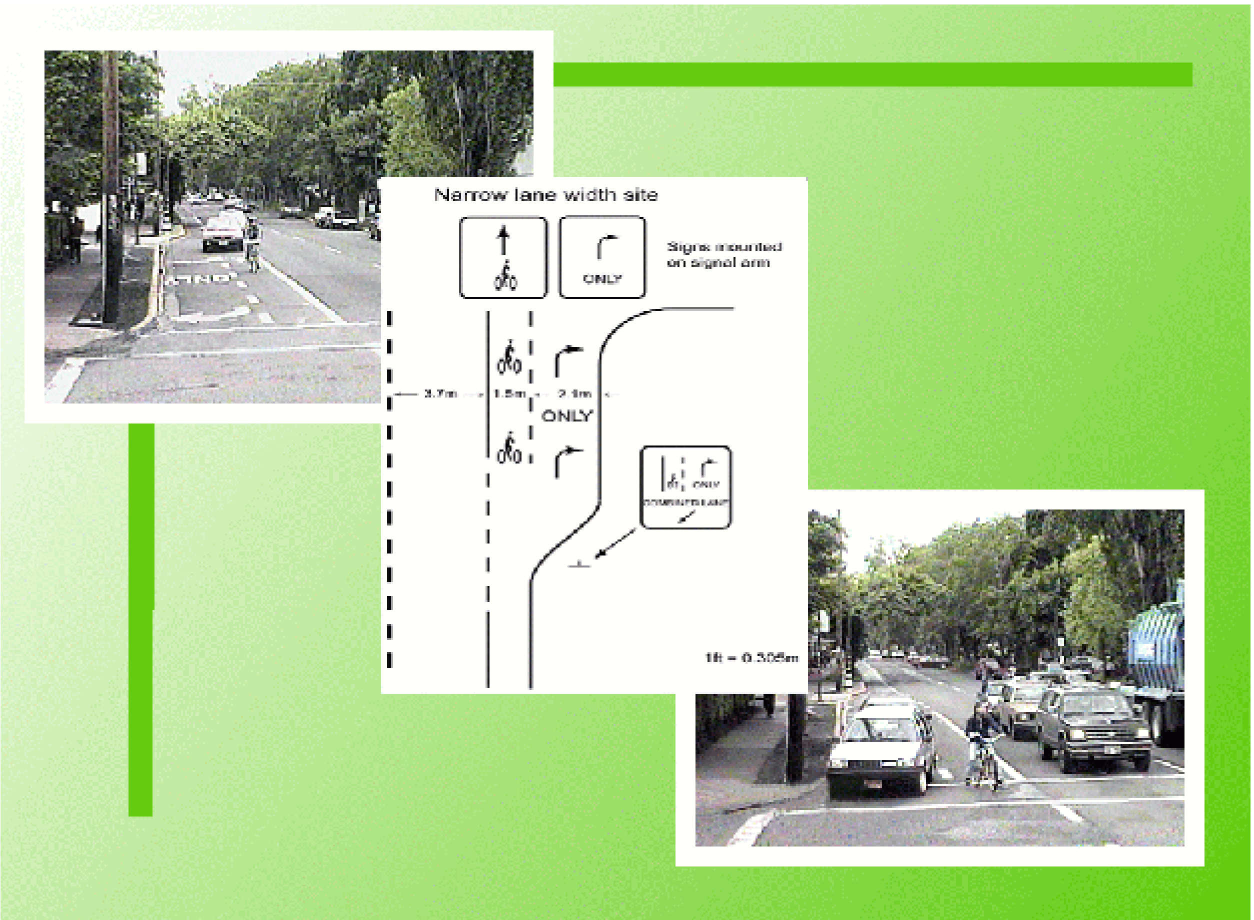
Evaluation of a Combined Bicycle Lane/Right Turn Lane in Eugene, Oregon

PUBLICATION NO. FHWA-RD-00-151
August 2000



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Federal Highway Administration
Research and Development
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FOREWORD

The 1991 congressionally mandated National Bicycle and Walking Study set two goals: to double the percentage of trips made by bicycling and walking, and to reduce by 10 percent the number of bicyclists and pedestrians killed or injured in traffic crashes. During the past decade, the Federal Highway Administration’s (FHWA) Pedestrian and Bicycle Safety Research Program has supported these goals with its activities. The FHWA’s Pedestrian and Bicycle Safety Research Program has and will continue to focus on identifying problem areas for pedestrians and bicyclists, developing analysis tools for planners and engineers to target these problem areas, and evaluating countermeasures to reduce crashes involving pedestrians and bicyclists.

