•	Female	n=245	32.7%

Use of the Red Shoulders

Grouping all three sites, nearly 80 percent of the cyclists made full-time use of the red shoulder (Table 1). Another 14 percent did not use the shoulder at all, and 6 percent used the shoulder partially (i.e., split time riding on the shoulder and in the travel lane). Most of the non-users were part of groups of cyclists where riding might be done two abreast. Use of the red shoulders for Sites 1-3 is also indicated separately in the table. More than 86 percent of the

Table 1. Bicyclists using the red shoulders by site.

Bicyclist Used Shoulder	Site 1	Site 2	Site 3	Total
Yes	38 (69.1) ¹	102 (71.3)	226 (86.6)	366 (79.7)
No	13 (23.6)	36 (25.2)	16 (6.1)	65 (14.3)
Partially	4 (7.2)	5 (3.5)	19 (7.3)	28 (6.1)
Total	53 (11.6) ²	143 (31.4)	259 (56.9)	455 (100.0)

cyclists used the Site 3 red shoulder, as compared to 69 percent at Site 1 and 71 percent at Site 2. The use is likely lower at Sites 1 and 2 because these are intersection sites close to the downtown of Tavares, where speeds of motor vehicles are lower and cyclists are maneuvering for turns at the intersections. Site 3 is a non-intersection location that functions more like a rural road, with cyclists often proceeding straight through the intersection.

Motorists Passing Bicyclists

Several variables were coded when motorists passed bicyclists, including motor vehicle encroachment information and whether there were conflicts between motor vehicles as a result of the encroachment. The bicyclist was videotaped over an extended distance, both approaching and departing from the camera position, when possible.

Encroachments. Encroachment was defined as the motor vehicle moving across the center line and into the other lane of opposing traffic when passing the bicycle. Severity of encroachment (Figures 7-9) was coded as the following:

¹Column percent.

²Row percent.



Figure 7. Minor encroachment

- Minor - motor vehicle just over centerline
- Moderate - 1/4 to 1/2 of motor vehicle over centerline
- Severe - more than 1/2 of motor vehicle over centerline

Depending on vehicle volumes, up to three encroachments could be coded for each bicyclist (i.e., three separate motor vehicles passing a bike and encroaching into the oncoming traffic lane).



Figure 8. Moderate encroachment

The primary comparisons were made from data collected at the two non-intersection locations with (Site 3) and without (Site 4) the red shoulders. The roadway width was just under 19 feet at both Sites 3 and 4, with the only difference being the 3-foot red shoulders on both sides of the road at Site 3. Based on results from a recent study for the Florida DOT (Harkey and Stewart, 1997), it was hypothesized that both the frequency and level of encroachment would be worse at the site without red shoulders. The FLDOT study found that motor vehicle encroachment into the adjacent lane when passing a bicycle was much greater on wide curb lanes (22.3 percent) than on facilities with bike lanes (8.9 percent) or paved shoulders (3.4 percent).



Figure 9. Severe encroachment

Overall there were 374 encroachments, with about 1/3 taking place at Site 3 and 2/3 at Site 4 (Table 2). The 143 encroachments at the red shoulders site distributed fairly equally into minor, moderate, and severe levels. There were also occasions at this site where the motor vehicle passed the bicyclist without any encroachment into the adjacent traffic lane (Figure 10). The vast majority (93 percent) of the 231 encroachments at the non-red shoulders site were severe.

Table 2. Frequency and severity of encroachment when a motor vehicle passed a bicycle.

Level of Encroachment	Site 3 with Red Shoulders	Site 4 without Red Shoulders	Total
Minor - just over centerline	45 (31.5)	1 (0.4)	46 (12.3)
Moderate - 1/4 to 1/2 over centerline	44 (30.8)	16 (6.9)	60 (16.0)
Severe - >1/2 over centerline	54 (37.8)	214 (92.6)	268 (71.7)
Total	143 (38.2)	231 (61.7)	374 (100.0)



Figure 12. Passing a bicyclist on the red shoulder section without encroaching into adjacent traffic lane.



Figure 11. Serious motor vehicle to motor vehicle conflict resulting from a passing maneuver.

