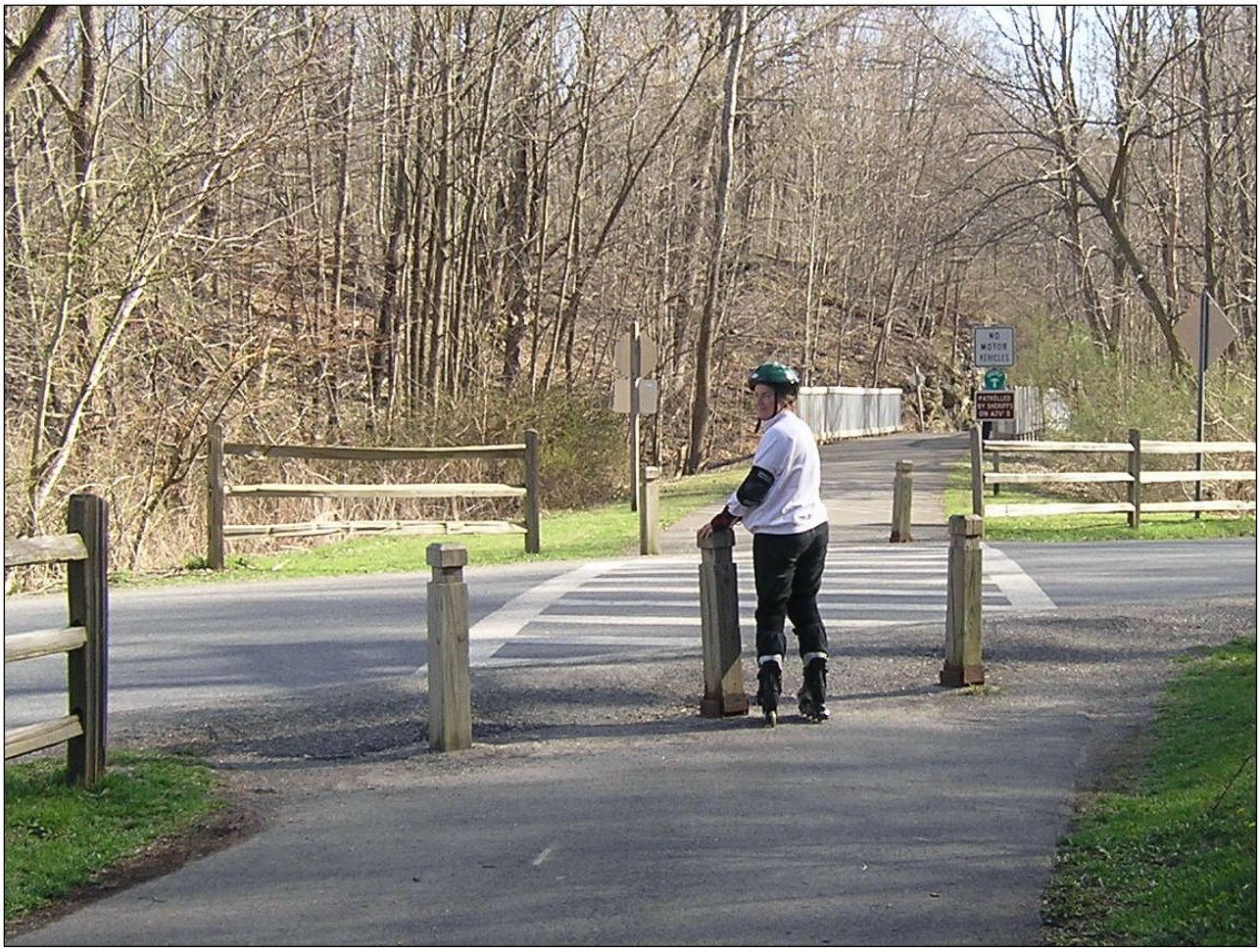

Road and Trail Intersection Safety

An examination of present practice
Recommendations for future actions

Funded by the National Highway Traffic Safety Administration with a grant from
the New York State Governor's Traffic Safety Committee

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This study was funded by the National Highway Traffic Safety Administration with a grant from the New York State Governor's Traffic Safety Committee.

Executive Summary

Fueled by funding from federal transportation enhancements programs and growing public demand, new trails are opened each year. With the exception of trails that are fully contained within a park or other facility, most trails will inevitably cross over or intersect in some manner with roadways. As the number of trails increases and more and more persons of all ages and abilities become trail users, the opportunities for exposure to the risks associated with road and trail intersections will continue to grow. The number of reported road and trail intersection crashes may now be low, or under reported, but with increasing trail traffic volume this situation will inevitably change, with possibly very disastrous consequences.

The time has come to learn more about the needs and behaviors of motorists and trail users and ensure that design guidelines and laws and policies governing road and trail intersections fully provide for the safety of this increasingly prevalent type of traffic junction. The purpose of this study is to examine the current state of practice of the design and management of intersections between trails and roadways, gather feedback on road and trail intersection crashes and complaints, raise public awareness of the issue of road and trail intersection safety, and offer policy and design recommendations that will improve the safety of road and trail intersections.

Information on the current state of practice was obtained from a literature review of existing design guidelines and trail design and management practices, interviews with persons experienced in the design and management of trails, and the results of a comprehensive surveys mailed to individuals and organizations involved with trail design and management.

Survey Results

In Phase One of the study, 1896 surveys were mailed to trail groups and officials from different levels of government. A total of 212 survey responses were received which provided information on 194 different trails.

Overall response rate was nine percent which is respectable for a mailed survey with no incentives and where the recipients had no prior knowledge of the study and no or little prior association with Parks & Trails New York. The greatest number of surveys was received from local highway superintendents, a group of individuals who should be very familiar with road and trail intersections within their jurisdiction.

To obtain more data about crashes and complaints identified by respondents to the Phase One survey, Parks & Trails New York distributed a follow-up survey to those who indicated a crash had occurred at a road and trail intersection or a complaint had been received about safety at the intersection.

In Phase Two of the study, Parks & Trails New York distributed a second survey to 108 state, county, and regional agencies to better obtain road and trail intersection safety data from key stakeholder groups that had provided few or no responses to the Phase One survey. The Phase Two survey was also distributed to 64 County Traffic Safety Board Chairpersons and Coordinators who did not receive the Phase One survey.

Crashes: Seven road and trail intersection crashes were reported in the Phase One survey, three of which were fatal. Two of the fatal crashes involved collisions between motorists and off-highway vehicles (ATVs, dirt bikes, four-wheelers). The other fatal crash involved a motorist and a bicyclist. Only one crash was reported by the 20 respondents to the Phase Two survey. In all cases, few details were available regarding the conditions and behaviors that led to the crash, illustrating the lack of knowledge and availability of detailed reports concerning crashes at road and trail intersections.