There is a variety of on- and off-road bicycle facilities – each with its advantages and disadvantages. A thorough evaluation of the various kinds of facilities implemented in pro-bicycling communities has be needed by the transportation engineering profession. As part of the Pedestrian and Bicycle Safety Research Program, evaluations of some innovative treatments to accommodate bicyclists were conducted. This report documents the evaluation of a combined bicycle lane/right-turn lane used to accommodate both movements when intersection right-of-way was limited.

The information contained in this document should be of interest to State and local bicycle and pedestrian coordinators and to transportation professionals involved in safety and risk management. Other interested parties include those in enforcement and public health.

Michael F. Trentacoste
Director, Office of Safety Research & Development

NOTICE

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
FHWA-RD-00-151		

4. Title and Subtitle
EVALUATION OF A COMBINED BICYCLE LANE/RIGHT-TURN LANE IN EUGENE, OREGON

5. Report Date
August 2000

6. Performing Organization Code

7. Author(s)
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8. Performing Organization Report No.

9. Performing Organization Name and Address
Highway Safety Research Center
University of North Carolina
730 Airport Road, CB #3430
Chapel Hill, NC 27599

10. Work Unit No. (TRAIS)

11. Contract or Grant No.
DTFH61-92-C-00138

12. Sponsoring Agency Name and Address
Office of Safety Research and Development
Federal Highway Administration
6300 Georgetown Pike
McLean, VA 22101-2296

13. Type of Report and Period Covered
Final Report
October 1997 - July 1999

14. Sponsoring Agency Code

15. Supplementary Notes
Contracting Officer's Technical Representative (COTR): Carol Tan Esse, HRDS

16. Abstract

In many bike-lane retrofit projects, there is not enough space to mark a minimum 1.2-m bike lane to the left of the right-turn lane. This report focuses on a combined bicycle lane/right-turn lane used when right-of-way at an intersection is limited. This evaluation took place in Eugene, OR. The narrow right-turn lane described above was evaluated by comparing the behaviors of bicyclists and motor vehicle drivers at 13th and Patterson (an intersection that had the shared, narrow right-turn lane described above in place) with behaviors at 13th and Willamette (an intersection that had a standard-width (3.7-m) right-turn lane and accompanying bike lane (pocket) to the left of the right-turn lane). The intersection of 13th and Willamette is located about 0.8 km (½ mi) to the west of 13th and Patterson. It is important to note that bicyclists approaching on 13th at Patterson Street proceed straight ahead to the bike pocket at the intersection proper, in that the right-turn lane is "bulbed out." Bicyclists approaching on 13th at Willamette have to shift to the left to get in the bike pocket adjacent to the right-turn lane at the intersection (i.e., there is no "bulb out").

Bicyclists traveling through each intersection were videotaped. The videotapes were coded to evaluate operational behaviors and conflicts with motorists, other bicyclists, and pedestrians. More than 17 percent of the surveyed bicyclists using the narrow-lane intersection felt that it was safer than the comparison location with a standard-width right-turn lane, and another 55 percent felt that the narrow-lane site was no different safety-wise than the standard-width location. This is probably a function not only of relatively slow motor vehicle traffic speeds on 13th Street, but also due to the bike lane proceeding straight to the intersection at the narrow-lane site such that motorists crossing to the right-turn lane tended to have to yield. It was also relatively easy for bicyclists to time their approach to the intersection and ride through on a green indication. It was quite easy for bicyclists to ride up to the narrow-lane intersection and position themselves beside passenger cars or light trucks. Bicyclists at the narrow-lane site were "forced into" the adjacent traffic lane on a few occasions, usually the result of a heavy vehicle taking extra space. Sometimes bicyclists would shift to the right-turn portion of the lane if a heavy vehicle were in the through lane. Right turns on red by motor vehicles were rarely prevented when bicyclists were present at the front of the queue at the narrow-lane site. No conflicts between bicyclists and motor vehicles, other bicyclists, or pedestrians took place at either intersection. It is recommended that the design be implemented at other types of intersection locations (i.e., different motor vehicle approach speeds and approach configurations) and evaluated for effectiveness.

17. Key Words	18. Distribution Statement
Bicycle lane, bicycle operations, bicycle maneuvers, conflicts.	No restrictions. This document is available to the public through the National Technical Information Service, Springfield, VA 22161.