Conflicts. An **encroachment conflict** between motor vehicles was defined as one of the motor vehicles having to suddenly change speed or direction as a result of a motor vehicle passing a bicycle and encroaching into the adjacent lane (Figure

11). It was hypothesized that more conflicts would occur at the site without red shoulders

because the severity of encroachment would tend to be greater. This was indeed the case. There were no encroachment conflicts at the red shoulder site and eight conflicts at the non-red shoulder site (four minor and four serious).

A **bicycle-motor vehicle conflict** was defined as the bicycle or motor vehicle having to suddenly change speed or direction as a result of a maneuver by the other. There were a few events that nearly met this definition of a conflict, but none that actually merited such a classification at either Site 3 or Site 4. Figure 12 shows an example of a potential bike-motor vehicle conflict at Site 3. In this case a motor vehicle was passing a group of bicyclists and had to quickly return to its own lane to avoid an oncoming motor vehicle. The cyclists, however, appeared to be unaffected by the maneuver.



Figure 12. A potential bicycle-motor vehicle conflict.

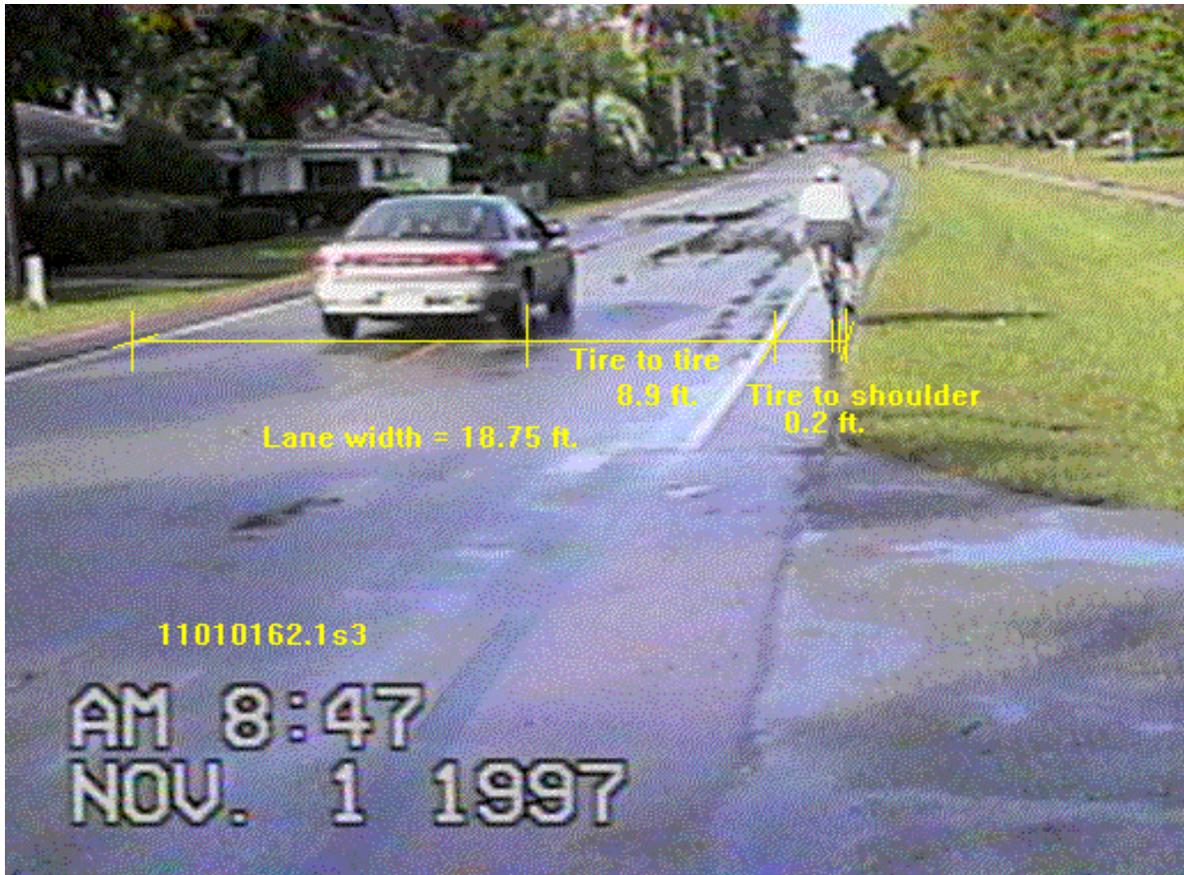
Lateral Positioning of Bicycles Being Passed by Motor Vehicles