Complaints: Twenty percent of the Phase One surveys indicated that complaints had been received regarding road and trail intersection safety. Speeding vehicles and visibility (sight distance) for cars, pedestrians, and snowmobiles were the types of complaints mentioned most often.

In the Phase Two surveys, six (30 %) of respondents indicated complaints had been received regarding road and trail intersection safety. Speeding, failure to yield, and sight distance were the complaints most frequently mentioned.

Traffic Control Devices: More than half of the trails surveyed in Phase One had on-road trail identification signs. Less than half had gates or bollards. More than half of all trails had STOP signs. But, since STOP signs reinforce assignment of right of way, the fact that 44 percent of state roads, 22 percent of county roads, and 41 percent of town roads had no such controls could increase the exposure to risk at these road and trail intersections.

Because the respondents to the Phase Two survey were providing information on a number of trails, the surveys asked whether the safety devices mentioned above were present at all, most, half, some, or none of the road and trail intersections within their jurisdiction. More than half of the survey respondents indicated that traffic control devices were present on at least some trails.

Ways to improve safety: Survey respondents offered a number of ways to improve road and trail intersection safety. Additional signage was suggested most often, such as trail or snowmobile crossing ahead signs, pedestrian crossing signs, and signs alerting vehicles and pedestrians of the need to stop for pedestrians in a crosswalk. Pavements markings and crosswalks were also frequently suggested. Other survey respondents mentioned the need to strengthen enforcement of speed limits and crosswalk laws, maintenance of sight distance, and education of trail users and motorists as ways to improve road and trail intersection safety.

Lack of knowledge: In response to a question about knowledge of road and trail intersection crashes, 41 Phase One surveys (21%) answered “unknown.” On 42 surveys (22 %), respondents did not answer the question, which also suggests a lack of information. This means that 43 percent of survey respondents most likely had no idea about any crashes at their road and trail intersections. In the Phase Two survey, 10 respondents, (50%)

answered "unknown" in response to a question about knowledge of road and trail intersection crashes.

Similarly, in a Phase One follow up survey with those who had received complaints about road and trail intersection safety, nearly 88 percent stated that they were unaware if there was any review process in place if a crash were to occur.

Phase One follow up surveys with individuals who had received complaints about road and trail intersection safety also revealed that nearly 60 percent of respondents had little or no knowledge of what guidelines had been used to design their road and trail intersections. Half did not know if sight distance was even considered in road and trail intersection design. Phase Two surveys also asked specifically what design guidelines were used when trails were constructed. More than half of the respondents, 65%, answered they were unsure of the guidelines used.

Recommendations

The recommendations presented in the report are based on feedback from the Phase One and Phase Two surveys, an examination of present New York State laws governing motorists and trail users at road and trail intersections, techniques and treatments employed in other states and municipalities, the experience of trail design experts, and a recognized lack of not only public understanding of laws related to trails but also detailed information regarding the design of roadway and trail intersections.

Policy change and safety education recommendations

- **Increase awareness and understanding of New York Vehicle and Traffic Law Section 1151 with trail users, motorists, and law enforcement officials**
    - Urge trail managers to work with highway officials to install "yield to pedestrian signs" at crosswalk-marked road and trail intersections.

  - Distribute news releases and place articles in trail newsletters to inform the public of Vehicle and Traffic Law Section 1151 and how it also applies to trail users and motorists at road and trail intersections.

- **Refine or clarify New York's Vehicle and Traffic Law to address the unique needs of road and trail intersections**
  - Clarify whether presently Vehicle and Traffic Law Section 1151 or Section 1152 applies to trails with unmarked crosswalks.
  - Clarify or amend New York Vehicle and Traffic Law so that road and trail intersections without marked crosswalks are treated the same as road intersections with unmarked crosswalks.
  - Inform the general public of the need to obey Section 1151 of the Vehicle and Traffic Law in more instances than when they see crosswalk striping.
  - Amend Vehicle and Traffic Law Section 110 part (a) to include pedestrian and bicycle paths as well as sidewalks within the definition.

- **Improve road and trail intersection crash reporting through public education and more detailed data collection**
  - Encourage trail groups and trail managers to ensure their constituents are aware of the requirements of New York Vehicle and Traffic Law Sections 605, 1240 and 1241, possibly by including a short reminder in trail brochures, newsletters, or other organizational materials.
  - Undertake efforts to ensure that law enforcement personnel include trail names and locations when preparing reports for crashes that occur at road and trail intersections.
  - Review State accident report forms to determine if alterations can be made to make it easier to identify whether a crash occurred at a road and trail intersection.

- **Increase attention to, funding for, and improve communication surrounding maintenance of road and trail intersections**
    - Encourage volunteer trail adopters to assist with regular trimming at road and trail intersections.
    - Encourage trail managers to meet periodically with their state, county and local highway officials to discuss roles and responsibilities regarding maintenance and safety at their trail and road intersections.
    - Encourage trail managers and trail groups to work with highway officials to find new and creative sources of funding for trail maintenance and management.

Design Recommendations

The design recommendations presented are not intended to replace or conflict with current guidelines and standards, but to supplement and clarify these guidelines and standards for all those responsible for design, construction and maintenance of road and trail intersections.

- **Design intersections of trails and roadways with the appropriate assignment of right of way**
    - Place STOP signs or YIELD signs on a trail approach to an intersection to specifically assign the right-of-way to vehicles in the roadway.
    - Consider assigning the right-of-way to trail users using STOP signs or traffic control signals when there are large volumes of trail users and when the volume of vehicular traffic becomes so great that trail users have difficulty crossing the roadway.

- **Design intersections of trails and roadways to alert trail users and road users of an approaching crossing**
    - Design crossings to be perpendicular to the roadway so trail users will be in a position where they can readily see approaching traffic from both directions and both trail users and motorists can take appropriate actions.
    - Consider the use of warning signs, marked crosswalks, or flashing signals as appropriate to the needs and conditions.

- **Design roadways and trails to minimize risk at crossings**
    - Consider use of refuge islands for crossing multiple lane roadways or high volume two-lane roadways.
    - At crossings of high volume or high speed multi-lane roadways where a refuge island is used, consider completely offsetting the crossing to keep trail users from "darting out" into the lane of traffic on the opposite side of the refuge island.
    - As an alternative to the erection of trail head barriers, split the trail into two separate narrower paths at the entrance by using a raised island or an area landscaped with low shrubs, ground covers or perennial flowers.
    - In cases where there is a steep descent approaching a crossing, design a curve or bend in the trail at the bottom of the descent along with a barrier to keep bicyclists from leaving the trail and coasting into the roadway.
    - Consider using traffic-calming measures, such as a textured or raised crosswalk, a roundabout or planting median, to slow vehicles as they approach road and trail intersections.