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	19	

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INTRODUCTION

Innovative, on-street bicycle treatments are now routinely being implemented. This is the third in a seri of reports for the Federal Highway Administration (FHWA) pertaining to evaluation of these innovative bicycling treatments. The other reports were concerned with a bike box in Eugene, OR (Hunter, 2000) and colored (blue) bike lanes to define bicyclist/motor vehicle conflict areas near intersections in Portland, OR (Hunter, Harkey, Stewart, and Birk, 2000). This report focuses on a combined bicycle lane/right-turn lane used when right-of-way at an intersection is limited. This evaluation took place in Eugene, OR.

BACKGROUND

In many bike-lane retrofit projects, there is not enough space to mark a minimum 1.2-m bike lane to th left of the right-turn lane. The *Oregon Bicycle and Pedestrian Plan* (Oregon DOT, 1995) recognizes this limitation and states that when this occurs, “a right-turn lane may be marked and signed as a shared-use lane, to encourage through cyclists to occupy the left portion of the turn lane. This is most success on slow-speed streets.” The City of Eugene, OR has such a shared, narrow right-turn lane in place on 13th Avenue at its intersection with Patterson Street. Thirteenth Avenue leads directly into the Universi of Oregon campus and has considerable bicycle traffic. Near campus, 13th Avenue has a speed limit of 48.3 km/h (30 mi/h) and carries 6,000 to 8,000 vehicles per day.

OVERVIEW OF CURRENT PROJECT AND METHODS

The narrow right-turn lane described above was evaluated by comparing the behaviors of bicyclists and motor vehicle drivers at 13th and Patterson (an intersection that had the shared, narrow right-turn lane described above in place) with behaviors at 13th and Willamette (an intersection that had a standard-width (3.7-m) right-turn lane and accompanying bike lane (pocket) to the left of the right-turn lane). Th intersection of 13th and Willamette is located about 0.8 km (0.5 mi) west of 13th and Patterson.

Figure 1 provides details for 13th and Patterson, which will be referred to hereafter as the narrow right-turn lane site. At this site, bicyclists usually approach the intersection in a 1.5-m bike lane at the edge c the street. At the intersection proper, the total right-turn lane width is 3.6 m, which includes a bike lane (pocket) of 1.5 m and a 2.1-m space to the right of the bike pocket. Figure 2 provides details for 13th and Willamette, which will be referred to hereafter as the standard-width right-turn lane site. At this location, bicyclists also usually approach the intersection in a 1.5-m bike lane at the edge of the street. At the intersection proper, the total right-turn lane width is 5.2 m, which includes a bike lane (pocket) c 1.5 m and a standard 3.7-m lane to the right of the bike pocket. Figures 1 and 2 also show accompanying signing used at both intersections.

It is important to note that bicyclists approaching on 13th at Patterson Street proceed straight ahead to the bike pocket at the intersection proper, in that the right-turn lane is “bulbed out.” Bicyclists approaching on 13th at Willamette have to shift to the left to get in the bike pocket adjacent to the right-turn lane at the intersection (i.e., no “bulb out”).

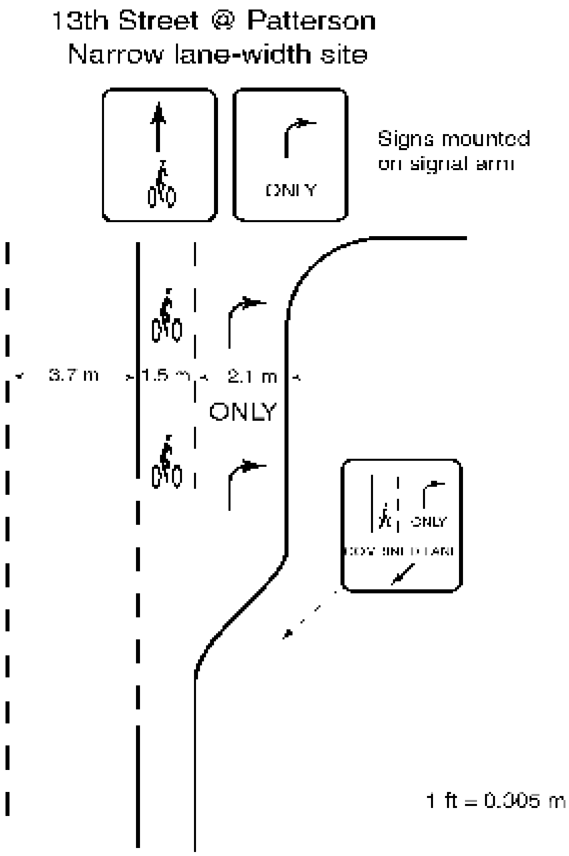

Figure 1. Sketch of narrow right-turn lane site (13th and Patterson), including signing.