It was felt that the **lateral positioning** of bicyclists when being passed by motor vehicles would produce two measures of effectiveness of the red shoulders. Two hypotheses were formulated. The first was that bicyclists would ride closer to the edge of pavement on the non-red shoulder section when being passed due to the lack of a stripe designating the shoulder. This was the finding in the aforementioned study for the Florida DOT, where such spacing measurements were made on streets with bike lanes and wide curb lanes from a camera positioned inside a van following motor vehicles as they overtook bicycles. The finding from this study was that the distance between the bicyclist and the edge of the roadway was considerably greater on bike lane and paved shoulder facilities (2.6 feet) than on wide curb lanes (1.3 feet).

The FLDOT study also found that motor vehicles moved about 1.3 feet further to the left when passing a bicyclist on wide curb lanes compared to bike lane and paved shoulder facilities. Thus, the second hypothesis was that the spacing between bicycles and passing motor vehicles would be greater on the non-red shoulder section, in that the passing vehicles would tend to swing out wider around a bicyclist not riding in a designated shoulder area.

Distance from Bicycle to Edge of Pavement. Images of motor vehicles passing bicycles at Sites 3 and 4 were extracted from the videotapes. Using image analysis software (SigmaScan Pro 4.0) and the roadway width as a calibration measurement, two spacing distances were derived. The first was the distance from the outside bicycle tire to the edge of pavement, and the second was the distance between the bicycle and passing motor vehicle (Figure 13).

The mean distances from the bike tire to edge of pavement were 1.56 feet at the red shoulder site and 1.32 feet at the non-red shoulder site. The variances associated with the means were almost identical, and a t-test assuming equal variances showed there to be no statistically significant difference between the two mean values. **In other words, bicyclists positioned themselves about the same distance from the edge of pavement on both the red shoulder and non-red shoulder sections.**



Spacing Between Bicycles and Passing Motor Vehicles. In the previous FLDOT study, the mean distance between the bicycle and a passing motor vehicle was 5.41 feet on roads with 3-foot bike lanes and 5.63 feet on roads with 3-foot paved shoulders. Most of the adjacent traffic lane widths were 11 or 12 feet, and the traffic volumes were generally much greater, indicating less opportunity to pass bicyclists. In the current study, the mean distance between the bicycle and a passing motor vehicle (bike tire to motor vehicle tire) was 6.55 feet at the red shoulder site and 7.17 feet at the non-red shoulder site, or a foot or so greater than was found in the FLDOT study. However, the adjacent traffic lane widths were approximately 9.5 feet at both Site 3 and Site 4 on Lakeshore Drive.

The variances associated with the means for the Lakeshore Drive sites were almost identical, and a t-test assuming equal variances showed that the difference in the means was statistically significantly different ($p=.01$). **In other words, the spacing between bicycles and passing motor vehicles was greater on the section without red shoulders.** This result is

similar to that found in the FLDOT study, where passing motorists tended to space themselves further from bicyclists on facilities with wide curb lanes than on facilities with bike lanes or paved shoulders.

Motor Vehicle Speeds

Speed data were gathered on Lakeshore Drive by the Lake County Department of Public Services both before and after placement of the red shoulders. There were three before and three after measurements. The data were consistently collected during midweek on a non-red shoulder section midway between Sites 3 and 4 (referred to as “Main Site” below). The location is away from intersections and was selected to reflect cruising speeds of motorists. Traffic volumes ranged from 1,472 to 1,582 vehicles per day. Traffic on the roadway tends to be highly local.

Table 3 shows mean and 85th percentile speeds. Highest mean and 85th percentile speeds were recorded in September 1993, and the lowest values were in August 1995 (prior to the red shoulders). Compared to January 1996, about six months before the red shoulders were installed, results show very little difference in either the mean speed or 85th percentile speed during the after period.