Next Steps

This report serves as the basis for additional activities designed to raise awareness of road and trail intersection safety and as a vehicle for stimulating conversation and examination of this issue that will lead to actions that can provide lasting benefit for everyone. To fulfill these goals, Parks & Trails New York plans to:

- Organize regional forums where stakeholder groups can meet and discuss the report's recommendations and explore ways to acquire resources for road and trail intersection safety enhancements;
- In cooperation with the NYS Canal Corporation, County Traffic Safety Boards and trail organizations, continue to implement a road and trail intersection safety education campaign in Canalway Trail and other New York communities;
- Develop a policy agenda based on the report's recommendations.

I. Growth of the Trails Movement in the U.S. and New York

The number of multi-use trails throughout the U.S. has grown substantially in the last twenty years. When the national, nonprofit Rails to Trails Conservancy formed in 1985, it was estimated that there were about 250 miles of rail trails nationwide. Now there are more than 13,000 miles of rail trails in addition to hiking, snowmobiling and other off-road trails, and many more miles of canal towpaths, river and stream banks, and utility and other corridors that have been developed as community trails. A growing interest in improved health and fitness and recreational pursuits such as bicycling and rollerblading have contributed to the popularity of trails and fueled demand.

Few multi-use trails would have been built without enactment of the Intermodal Surface Transportation Efficiency Act (ISTEA) in 1991. ISTEA included the Transportation Enhancements (TEP) and Recreational Trails (RTP) Programs, which, for the first time in history, provided a dedicated stream of substantial funding for trail projects and helped launch the trails movement across the nation. In 1988, the Transportation Equity Act of the Twenty-first Century (TEA-21) continued the TEP and RTP funding and added the Congestion Mitigation and Air Quality (CMAQ) Improvement Program as another funding source that could be applied to trail projects. In 2005, the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) continued TEP, RTP, and CMAQ, and added the Safe Routes to School Program, which will provide funds to improve and/or develop public roads, bicycle-pedestrian pathways, or trails in the vicinity of schools.

The trails and greenways movement was also aided by the 1994 publication of *The National Bicycling and Walking Study: Transportation Choices for a Changing America*. Goals outlined in this Federal Highway Administration (FHWA) document were to double the percentage of trips made by bicycling and walking, reduce bicycle and pedestrian casualties by ten percent, and plan and construct needed facilities including trails.[1]

[1] Federal Highway Administration Publication No. FWHA-94-023, The National Bicycling and Walking Study; Transportation Choices for a Changing America, 1994, p. XVII.

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Since the early 1990s, New York State has experienced substantial growth in its trail network similar to that occurring across the nation. Increasing interest in outdoor recreation and alternative, healthy modes of transportation and the availability of federal transportation dollars have encouraged communities to develop multi-use trails and trail systems that provide recreational opportunities and improved mobility options for their citizens. Since 1992, NYSDOT has made more than $300 million in federal transportation enhancements program funds available to communities across the state for program activities, a majority of which have been bicycle-pedestrian and rail trail projects.[2]

A number of different State agencies, often not directly related to transportation, have also implemented programs and instituted policy favoring bicycle and pedestrian interests. The Healthy Heart Program of the New York State Department of Health fosters active living programs and its *Vision for Cardiovascular Health in New York State: 2004-2010* describes an ideal healthy community as a place where "people walk or bicycle whenever they can; physical activity is safe, inviting and commonplace."[3] The New York State Open Space Plan, developed by the New York State Department of Environmental Conservation (DEC) and the Office of Parks, Recreation and Historic Preservation (OPRHP) and the Statewide Comprehensive Outdoor Recreation Plan (SCORP), prepared by OPRHP, recommend development of a statewide trails plan and formation of an interconnected trail and greenway system[4]. The Department of State's Quality Communities Task Force states that "alternative transportation means, such as walkways and bicycle paths, are perceived to afford a higher quality of life" and recommends that "the State should continue partnership initiatives to further integrate bicycle and pedestrian travel into the transportation network."[5]

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[2] National Transportation Enhancements Clearinghouse, "Transportation Enhancements FY 2005 Spending Summary Report," *Connections*, Vol. 9, No. 3, Summer 2006, p.5.
[3] New York State Department of Health, *Cardiovascular Health in New York State: A Plan for 2004 – 2010*, September, 2004, accessed on line at http://www.health.state.ny.us/nysdoh/heart/chvplan.htm, December 30, 2006.
[4] New York State Office of Parks, Recreation and Historic Preservation, *Statewide Comprehensive Outdoor Plan*, 2003, p. 3-31.
[5] New York State Department of State, Quality Communities Task Force Report, Section F, *Transportation Infrastructure: The Search for Quality in the Built Environment*, accessed online at http://www.state.ny.us/governor/ltgov/ltgovdoc/cover.html, December 21, 2006.

II. The need for an improved understanding of issues surrounding road and trail intersection safety

Nationally, bicycle and pedestrian fatalities represent 13 percent of all traffic fatalities. In New York, 25 percent of all traffic fatalities are bicyclists or pedestrians, partly because of the number of pedestrians in large population centers such as New York City. National Highway and Traffic Safety Administration Fatal Accident Reporting System data for 2005 indicates that pedestrian and bicyclist fatalities in New York increased by three percent from 357 in 2004 to 368 in 2005, compared to a five percent increase nationwide. However, bicycle deaths in particular rose by almost 18 percent.[6] Current reporting systems are not able to easily discriminate between bicyclist and pedestrian fatalities at trail crossings and other types of traffic-related fatalities. Therefore, it is not known how many of these deaths occurred at road and trail intersections or how many nonfatal accidents also occurred at these locations.

The 2002 National Bicycling and Walking Study found that bicyclists and pedestrians riding and walking in areas without bike paths or trails are nearly twice as likely to feel endangered (mostly by motorists) as are bicyclists or pedestrians using bike paths or trails. Bicycle and pedestrian advocates also identify intersections between paths and roadways to be the "most critical issue in shared use path design," as well as the "most challenging."[7]

Fueled by funding from federal transportation enhancements programs and growing public demand, each year new trails are opened. With the exception of trails that are fully contained within a park or other facility, most trails will inevitably cross over or intersect in some manner with roadways. As the number of trails increases and more and more persons of all ages and abilities become trail users, the opportunities for exposure to the risks associated with road and trail intersections will continue to grow. The number of reported road and trail intersection crashes may now be low, or under reported, but with increasing trail traffic volume this situation will inevitably change, with possibly very disastrous

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[6] Brustman, RD, "USDOT 2005 Traffic Fatality Database Now Available" *NY Bikes*, New York Bicycling Coalition, Fall 2006, p.1.