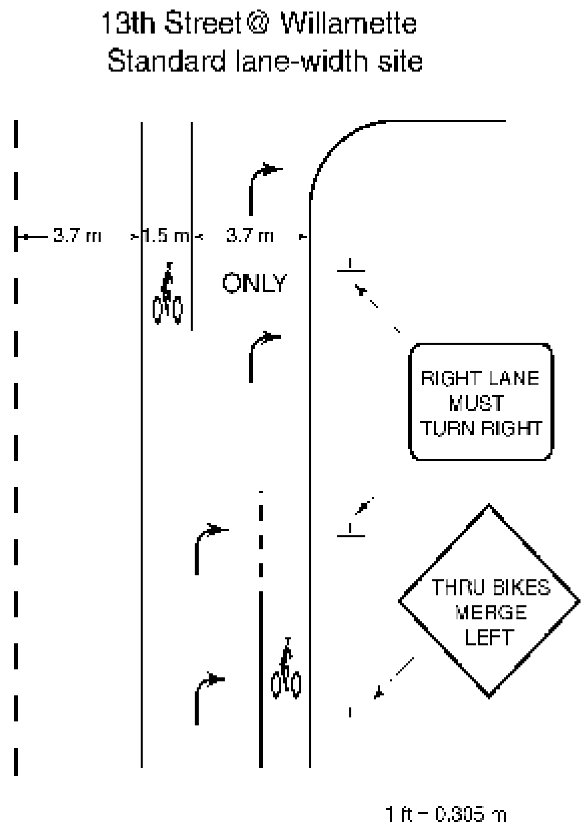

Figure 2. Sketch of standard-width right-turn lane site (13th and Willamette), including signing.

Bicyclists traveling through each intersection were videotaped. The videotapes were coded to evaluate operational behaviors and conflicts with motorists, other bicyclists, and pedestrians. Figure 3 shows the view from a video camera of an oncoming bicyclist at 13th and Patterson (the narrow-width site), and figure 4 is the counterpart for 13th and Willamette (the standard-width site).

RESULTS

Using the methods described above, this section presents the results of the analysis of the data. The sections that follow are descriptive and focus on bicyclist characteristics, information about movemen through the intersection and the use of the different right-turn lane configurations, and conflicts.

Videotaped Bicyclist Characteristics

Several variables describing the videotaped bicyclists are presented in tables or text that follow. The variables are crosstabulated by whether the right-turn lane was narrow or standard width. Frequencies and column percentages are routinely presented. Totals differing from 592 bicyclists at the narrow-wic lane (13th and Patterson) and 611 at the standard-width lane (13th and Willamette) are due to missing values.

Statistical testing of relationships was done using chi-square tests to determine if differences between two sites were significant or due

Figure 3. Bicyclist in combination with motor vehicle at the narrow right-turn lane site (13th and Patterson).

Figure 4. Bicyclist in combination with motor vehicle at the standard-width right-turn lane site (13th and Willamette).

to chance alone. When the distributions were significantly different, an asterisk (*) was placed beside t name of the variable and the level of significance (p-value) was shown at the bottom of the table. As an example, a p-value of < 0.05 means that the differences in the distributions could be due to chance less than 5 times out of 100.

Generally, the tables show all levels of a variable in order to convey more information to the reader; however, categories were grouped, when necessary, to permit appropriate statistical testing. In the text that follows, a single triangle (?) is used to indicate a major individual cell chi-square contribution to a significant chi-square value for the overall distribution.

Table 1 shows that slightly less than 70 percent of the bicyclists observed on the videotapes were male The differences in the distributions were significant ($p < 0.001$), primarily due to more females than expected at the narrow-width right-turn lane site and fewer females than expected at the standard-width right-turn lane site (?).

Table 1. Gender of bicyclists at narrow- and standard-width right-turn lanes.