Table 3. Before and after speed data at Main Site on Lakeshore Drive.

Before Red Shoulders	Mean Speed (mph)	85 th Percentile Speed (mph)
September 1993	40.2	47.6
August 1995	36.2	45.8
January 1996	39.3	46.3

After Red Shoulders	Mean Speed (mph)	85th Percentile Speed (mph)
June 1996	39.3	46.3
July 1997	39.6	46.9
May 1998	39.8	47.0

Similar results were obtained at another speed data collection site (Comparison Site) a few miles closer to Mount Dora (no table shown). Overall mean speed values for both sites are shown below:

	<u>Before Red Shoulders</u>	<u>After Red Shoulders</u>
Main Site	38.8 mph	39.6 mph
Comparison Site	35.8 mph	37.4 mph

At the Main Site the mean speed increased by 2.1 percent from before to after, while at the Comparison Site the mean speed increased by 4.5 percent. The ratio of the Main Site mean speed to Comparison Site mean speed was 1.08 before the red shoulders and 1.06 after. **Thus, there is no evidence that the mean speed increased at the Main Site any more than at the Comparison Site.**

Mailback Survey Results

The mailback **questionnaire** developed by the Lake County Department of Public works and administered to bicyclists riding along Lakeshore Drive near Sites 3 and 4 was fairly well received. Approximately 125 questionnaires were handed out at various times during the data collection, and 92 responses were obtained. Answers to the three questions on the survey are shown below:

1. Do you feel that widening Lakeshore Drive and adding the painted red shoulders has resulted in:

- | | |
|---|-------------------|
| a. Slower speeds for cars and trucks | 12 (13.2%) |
| b. Faster speeds for cars and trucks | 6 (6.6%) |
| c. No change in the speeds of cars and trucks | <u>73 (80.2%)</u> |
| | 91 (100.0%) |

2. As a result of adding the painted red shoulders, do you feel that there is:

- | | |
|---|-------------------|
| a. More space between bicyclists and passing vehicles | 79 (85.9%) |
| b. Less space between bicyclists and passing vehicles | 0 (0%) |
| c. No change in the space between bicyclists and passing vehicles | <u>13 (14.1%)</u> |
| | 92 (100.0%) |

3. Compared to ordinary unpainted paved shoulders, do the painted red shoulders:

- | | |
|--|-------------------|
| a. Make you feel more safe | 75 (79.0%) |
| b. Make you feel less safe | 3 (3.2%) |
| c. Make no difference in how safe you feel | <u>17 (17.9%)</u> |
| | 95 (100.0%) |

The responses were quite favorable toward widening the road and adding the red shoulders. Slightly more than 80 percent felt the shoulders had resulted in no change in the speed of cars and trucks, and another 13 percent felt that speeds had slowed. More than 85 percent felt there was more space between bicyclists and passing vehicles with the red shoulders. It is obvious that the red shoulders increased the comfort level of bicyclists on the section, because the actual spacing between bicycles and motor vehicles was greater on the section without red shoulders. Finally, almost 80 percent felt that the red shoulders made them feel more safe than ordinary unpainted shoulders.

Space was also given for additional comments. The complete set of comments is provided in Appendix A and are generally quite favorable, as would be expected from the above responses. However, a comment section also tends to elicit negative remarks. These tend to refer to wanting the shoulder wider, problems with trash or debris on the shoulder, and wanting the shoulder extended all the way to Mount Dora. Shown below are some typical positive and negative responses - it is interesting to note that many bicyclists consider the red shoulders to be a bike lane:

Positive Responses.

- I think the color variation helps noncycling motorists know that it is not just part of the road, that it is a “different” lane for cyclists.
- Bike lanes make me feel safer no matter what color they are. Wider roads add safety to motorists and bicyclists alike.
- I think it makes motorists more aware of the shoulders.
- Bike lanes keep drivers off of the section of road that bikes use, primarily due to the solid white line that designates that section of pavement as not belonging to cars.
- I love them. They make the cyclist area very clear. It is especially nice when kept clean from debris.
- They improve the “look” of the neighborhood too!
- Bike lanes work! They make it **much** safer for the cyclist and give cars and trucks more room to pass, making it more convenient for them as well.

Negative Responses.