[7] BicyclingInfo.org, *Rails and Trails: Design of Trails*, accessed online at www.bicyclinginfo.org/rt/design/printerversion.htm December 30, 2006.

consequences. The time has come to learn more about the needs and behaviors of motorists and trail users and ensure that design guidelines for and laws and policies governing road and trail intersections fully provide for the safety of this increasingly prevalent type of traffic junction.

III. Resources for Road and Trail Intersection Design

Published resources for the design of the intersections of roadways and trails in New York State are: the American Association of State Highway and Transportation Officials' (AASHTO) Guide for the Development of Bicycle Facilities, the federal Manual for Uniform Traffic Controls (MUTCD) published by FHWA, the New York State Manual for Uniform Traffic Controls (NYS MUTCD), and the NYSDOT Highway Design Manual. These documents contain the majority of the design guidelines currently available for providing safe, accessible, well-designed facilities for pedestrians and bicyclists.

AASHTO Guides

The AASHTO guides offer policies, planning and design guidance for highways, streets and bicycle paths. They should not be confused as standards, specifications, requirements or regulations, but rather guidelines. Transportation officials and engineers use AASHTO as their primary source of design guidance. In New York, AASHTO guidelines are followed on any highway or bikeway project funded with federal or state dollars.

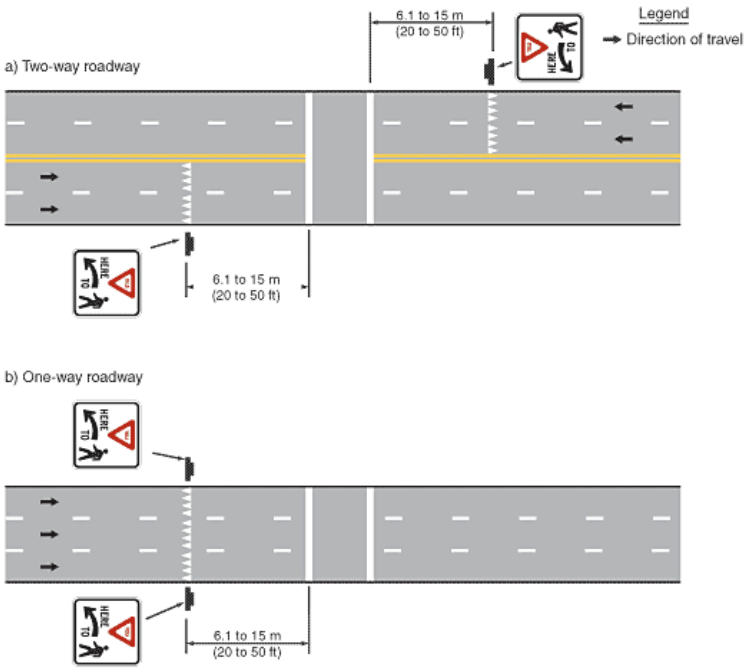
The prevailing AASHTO guideline for the design of highways is the most current edition of *A Policy on Geometric Design of Highways and Streets*. This document has been traditionally referred to by highway designers as the "Green Book." The document presents general planning and design guidance for bicycle and pedestrian facilities as they relate to highways.

The *AASHTO Guide for the Development of Bicycle Facilities* has been published since 1974 and provides specific guidance for the planning and design of bicycle facilities. The most current edition, published in 1999, describes intersections between paths (trails) and roadways as "the most critical issue in shared use path design." AASHTO adds, "Each intersection is unique and will require sound engineering judgment on the part of the designer as to the appropriate solution."[8] Road and trail intersections are categorized by

[8] The American Association of State Highway and Transportation Officials, "Guide for the Development of Bicycle Facilities," 1999, p. 46.

AASHTO into three groups: midblock, adjacent path and complex. Midblock crossings are the most typical type of road and trail crossing, as illustrated in Figure 1.

Figure 1. Typical midblock crossing



Manual on Uniform Traffic Control Devices

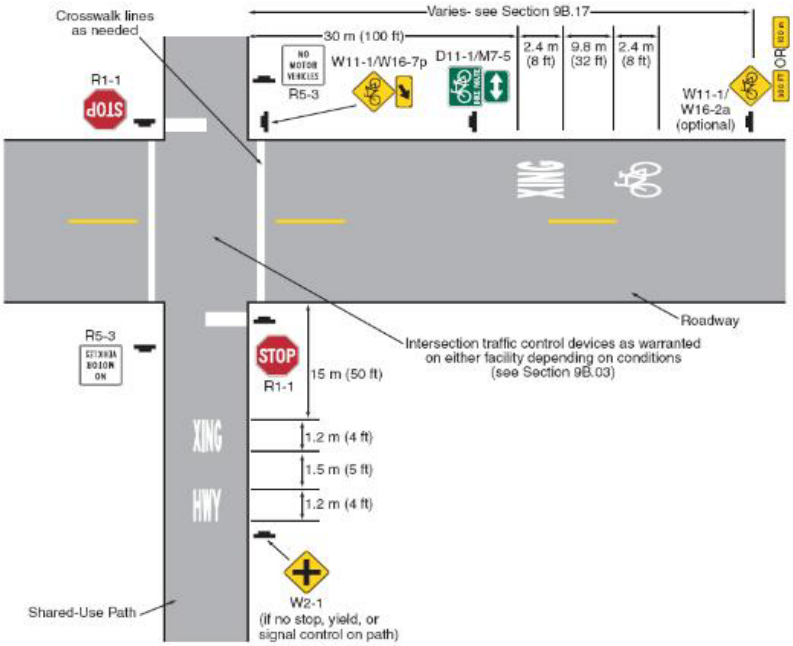
The *Manual on Uniform Traffic Control Devices* (MUTCD) published by FHWA is the national standard for all traffic control devices installed on any street, highway, or shared use path open to public travel. New York State is one of the few states that maintain its own MUTCD. The NYS MUTCD parallels the federal MUTCD, but provides standards and guidance on traffic control devices that are specific to New York. The Cornell Local Roads Program recommends that every municipality have a copy of the MUTCD and advises that failure to comply with it greatly increases exposure to liability of municipalities in the event of an accident.[9]

[9] Cornell Local Roads Program, MUTCD Tutorial, accessed online at http://www.clrp.cornell.edu/flaggingTutorial/Lesson1.htm, December 30, 2006

MUTCD standards apply to traffic signals, signing, STOP and YIELD lines, symbol markings, and crosswalk markings at road and trail intersections. Location of, distance from road/path, and height of traffic control devices are all outlined in the MUTCD. The uniformity in design required by the MUTCD applies to the shape, color, symbols, wording, lettering and illumination or retro-reflectorization of the traffic control device. Under the Highway Safety Act of 1966, all persons are prohibited to install or maintain any sign, signal, marking, or other device intended to regulate, warn, or guide traffic used by the public unless it conforms to the MUTCD. Therefore, if a locality or organization wishes to post signs on a highway related to a trail or a road and trail intersection, the sign must meet MUTCD standards.