Gender*	Narrow Width	Standard Width	Total
Male	375 (64.8)[1]	429 (74.0)	804 (69.4)
Female	204 (35.2)	151 (26.0)	355 (30.6)
Total	579 (50.0)[2]	580 (50.0)	1,159 (100.0)

[1]Column percentage
[2]Row percentage
* $p < 0.001$

The ages of the bicyclists were estimated from observing the videotapes and were categorized into the following groups: <16, 16-24, 25-64, and >64 years of age. There were two bicyclists that were younger than 16 years of age and two that were older than 64 years of age, and these were omitted from table 2. Overall, 74 percent of the bicyclists were ages 16-24 and 26 percent were ages 25-64 (table 2), and the narrow versus standard lane width age distribution differences were non-significant.

Table 2. Age of bicyclists at narrow- and standard-width right-turn lanes.

Age	Narrow Width	Standard Width	Total

16-24	414 (75.0)	398 (73.0)	812 (74.0)
25-64	138 (25.0)	147 (27.0)	285 (26.0)
Total	552 (50.3)	545 (49.7)	1,097 (100.0)

Observed helmet use was significantly greater ($p < 0.001$) at the standard-width site (?), where 36 percent of the bicyclists were observed wearing a helmet as opposed to 23 percent at the narrow-width site (table 3). No bicyclists were carrying passengers at either location.

Table 3. Bicyclist helmet use at narrow- and standard-width right-turn lanes.

Helmet Use*	Narrow Width	Standard Width	Total
Yes	137 (23.4)	217 (36.2)	354 (29.9)
No	449 (76.6)	382 (63.8)	831 (70.1)
Total	586 (49.5)	599 (50.6)	1,185 (100.0)

* $p < 0.001$

Characteristics of Surveyed Bicyclists

In addition to the videotapes, data regarding the bicyclists' characteristics were obtained through short oral surveys administered near the narrow right-turn lane intersection. While these surveys provided additional data about the bicyclists using the intersection, the surveys were mainly done to see how bicyclists felt about using the bike lane combined with the narrow turn lane. Results from the oral surv included the following:

- 60 percent of the bicyclists were male.
- The self-reported age distribution was 1.5 percent <16 years of age, 57 percent 16-24 years of age, 41 percent 25-64 years of age, and 0.5 percent >64 years of age. This distribution had a lesser proportion of bicyclists 16-24 years of age and a greater proportion of bicyclists 25-64 years of ag when compared to the videotaped bicyclists using the intersection.
- Helmet use was 29 percent.
- 33 percent considered themselves to be experienced bicyclists. "Experienced" was defined as the following: "I feel comfortable riding under most traffic conditions, including major streets with bus

traffic and higher speeds."

- 40 percent rode more than 40 km (25 mi) per week.
- 62 percent were comfortable sharing this narrow right-turn lane with motorists.
- When asked how often motorists give bikes enough room when sharing the lane, 20 percent said "almost always," 53 percent said "some of the time," and 27 percent said "almost never."
- When asked how they would compare this narrow right-turn lane with the standard-width right-turn lane at 13th and Willamette, 18 percent said it was safer, 27 percent said it was less safe, and 55 percent said there was no difference.

Approaching and Maneuvering Through the Intersections

Bicyclist approach positions differed significantly ($p < 0.001$) between the two sites (table 4). At the narrow-lane site, 97 percent approached in the bike lane, compared to 83 percent at the standard-lane site. The 97 percent approaching in the bike lane at the narrow-lane site matches the percent continuing straight through the intersection (see table 8). A larger proportion of bicyclists also used the through lane, the sidewalk, or some other approach position at the standard-lane site (?). This is consistent with the higher percentage of bicycle left and right turns at the standard-lane site. The approach position was examined further by gender of bicyclist and did not vary by gender at the narrow-lane site. At the standard-lane site, a higher proportion of female bicyclists approached in the through lane and from the sidewalk.

Similar to the above, bicyclist positions at the intersection (table 5) differed significantly ($p < 0.001$). the intersection of the narrow-lane site, 94 percent of the bicyclists were in the bike lane, compared to 86 percent at the standard-lane site. More bicyclists than expected were in the through lane at the narrow-lane site, while fewer bicyclists than expected were in the right-turn lane and sidewalk locations at the standard-width site (?). There were no differences in position at the intersection at either site by gender of bicyclist.

Upon arriving at a red traffic signal indication, the proximity of the bicyclists to the motor vehicles was coded. It was expected that some bicyclists and motor vehicles would be positioned behind each other at the narrow-lane site (figure 5), and

Table 4. Bicyclist intersection approach position at narrow- and standard-width right-turn lanes.