- The shoulder could be wider, at least a foot wider. Trash on the shoulder is sometimes a problem.
- If the intent was for bicyclists to ride in the red area, it is not wide enough. It should be 6 feet either on both sides or on one side. It’s a good start. Let’s spend the money and make the next phase wide enough.
- It is better than nothing, but still too narrow for adult tricycles.
- The shoulders should be at least two feet wider to do any good. I walk Lakeshore Drive every morning and I still have to get off into the grass or get hit.
- The widening was only for a couple of miles. My family rides bikes and runs and the widening needs to be extended. The money expended was extremely worthwhile as this area is sought out by bikers and runners who spend additional dollars in our communities.

- Dedicated lanes help both cyclists and motorists, however, the lane must be kept debris-free. Otherwise, such lanes become hazards! Today, the lane contained obstructions and debris. Also the lane itself is not as “flat” (grade of pavement) as the road itself. Lane should be “ultra-smooth”.

Discussion

Evaluation of the red shoulders considered a variety of issues. Major findings are highlighted below:

- Full-time bicyclist use of the shoulder tended to be around 80 percent, and another 6 percent used the shoulder partially.
- The frequency of motor vehicles encroaching over the center line when passing a bicyclist was greater at the site without red shoulders.
- The severity of encroachment was fairly evenly split between minor, moderate, and severe at the red shoulder site. Almost 93 percent of the encroachments were severe at the site without red shoulders.
- There were no motor vehicle to motor vehicle conflicts when passing a bicyclist at the red shoulder site, and there were eight (four minor and four serious) at the site without red shoulders.
- Bicyclists positioned themselves about the same distance (about 1.5 feet) from the edge of pavement on both the red shoulder and non-red shoulder sites.
- The spacing between bicycles and passing motor vehicles was statistically significantly greater (about 0.6 feet) at the site without red shoulders. In reality, however, this difference is hardly practical.
- Mean and 85th percentile speeds show little difference before and after the placement of the red shoulder.
- Mailback survey responses showed that 80 percent of the respondents felt that the red shoulders had resulted in no change in the speed of cars and trucks. More than 85 percent felt there was more space between bicycles and passing motor vehicles with the red

shoulders in place, even though actual measurements of spacing distance showed more clearance between bicycles and motor vehicles on the section of roadway without red shoulders. A final survey response showed that almost 80 percent felt that the red shoulders made them feel more safe than ordinary unpainted shoulders. Thus, bicyclist comfort level was increased by installing the red shoulders.

The red shoulder section of roadway has not only been well received but also has functioned well in an operational sense. The comfort level of bicyclists appears to be greater on the red shoulder section, which matches the results of a recent Federal Highway Administration study focused on the development of a bicycle compatibility index (BCI), a means of measuring the “bicycle friendliness” of a roadway (Harkey, Reinfurt, Knuiman, Stewart, and Sorton, in press). In this study the variable with the largest effect on the index was the presence of a bicycle lane or paved shoulder. In other words, the presence of a bicycle lane or paved shoulder increased the comfort level more than any other factors.

Use of the shoulder was quite high. Riders who did not use the red shoulder tended to be part of a group, where the typical placement was to have one or more following cyclists riding to the left of lead cyclists for safety purposes. In addition, cyclists in pairs often rode abreast so they could converse. Children also had a tendency to be partial users of the red shoulders, with a tendency to cross back and forth across the road.

In regard to positioning with the roadway, the spacing between bicycles and passing motor vehicles was slightly greater at the site without red shoulders. It is perhaps arguable whether this is preferable. A larger spacing means more clearance between the motor vehicle and bicycle. At the same time, the larger spacing was also associated with more motor vehicle encroachments and motor vehicle to motor vehicle conflicts at the site without red shoulders. In reality, there was little practical difference in the spacing between bicycles and passing motor vehicles at the site with red shoulders or the site without. At either site, there was a tendency for the spacing to be greater when the motor vehicle was passing a child cyclist, an adult tricycle, or a group of riders.

Perhaps the most important evaluation parameter was the speed of motor vehicle traffic before and after the placement of the red shoulders. The primary intent of the red shoulders was to create a visual sense of no widening of the road, which would lead to no increase in traffic speed. This appears to be the case. One could speculate that the general curvy alignment of the roadway could also have a bearing on this result; however, the section of the roadway where the red shoulder was installed is relatively straight.