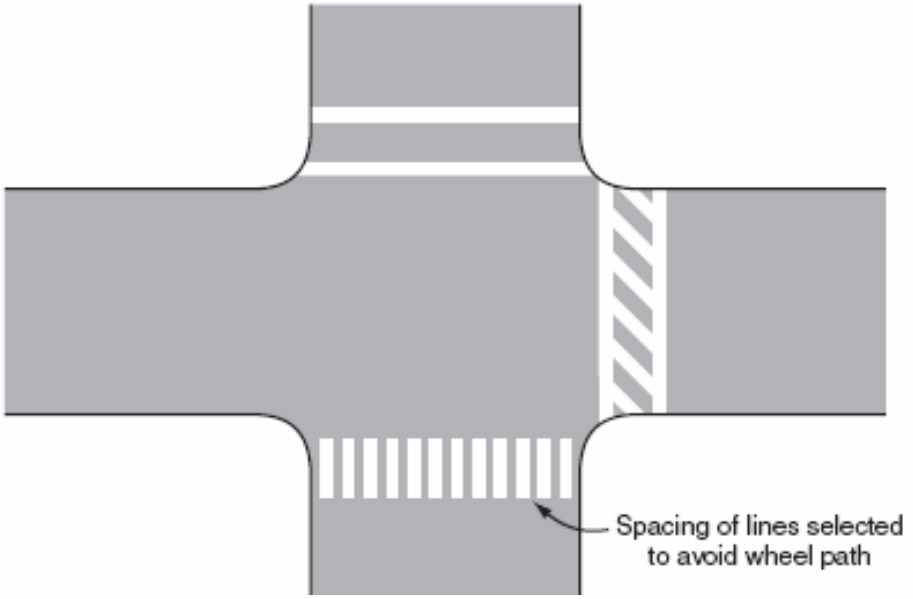
An example of the MUTCD's suggestion for the signing and marking of a road and trail intersection is illustrated in Figure 2.

Figure 2. Example of signing and marking a road and trail intersection



The three different types of crosswalk markings permitted by MUTCD are displayed in Figure 3. Specific recommendations are not made for type and location of crosswalk stripes or the types of intersections where they should be used.

Figure 3. Examples of crosswalk markings



New York State MUTCD

Examples of signage in the NYS MUTCD include a hierarchy of local, regional, state and national bicycle route signage, “shared roadway” bike signs, and “yield to pedestrians” devices and signage. Figure 4 and Figure 5 are examples of signage used in New York to identify and label bicycle facilities which are similar to the system of routes and signage that motorists enjoy for local, county, state and interstate highways. Many of these signs are designed for on-road facilities, but some may have applicability to off-road trails and shared use paths.

Figure 4. NYS Hierarchy of bicycle route signs

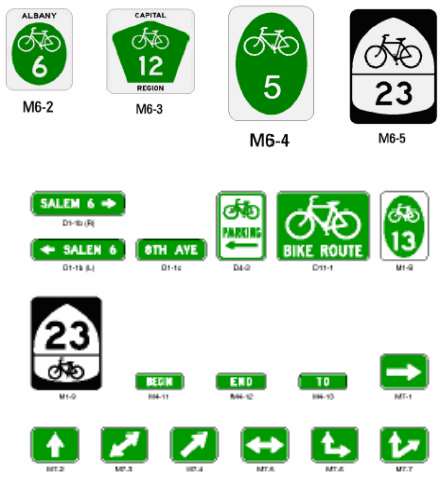


Figure 5. Regulatory signs for bicycle facilities

NYSDOT Highway Design Manual

The NYSDOT Highway Design Manual provides planning and design guidance for bicycle and pedestrian facilities specific to New York. Chapter 17 – Bicycle Facility Design and Chapter 18 – Pedestrian Facility Design offer policy, procedures and guidelines for on and off-road facilities. The manual clearly encourages engineers and planners to explore all alternative designs and treatments of bicycle and pedestrian facilities, including trails, in order to assure their safety. The first page in Chapter 17 includes the following:

> *"Despite the importance of walking and bicycling, many existing streets and highways do not adequately provide for these modes of travel. Therefore, the scoping and Design Approval Documents for projects that are used by bicyclists should identify their needs, the objectives for meeting those needs, the design criteria, and all feasible alternatives. Designers are responsible for assuring project designs provide for safe, convenient and cost effective bicycle travel consistent with the objectives and design criteria developed during project scoping or preliminary design."*[10]

The NYS Highway Design Manual provides best practices for pedestrian crossing design at intersections as well as typical crossing distances, speeds and times. Although the suggestions do not specifically refer to where trails cross roadways, they are a valuable reference. Figure 6 provides explanations for essential attributes of a crossing and Figure 7 is a table of pedestrian crossing distances, speeds and times found in the NYSDOT Highway Design Manual.

Figure 6. Best practices for pedestrian crossing design at intersections

Attributes	Explanation
Clarity, Directional, and Instructional Information (e.g., signing and audio/tactile cues as needed)	It should be obvious to motorists that there will be pedestrians present; it should be obvious to pedestrians where best to cross.
Convenient	Pedestrians will cross where it is most convenient.
Predictability	The placement of crossings should be predictable. Additionally, the frequency of crossings should increase where pedestrian volumes are greater.
Visibility	The location and illumination of intersection crossings allows pedestrians to see and be seen by approaching traffic while crossing.
Reasonable delays	The pedestrian does not have to wait unreasonably long for an opportunity to cross.
Adequate Crossing Time	The time available for pedestrians to cross accommodates users of all abilities.
Reduced Vibration Zone	Provide a 1220 mm minimum path within the crossing which eliminates or minimizes rough or jointed surfaces.
Limited Exposure	Conflict points with vehicular traffic are few, and the distance to cross is short or is divided into shorter segments by refuge islands or medians.
Clear and Accessible Crossing	The crossing is free of barriers, obstacles, and hazards, and is accessible to all users.

[10] Highway Design Manual, Chapter 17 – Bicycle Facility Design, Revision 49, March 30, 2006, p. 17-2.