Figure 5. Bicyclist behind motor vehicle at the narrow right-turn lane site (13th and Patterson).

Bicyclist Approach Position*	Narrow Width	Standard Width	Total
Bike lane	574 (97.0)	508 (83.1)	1,082 (89.9)
Through lane	3 (0.5)	46 (7.5)	49 (4.1)
Right-turn lane	4 (0.7)	0 (0.0)	4 (0.3)
Sidewalk	9 (1.5)	34 (5.6)	43 (3.6)
Other	2 (0.3)	23 (3.8)	25 (2.1)
Total	592 (49.2)	611 (50.8)	1,203 (100.0)

* $p < 0.001$

Table 5. Bicyclist intersection position at narrow- and standard-width right-turn lanes.

Bicyclist Intersection Position*	Narrow Width	Standard Width	Total
Bike lane	557 (94.1)	526 (86.1)	1,083 (90.0)
Through lane	13 (2.2)	2 (0.3)	15 (1.3)
Right-turn lane	14 (2.4)	30 (4.9)	44 (3.7)
Sidewalk	8 (1.4)	53 (8.7)	61 (5.1)
Total	592 (49.2)	611 (50.8)	1,203 (100.0)

* $p < 0.001$

indeed this was the case (table 6). Almost all of the bicyclists positioned themselves next to motor vehicles at the standard-lane site, while 24 percent and 19 percent positioned themselves in front of or behind a motor vehicle, respectively, at the narrow-lane site (?). These differences were statistically significant ($p < 0.001$). There were no differences in proximity by gender of bicyclist at either site. As would be expected, the bicyclists were more likely to be in front of or behind a heavy vehicle than a passenger car or light truck at the narrow-lane site.

Table 6. Proximity of bicyclist to motor vehicle at narrow- and standard-width right-turn lanes (when bicyclists and motor vehicles are both stopped at the traffic signal).

Proximity to Motor Vehicle*	Narrow Width	Standard Width	Total
Beside motor vehicle	90 (57.0)	69 (98.6)	159 (69.7)
In front of motor vehicle	38 (24.1)	1 (1.4)	39 (17.1)
Behind motor vehicle	30 (19.0)	0 (0.0)	30 (13.2)
Total	158 (69.3)	70 (30.7)	228 (100.0)

* $p < 0.001$

Not surprisingly, significantly more bicyclists ($p < 0.05$) were forced into the adjacent through lane (figure 6) at the narrow-lane site (table 7). "Forced into" means that when the bicyclist approached the intersection proper, there was not enough space to comfortably use the bike pocket to the left of the right-turn area. This occurred for 7 percent of the bicyclists arriving at a red traffic signal indication, and all of these events occurred at the narrow-lane site (?). There were no differences by gender of bicyclist. In two-thirds of the cases where the bicyclist was forced into the adjacent lane, the motor vehicle was a heavy truck. There were proportionately more heavy vehicles at the narrow-lane site.

Figure 6. Bus forces bicyclist into the traffic lane at the narrow right-turn lane site (13th and Patterson).

Table 7. Bicyclists forced into through travel lane at narrow- and standard-width right-turn lanes.

Bicyclist Forced Into Through Lane*	Narrow Width	Standard Width	Total
Yes	11 (6.6)	0 (0.0)	11 (4.5)
No	156 (93.4)	80 (100.0)	236 (95.6)
Total	167 (67.6)	80 (32.4)	247 (100.0)

* p <0 .05

A significantly larger proportion ($p < 0.001$) of bicyclists made both left and right turning maneuvers a the standard-lane site (table 8). To some extent, this is a function of commercial developments nearby, as well as Willamette accommodating bicyclists better with less on-street parking than Patterson.

Table 8. Bicyclist turning maneuvers at narrow- and standard-width right-turn lanes.

Bicyclist Turning Maneuver*	Narrow Width	Standard Width	Total
None (straight)	576 (97.5)	556 (93.1)	1,132 (95.3)
Right turn	13 (2.2)	31 (5.2)	44 (3.7)
Left turn	2 (0.3)	10 (1.7)	12 (1.0)
Total	591 (49.8)	597 (50.3)	1,188 (100.0)

* p <0.001

Significantly more bicyclists ($p < 0.001$) either ran the red traffic signal or still had a red traffic signal indication (?) as they started into the intersection (i.e., anticipated the green indication) at the narrow-lane site (table 9). Two factors may have had a role in this behavior. First, the narrow-lane site is 0.8 km (0.5 mi) closer to campus, and the local bicycle coordinator stated that bicyclist violations are more numerous near campus. Second, the intersecting street at the narrow-lane site is one-way, and the absence of cross-street traffic would be easy to discern. Cross-street traffic is two-way at the standard-lane site.