The overall conclusion is that the red shoulders have produced operational benefits for both bicyclists and motorists.

APPENDIX A

QUESTIONNAIRE COMMENTS

COMMENTS ON LAKESHORE DRIVE RED SHOULDERS

Answer to # 3 is the key (given enough space). Painted bike lanes are a must - must - must if bike safety is a consideration!!!! Do we need a study to prove this. More bikes mean local government must - must - must respond. If they don't, I'm sure insurance companies will - will - will!!!! Thank you for "proving" the obvious!

I think it makes everyone more aware of cyclists and safe driving.

I think the color variation helps noncycling motorists know that it is not just part of the road, that it is a "different" lane for cyclists.

Bike lanes make me feel safer no matter what color they are. Wider roads add safety to motorists and bicyclists alike.

I think it makes motorists more aware of the shoulders.

Dedicated lanes help both cyclists and motorists, however, the lane must be kept debris-free. Otherwise, such lanes become hazards! Today, the lane contained obstructions and debris. Also the lane itself is not as "flat" (grade of pavement) as the road itself. Lane should be "ultra-smooth".

Painted surfaces tend to be very slick when wet.

We definitely need bicycle lanes. It would slow cars and trucks that bikes are part of the traffic and they are recognized as belonging on the road.

The red shoulders were starting to have lots of cracks. Doesn't appear it holds up well. Would feel much safer still with a "bikes only" sign and a bicycle marked lane on the path.

The fact that they are red means nothing. A line of separation and a sign saying "bikes lane" with the words "bikes only" painted on the street are best. Plus, the lane (red) ends, so where does it go? For a cyclist, it compares to a paved road that dead ends into a dirt road. You can travel on it, but not as safely. Thanks for your concern.

I am concerned if the paint will make the surface more slippery when it is wet. I think it was a good idea otherwise.

Item 3b - less safe because paint felt like it had less traction than unpainted asphalt. My fat knobby tires have a center ridge. On painted surfaces, like road stripes, these tires slip and slide. I have noted my fellow freewheelers seem to prefer to ride their skinny road bike tires on those same strips that cause me to lose traction. Accordingly, I felt most road bikers would actually like the smooth painted surfaces. Thanks for your efforts. (A Florida Freewheeler)

The painted shoulders are nice, but I don't think they make much difference over non-painted shoulders (assuming the same width shoulder). I wish they would put shoulders on the entire length of Lakeshore – all the way to Mt Dora.

I do not think the painting does much to cars, but it makes the cyclist feel like he has his own "turf".

Bike lanes keep drivers off of the section of road that bikes use, primarily due to the solid white line that designates that section of pavement as not belonging to cars.

Bike lanes make drivers aware that bikers may be on the road.

The use of paved shoulders designated for bicycle traffic should be promoted nationwide.

I feel that is "my space" when on a bike. Vehicles know it is the space for bikers and respect that.

Shoulders on roads are very necessary for bike safety. Angry motorists resent sharing the road with bikers, especially if shoulders aren't present. Stricter enforcement of speed laws and posted signs that say **Yield to Bikers** or **Caution Bikers Present**.

Very comfortable to ride on. However, must be kept clean and clear to be effective.

It looks nice.

I love them. They make the cyclist area very clear. It is especially nice when kept clean from debris.

The extra space and color are definitely an improvement. We need more.

I feel the different color between paved roadway and the bicycle lane give passing motorists a way to differentiate between their space and the road shoulder. When the shoulder is regular pavement color separated by only the white line, they are more likely to think of it as extra lane space. It's a good idea!

Signs along the road indicating the bike way might help draw attention and make motorists more aware of cyclists' space on road.

At first I thought they would be slippery, but this has proven not to be the case. I think I feel safer because I believe drivers view this red painted area differently than an unpainted lane, but I don't know if this is a true assumption. Thank you for allowing me to participate in this survey.