Figure 7. Crossing distances, speeds, and times

Crossing Distance	MUTCD Normal Crossing Time at 1.2 m/s	Older Adult Crossing Time at 0.9 m/s	Mobility-Impaired Crossing Time at 0.8 m/s
7.2 m (2 lanes*)	6 seconds	8 seconds	9 seconds
10.2 m (2 lanes w/bike lanes**)	8.5 seconds	11.3 seconds	12.75 seconds
13.8 m (3 lanes w/bike lanes**)	11.5 seconds	15.3 seconds	17.25 seconds
17.4 m (4 lanes w/bike lanes**)	14.5 seconds	19.3 seconds	21.75 seconds
21.0 m (5 lanes w/bike lanes**)	17.5 seconds	23.3 seconds	26.25 seconds

* Assumes a 3.6 m vehicular lane width.
** Assumes a 3.6 m vehicular lane width, and a 1.5 meter bicycle lane width.
Adapted from: *Pedestrian Facilities Guidebook*, Washington State Dept. of Transportation, 1997.

IV. Studies and guides from other states and abroad

Design manuals developed by other bicycle-pedestrian advocates, such as *The Ottawa Cycling Plan*, Sustran's *Paths for People*, the *Contra Costa County Trail Design Resource Handbook*, and the Florida Department of Transportation's *Trail Intersection Design Handbook*, also provide examples of treatments and designs used elsewhere in the U.S. and abroad to improve safety at road and trail intersections.

The Ottawa Cycling Plan recommends bollards, signs, and/or change in trail environment, surface, or alignment to slow trail bicyclists and provide advance warning of an approaching intersection. In places with limited sight distance, the Plan suggests a change in texture, color, or elevation of the road surface to alert motorists to an approaching trail intersection. Where "sight distances are poor or the view of the path is obstructed" the plans recommends the installation of a motion activated "cross alert" early warning system and use of the pedestrian and bicycle crossing ahead sign (see Figure 8) rather than the yellow bicycle warning sign.[11]

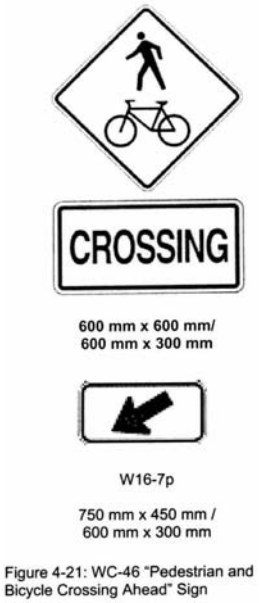


Figure 8. Bicycle and Pedestrian Crossing Ahead sign, Ottawa Cycling Plan, 4-40.

England's Sustrans guide presents six different road and trail intersection designs based on traffic volume and whether trail user or motorist has priority. Suggestions include elevated road surfaces to give trail user priority, YIELD and STOP signs on road or trail, traffic light controlled crossings, gates, and refuge islands.

For California's Co*ntra Costa County Trail Review Study*, data was gathered from field reviews of road and trail intersections on two popular trails as well as surveys of cyclists reached through direct mail and the Internet. The study recommends that road and trail intersections include street lighting to encourage use for year round transportation; street name signs both on-road and on-trail so bicyclists and motorists realize that the trail is a

[11] Draft City of Ottawa Cycling Plan Draft, March 2005, p. 4-38-40.

transportation facility; no bollards or bollards set far enough apart to allow two bicyclists to pass at a time; trimmed vegetation to improve sight distance; Zebra crosswalks; and trail warning signs on cross streets. The *Trail Review Study* includes a *Trail Design Resource Handbook* that supplements the Caltrans Highway Design manual and offers guidance on when and how to exceed the highway design manual standards. The *Handbook* presents ten different designs for road and trail intersections and assignment of right of way based on type of road, sight distance, and average daily traffic volume (see Figure 9) and typical signage for roadways at trail crossings (see Figure 10).

The Florida Department of Transportation's, *Trail Intersection Design Handbook* presents the most comprehensive discussion of road and trail intersection design in the U.S. to date. Its goal is "to have a manual that provides guidelines to assist in designing these trail junctions so that operations and safety are maximized, and the number of conflicts and crashes are minimized."[12] In developing the *Handbook,* FDOT conducted field observations at approximately 60 trail-roadway and trail–driveway junctions across the state. Locations were chosen to provide a variety of intersection designs and a range of road widths, vehicle speeds, and traffic volumes. The study also relied on three hours of films, each taken at 20 different road and trail intersections. The knowledge gained from the observations, as well as an in-depth analysis of the needs of bicyclists, pedestrians, skaters, children, the elderly, and the physically challenged were used to develop the *Handbook's* "principles of friendly design," (see Figure 11), and suggested treatments and assignment of right of way on two- and four lane road and trail intersections (see Figures 12 and 13).

[12] Trail Intersection Design Handbook, 1996, http://www.dot.state.fl.us/safety/ped_bike/handbooks_and_research/TRAILINT.PDF, p. 1-2.

Figure 9. Traffic control at intersections, Contra Costa County Trail Design Guidelines