Table 9. Bicyclist signal violations at narrow- and standard-width right-turn lanes.

Bicyclist Signal Violations*	Narrow Width	Standard Width	Total
None	499 (85.2)	578 (95.9)	1,077 (90.6)
Ran Red	65 (11.1)	21 (3.5)	86 (7.2)
Red at Start Up (Anticipated green signal)	22 (3.8)	4 (0.7)	26 (2.2)
Total	586 (49.3)	603 (50.7)	1,189 (100.0)

* $p < 0.001$

The videotapes were examined closely to determine whether bicyclists at the front of the traffic queue prevented motor vehicles from making a right turn on red. It was expected that this would occur due to less space at the narrow-lane site, resulting in motor vehicles having to share the lane by lining up behind a bicyclist. The decision of whether a bicyclist prevented a motorist from making a right turn was based on both the amount of cross-street motor vehicle traffic and the available time to turn right. None of the motor vehicles at the

Figure 7. Motor vehicle making right turn on red with bicyclist in bike lane at narrow right-turn lane site (13th and Patterson).

standard-lane site was prevented from turning right on red, compared to 6 percent (seven vehicles) at the narrow-lane site (no table shown). This difference approached significance (p = 0.052). Figure 7 shows a motor vehicle making a right turn on red in the presence of a bicyclist in the bike lane at the narrow-lane site.

As bicyclists and motor vehicles maneuvered toward the intersection, there were some instances where weaving would take place, due to the bike pocket placement to the left of the right-turn lane at the intersection proper. Whereas 48 percent of the motorists yielded to bicyclists at the standard-lane site 93 percent yielded at the narrow-lane site (?) (table 10). These differences were statistically significan (p < 0.001) and probably reflect the ability of bicyclists to ride straight ahead at the narrow-lane site du to the "bulbed-out" right-turn lane, as opposed to having to move to the left at the standard-lane site. Figure 8 shows a motor vehicle yielding to a bicyclist at the narrow-lane site.

Table 10. Who yielded at the narrow- and standard-width right-turn lanes.

Who Yielded*	Narrow Width	Standard Width	Total
Bicyclist	3 (6.7)	26 (52.0)	29 (30.5)
Motorist	42 (93.3)	24 (48.0)	66 (69.5)
Total	45 (47.4)	50 (52.6)	95 (100.0)

* p < 0.001

Motor Vehicle Data at the Two Sites

If a bicyclist stopped for a red traffic signal indication and a motor vehicle was beside the bicyclist, the type of motor vehicle was coded as either a passenger car, a light truck (pick-up, sport utility vehicle, etc.), or a heavy vehicle (dump truck, heavy truck, bus, etc.). When the two sites were compared, the distribution of vehicle types (passenger cars, light trucks, and heavy vehicles) next to the bicyclist approached statistical significance ($p = 0.069$). There were proportionately more heavy vehicles at the narrow-lane site (?) (table 11).

In addition to examining the type of motor vehicle beside a bicyclist at the intersection proper, the mot vehicle type and position without a bicyclist present were also examined. After the bicyclist that was stopped for a red traffic signal indication had passed through the intersection, the placement of the nex arriving motor vehicle – in the absence of a bicyclist in both the through traffic lane adjacent to the bik pocket and the right-turn lane – was coded. At the narrow-lane site there was only one instance

Table 11. Motor vehicle type at the narrow- and standard-width right-turn lanes.

Motor Vehicle Type*	Narrow Width	Standard Width	Total
Passenger car	95 (60.9)	47 (70.2)	142 (63.7)
Light truck	45 (28.9)	19 (28.4)	64 (28.7)
Heavy truck	16 (10.3)	1 (1.5)	17 (7.6)

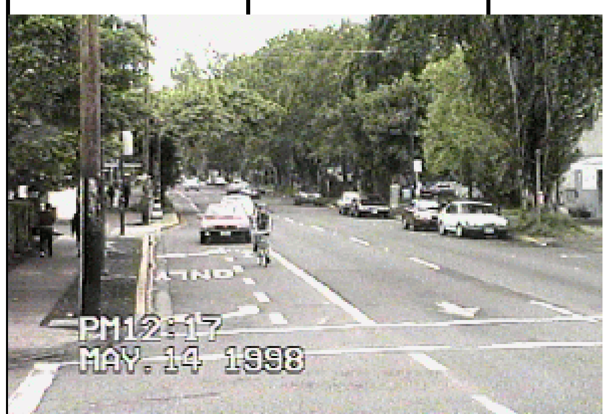

Figure 8. Motor vehicle yielding to bicyclist at narrow right-turn lane site (13th and Patterson).