The best bike paths are usually wider than the red shoulders because they allow for more distance between cars and bikes. That said, the red paths are a great improvement for all vehicles. Having a smooth unobstructed path is much safer for bikes and cars. Residents and visitors alike will greatly enjoy the recreational and safe bikeways. Thanks for asking for our opinion.

They improve the "look" of the neighborhood too!

I haven't ridden the red path enough to feel qualified to answer the first two questions but as a bike rider, I feel any bike paths are potentially life-savers. My gut feeling is that red adds an element of awareness for the drivers.

I truly believe that if our government or local government insisted on 3-4' shoulders on every road, cycling would replace driving and our real world would improve. Also jogging, walking -- all would be better for all of us with shoulders on **all** roads.

Bike lanes lend credibility to the biker. (Most motorists seem to believe bikes are not supposed to be on the road -- many have hollered "Get on the sidewalk where you belong".) The painted area makes the pavement smoother and seems to stay cleaner than unpainted bike lanes (maybe it is easier for the wind to blow the dirt away). I don't know how the painted area would be when wet. The painted white stripes are always very slippery when they're wet.

It would be wonderful if all roads were with the red bicycle lanes.

Red shoulders reduce tendency of car and truck drivers to drive on shoulders. This means they will develop a better habit, that of driving always in car lane.

Bike lanes work! They make it **much** safer for the cyclist and give cars and trucks more room to pass, making it more convenient for them as well.

The shoulder could be wider, at least a foot wider. Trash on the shoulder is sometimes a problem.

I appreciate the red painted shoulders for bicyclists, but they are too narrow to feel safe! They need to be at least a foot or more wider! I'm sure vehicles would like the red shoulders made wider, so they wouldn't have to slow down and sometimes pull out around us to ensure our safety riding our bikes. I ride a 3-wheel bike and it's a little scary to ride so close to passing vehicles.

I go the red painted widened lanes all the way to Mt. Dora and around Lake Dora! These red painted shoulders are the greatest!

Love the wide, painted shoulders of the road on Lakeshore Drive. Please continue the red wide shoulder to Mount Dora.

The shoulders need to be wider and longer. I ride Lakeshore Drive into Mount Dora, but the red shoulders don't go that far. I ride all the way to Donnley Street, which is not really safe, with the "Bike Fest" and a major triatalane in Clermont. Surely Lakeshore Drive can show improvement.

The video of the cyclists took place only on weekends; however, many avid bicyclists ride every day of the week using Lakeshore Drive. The painted red shoulders are great and should continue through the City Limits of Mount Dora and around the entire Lake Dora road area since we use this for our main riding route. Please tell the County Commissioners to add the red painted shoulders throughout the entire county road system. Many thanks for your video, survey, and concern for the bicyclists of Lake County.

Would like to see the red painted lines extended into Mt. Dora and more signs for vehicles to

alert them of bicyclists on the road. This road is one, if not the most, popular route for bicyclists in the area and could be for walkers and runners if it were widened.

The width of the shoulders could be enhanced by regular edging and keeping debris off of the surface whether painted or not. The shoulders make me feel much safer.

When garbage man picks up, if he breaks or spills garbage, he needs to pick it up. I don't go past the stop sign on Main Street because cars go too fast.

If the intent was for bicyclists to ride in the red area, it is not wide enough. It should be 6 feet either on both sides or on one side. It's a good start. Let's spend the money and make the next phase wide enough.

Paved shoulders are safer than no shoulders. The quality of the pavement (new) also helps a great deal. I feel 3 ft is really a minimum but if we had it on most roads, it would certainly be a great improvement and I believe bike traffic would increase.

While I think the idea of the bike lane is great, the practical side is less so. It is my experience that when vehicles see the bike lane, they tend to stay in the right lane when passing bicyclists. Without the bike lane, most cars will move over to the left lane when passing. This generally results in more car/bike clearance without the lanes. I bicycle approximately 12 miles times 5 days weekly. Good luck with your project.

It would be nice if all of Lakeshore Drive could have widened shoulder areas (paved in red) to make bicyclists feel safer on this road.

- 1) Instead of red, amber-yellow "caution"
- 2) All paved roads in Florida should have a paved pathway alongside or separate from the road. My wife and I have biked in Florida over 5,000 miles in the past five years. We avoid all busy roads and cycle 90 percent off-road, such as Pinellas Trail, Clearwater or islands such as Long Boat, Sanibel, Saliner Ranch - Sarasota.