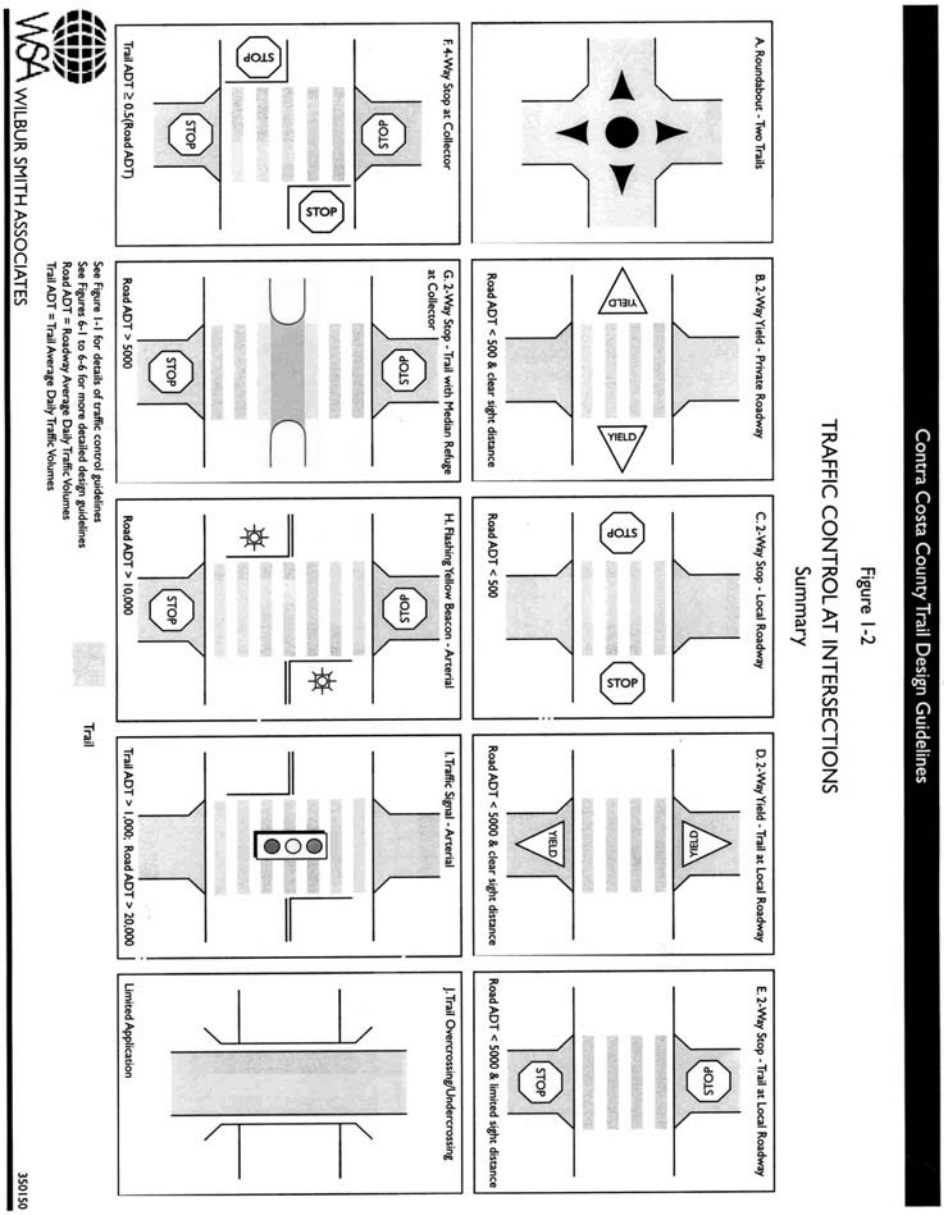


Figure 10. Typical signage for roadways at trail crossings, Contra Costa County Trail Design Guidelines

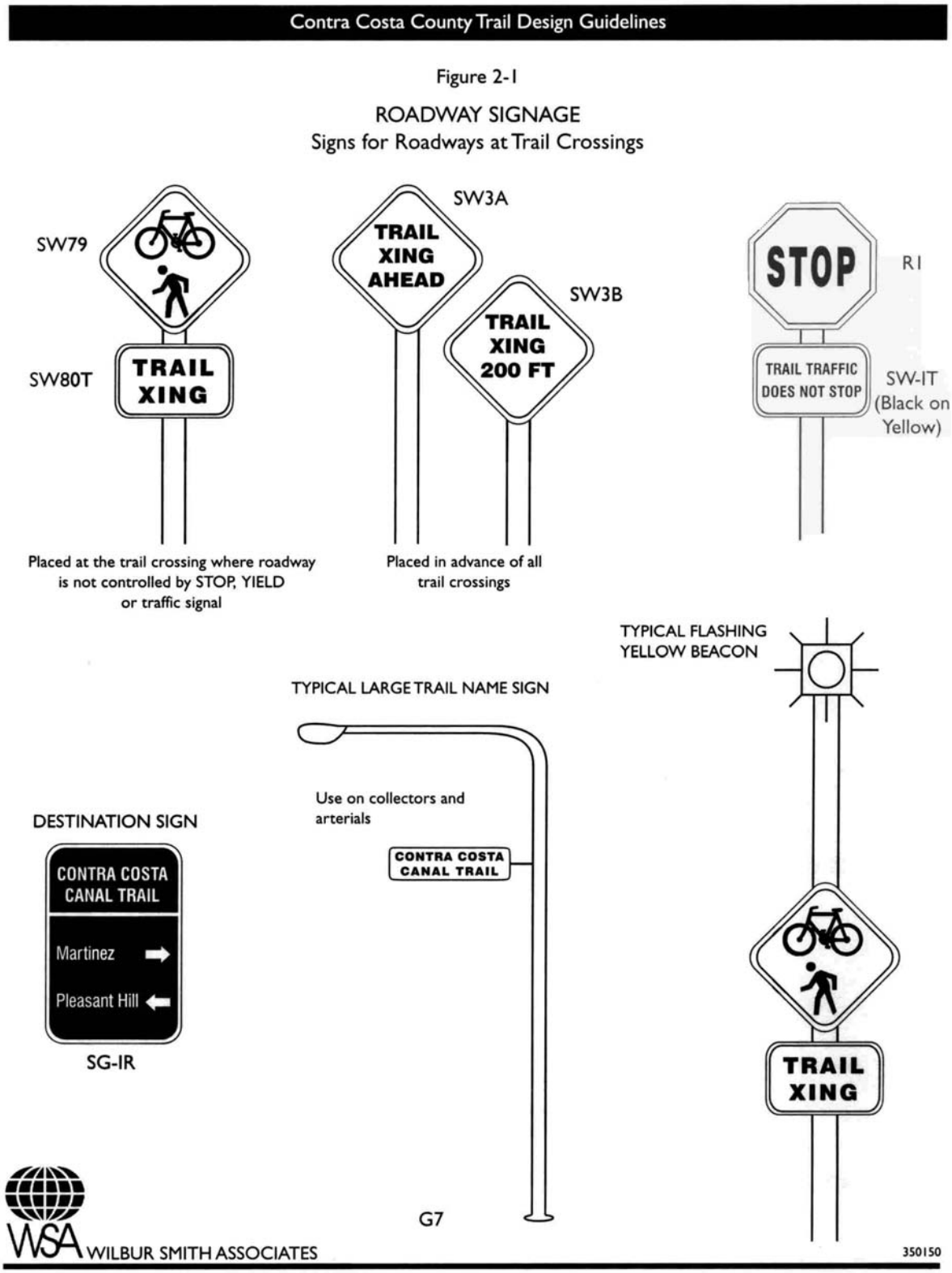


Figure 11. Principles of "friendly" design, *Trail Intersection Design Handbook, Florida Department of Transportation,* p. 2-11.

Design principles

- Treat every road as a potential trail entrance and exit point, integrated with sidewalks and on-street bicycle facilities as appropriate.
- Design to assist the trail user in looking in the direction of the potential hazard.
- Consider the potential for sun blinding.
- Consider lighting.
- Consider the ease of both construction and maintenance and the initial and lifetime costs for construction and maintenance.
- Be consistent in design.

Provide clear right-of-way assignment.