Total	156 (70.0)	67 (30.0)	223 (100.0)

* p <0.001

where a motor vehicle failed to stay within the through-lane boundaries, and this was a heavy vehicle tha encroached across the entire bike lane. The same was true at the standard-width site, where one heavy vehicle was partially in the bike lane. Examining the placement in the narrow-width site right-turn lane, motor vehicles arriving without a bicyclist present actually used only the narrowed portion of the right-turn lane 18 percent of the time (figure 9).

Motor vehicles were partially in the bike lane 51 percent of the time, and they encroached across the entire bike lane 30 percent of the time (table 12). Just over 38 percent of the light trucks and 85 percen of the heavy vehicles used the entire bike lane for a right turn when a bicyclist was not present. The differences by vehicle type were statistically significant ($p < 0.001$). At the standard-width site, motor vehicles remained within the right-turn lane 98 percent of the time. There were seven instances where a light truck or heavy vehicle was partially in the bike lane and one instance where a heavy vehicle encroached across the entire bike lane (no table shown).

Figure 9. Motor vehicle occupying only the narrowed portion of the right-turn lane at 13th and Patterson.

Table 12. Motor vehicle placement within the right-turn lane in the absence of a bicyclist at the narrow turn-lane site.

Motor Vehicle Placement*	**Passenger Car**	**Light Truck**	**Heavy Truck**	**Total**
Right-turn lane only	40 (19.7)	14 (15.9)	0 (0.0)	54 (17.7)
Partially in bike lane	117 (57.6)	40 (45.5)	0 (0.0)	157 (51.5)

Entire bike lane	45 (22.2)	34 (38.6)	12 (85.7)	91 (29.8)
Right-turn lane, bike lane, and through lane	1 (0.5)	0 (0.0)	2 (14.3)	3 (1.0)
Total	203 (66.6)	88 (28.9)	14 (4.6)	305 (100.0)

* $p < 0.001$

Conflicts

A "conflict" between a bicyclist and a motor vehicle, another bicyclist, or a pedestrian was defined as a interaction such that at least one of the parties had to make a sudden change in speed or direction to avoid the other. No conflicts were recorded at either intersection.

DISCUSSION

There are many intersections where retrofitting a minimum-width bike lane is not possible due to limit right-of-way. The use of a shared, narrow right-turn lane in combination with a bike lane in a limited right-of-way situation is a novel approach. The technique worked well at the intersection location evaluated in this study. More than 17 percent of the surveyed bicyclists using the narrow-lane intersection felt that it was safer than the comparison location with a standard-width right-turn lane, and another 55 percent felt that the narrow-lane site was no different safety-wise than the standard-width location. This is probably a function not only of relatively slow motor vehicle traffic speeds on 13th Street, but also due to the bike lane proceeding straight through the intersection at the narrow-lane site such that motorists crossing to the right-turn lane tended to have to yield. It was also relatively easy for bicyclists to time their approach to the intersection and ride through on a green indication.

It was quite easy for bicyclists to ride up to the narrow-lane intersection and position themselves besid passenger cars or light trucks. Bicyclists at the narrow-lane site were "forced into" the adjacent traffic lane on a few occasions, usually the result of a heavy vehicle taking extra space. Sometimes bicyclists would shift to the right-turn portion of the lane if a heavy vehicle was in the through lane. Right turns o red by motor vehicles were rarely prevented when bicyclists were present at the front of the queue at th narrow-lane site. No conflicts between bicyclists and motor vehicles, other bicyclists, or pedestrians took place at either intersection.

The combined bicycle lane/right-turn lane design is shown in the *Oregon Bicycle and Pedestrian Plan* and has been reviewed, but not yet officially adopted, by the Oregon Department of Transportation's Traffic Control Device Committee. However, adoption is expected in the near future. It is recommend that the design be implemented at other types of intersection locations (i.e., different motor vehicle approach speeds and approach configurations) and evaluated for effectiveness.

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