The painted red shoulders are great for bike riding.

The red shoulders help those of us who bicycle feel safer. For some reason, grass clippings collect along the shoulder and create dangerous conditions within the shoulder. Is there a possibility to have them maintained as a bicycle path? We are grateful for whatever we can get in a state where the "Automobile is King".

Red shoulder project should extend entire road to Mt. Dora. Pedestrian and cyclist safety would be greatly enhanced.

We would like to see the red shoulders extended into Mt. Dora!

I feel the red shoulders make it a safer place for bicyclists. They make a difference for me and friends who ride.

Automobile drivers still consider bicycles “toys”. They feel that bicycles should be on sidewalks. I ride an average of 100-150 miles a week. Close calls are too numerous to list. The only solution is separate trails (paved) with barricades separating autos from bikes.

I love the addition to the road! It looks great and as a walker, I feel safer. I’m not sure whether the increased number of cars and trucks is due to widening or just resurfacing. A smooth road invites higher speeds than a pot-hole filled one. The speeds seem to be the same ones each day for the most part. People hurrying to and from work.

I am a tri-athlete and the shoulder should be on all roads to decrease accidents.

The red shoulders need to be twice as wide. You need to visit Portland, Oregon and see what a real bike lane looks like. I feel very strongly that Lakeshore needs these “bike” lanes, as there are many walkers out on the street and they rarely move out of the street when vehicles are bearing down on them. As a driver, the narrow red lanes make me nervous - especially when people are walking their dogs. So, if you’re going to spend the money, DO IT RIGHT!

Cars drive faster. Increase in cars, because road is wider. Makes cars feel that they can now pass, and they do.

I strongly hope that the red shoulders will be extended the length of Lakeshore Drive. I’m a marathon runner and Lakeshore is my favorite place to train. It is my hope that the road will be made safer by extending the red shoulders.

Red shoulders are safer for runners and bicyclists.

Would much prefer a separate lane. Walk this road nearly every day.

Although I do not perceive a slower speed for motor vehicles, I believe very strongly that the added safety factor is immense. I bike this road several times a week!

My observation is that there are more walkers and runners than bike riders. It is a nice area to walk, but it is dangerous for the road is so narrow and as I said the cars seem to hug the white line near the red area.

The widening of Lakeshore is long overdue. The paved red shoulder will make it safer for vehicles and runners. I think more runners and bicyclists would use it.

P.S. The sooner the better for all.

It is better than nothing, but still too narrow for adult tricycles.

Make it longer!

I think red painted shoulders will be great on Lakeshore Drive toward Mt. Dora. If possible they should be even wider than the ones in Tavares.

Keep improving road facilities for bikers!

Painted paved shoulders are a great asset to a bike rider, runner, walker. They should be widened and extended. Most motor vehicles have safety in mind but there are those who think we should not share the road.

I walk this route twice a day most days and I don't feel there is enough room to walk, for the cars seem to hug the white line along the walking lane. I feel unsafe. I'm afraid someone is going to get hit!

The shoulders should be at least two feet wider to do any good. I walk Lakeshore Drive every morning and I still have to get off into the grass or get hit.

The widening was only for a couple of miles. My family rides bikes and runs and the widening needs to be extended. The money expended was extremely worthwhile as this area is sought out by bikers and runners who spend additional dollars in our communities.

We would like to see painted red shoulders added to the rest of Lakeshore Drive. We enjoy cycling here and feel much safer with the painted shoulder. Additionally, we think some sort of additional traffic control such as a "stop sign" added on Luccom will help to control traffic speed.

We think that the speed on Lakeshore Drive should be **25** and certainly no more than **30** miles per hour. The road is curvy and dangerous at higher speeds. When you have a 35 mile speed limit, the traffic tends to be 40-45 miles per hour. **Much Too Fast.**

Please widen road to provide space for bicycles, joggers, dog walkers. Thank you.

Wish we had this kind of riding space on our roads.

APPENDIX B

SELECTED VIEWS OF SITES USED IN THE RED SHOULDERS PROJECT

SELECTED VIEWS