Principles of "friendly" design

- Design for the full spectrum of trail users—young and old, slow and fast, bicyclists, skaters, and walkers.
- When assigning right-of-way, give trail users at least the same rights as the motoring public, and provide clear right-of-way assignment.
- Provide positive guidance for trail users and motorists to ensure full awareness of the intersection.
- Minimize conflicts and channelize the intersection to separate conflicting movements.
- Unavoidable conflicts should occur at right angles.
- Optimize sight triangles, ensuring stopping, intersection crossing, and decision sight distances. Conflicts should be clearly visible.
- Reduce motor vehicle speed through "traffic calming" techniques as appropriate.
- Minimize trail user crossing distance with a median refuge area or by narrowing the roadway as appropriate.
- Provide adequate staging and refuge areas for trail users.
- Discourage unwanted motor vehicle intrusion onto the trail while enabling emergency and maintenance vehicle entry.
- Avoid obstacles and visibly highlight unavoidable obstacles.
- At signalized intersections, minimize trail user delay by minimizing traffic signal cycle time.
- Provide adequate signal crossing time for design pedestrians.
- Provide easily accessible tactile/audible pushbuttons.

Figure 12. Suggested treatments on two-lane road and trail intersections, *Trail Intersection Design Handbook, Florida Department of Transportation,* p. 3-18.

Two-Lane Road Crossings				
ADT/ Speed (85%)	**<2000**	**2,000-4,999**	**5,000-9,999**	**10,000+**
<=40 km/h (25 mi/h)	Yield with traffic calming or Stop sign calming optional	Stop sign calming optional	Stop sign with added traffic calming	Consider signal
	Yield refuge not needed	Yield or Stop refuge optional	Stop sign with refuge area or Signal	
50-60 km/h (30-35 mi/h)	Stop sign calming optional	Stop sign with added traffic calming	Stop sign with refuge area or Signal	Consider signal
	Yield or Stop refuge optional	Stop refuge optional		
65-75 km/h (40-45 mi/h)	Stop sign refuge optional	Stop sign with refuge area	Stop sign with refuge area or Signal	Consider signal
80+ km/h (50+ mi/h)	Stop sign refuge optional	Stop sign with refuge area	Consider signal	Consider signal

Trail given right-of-way	Roadway given right-of way	- Criteria are for two thru lanes. In general, if turn lanes are present, move one cell to the right for each turn lane. - Yield conditions must satisfy MUTCD Warrant 1. Give precedence to Yield over Stop. - Trail as speed table is acceptable traffic calming for cell <2000 / <=40 km/h only. For other cells, the traffic calming may be lane narrowing (splitter island/refuge area/choker) or some other accepted method.

Figure 13. Suggested treatments on four (or more)-lane road and trail intersections, *Trail Intersection Design Handbook, Florida Department of Transportation,* p.3-19.

Four (or more) Lane Road Crossings			
ADT/ Speed (85%)	**<10,000**	**10,000-19,999**	**20,000+**
<=60 km/h (35 mi/h)	Refuge area, preferably protected	Protected refuge or Signal	Signal or grade separated
>=65 km/h (40 mi/h)	Protected refuge or Signal	Signal	Signal or grade separated

V. Methodology

Research Tool Selection

Parks & Trails New York was aided in the development of its study methodology by conversations with highway practitioners throughout the U.S., Canada, and Europe as well as examination of other design manuals such as *Florida's Trail Intersection Design Handbook*, the *Contra Costa County Trail Design Resource Handbook*, and the *Ottawa Cycling Plan*. Previous studies have used field observations and scientific calculations of angles, speed, road widths, etc. to examine hazards and develop recommendations for improving safety at road and trail intersections. Parks & Trails New York, however, sought to gather input directly from trail groups, highway superintendents, and officials from different levels of government who, through their involvement with the development, design and maintenance of trails, have first-hand experience with existing road and trail intersection design and the occurrence and nature of crashes at road and trail intersections.

Phase One Survey

Group Selection

The population chosen to survey consisted of 57 County Highway Superintendents, 55 County Planning Offices, 9 New York State Department of Conservation (DEC) Regional Natural Resource Supervisors, 21 New York State Department of Transportation (DOT) Regional Bike and Pedestrian and Transportation Enhancement Coordinators, 1,546 chief elected municipal officials (mayors and town supervisors), 13 Metropolitan Planning Organization (MPO) Bicycle and Pedestrian Coordinators, 14 New York State Office of Parks, Recreation and Historic Preservation (OPRHP) Regional Directors, and 182 trail groups within New York State. Parks & Trails New York felt these constituencies would have the greatest likelihood of being directly involved with road and trail intersection design and maintenance and would also possess knowledge of any crashes that may have occurred.

Anecdotal evidence suggested that treatment of road and trail intersections may vary between different road classifications, so Parks & Trails New York made certain to seek

input from officials from different levels of government. An attempt was made to acquire the names of all local highway superintendents. The list was not available in time for the survey mailing so surveys were sent to chief elected officials (mayors and supervisors) instead.

Design

Nationally respected bicycle and pedestrian advocates assisted with the review and editing of the survey in order to obtain a document that would be only one page in length, easily understandable by all recipients, and also capture sufficient, meaningful, and objective data.

The survey was divided into three parts.

- **Part One: Basic Trail Information** characterized the nature and location of the trail for which data was being provided. The questions in this part of the survey on allowed uses, surface characteristics, and length defined the type of trail being surveyed.
- **Part Two: Road and Trail Intersection Design** provided information on the number of road and trail intersections on the trail; the nature of the roads being crossed as determined by road width, vehicle speed, and average daily traffic volume; and the traffic control devices and other design elements that characterize the trail's road and trail intersections.
- **Part 3: Safety of Road and Trail Intersections** solicited feedback on whether any complaints had been received regarding the safety of the trail's road and trail intersections and the nature of any crashes that may have occurred at these intersections. An open-ended question was added to gather input from respondents on how they felt safety could be improved at road and trail intersections.

In order to facilitate further probing of responses, the survey concluded by asking if the respondents were willing to be contacted for follow up.

Distribution

Parks & Trails New York did not have email addresses for most of the individuals selected as survey recipients and the survey questions did not lend themselves easily to existing web-based survey instruments, so it was decided to distribute the survey using the US

Postal Service. A total of 1,896 surveys were mailed. A cover letter giving a brief overview of the study and a postage-paid return envelope were included with the survey. The cover letter also provided a web address to download additional survey forms. Survey recipients were asked to respond within one month, but surveys were accepted for an additional month and one-half beyond the return date of March 10, 2006. See Appendix A for the survey form and cover letter.

Project Promotion

Parks & Trails New York used several communication channels to publicize the survey effort and encourage maximum participation. Subsequent to mailing the surveys, Parks & Trails New York added a page to its website that explained the purpose and importance of the study and provided contact information for persons seeking additional information. The survey form was also made available on the website in downloadable form.

A press release was distributed to major media sources. No information is available on how many daily or weekly papers actually ran the story.

An overview of the study was included in the March-April 2006 issue of Parks & Trails New York's electronic Parks & Trails E-News, which was emailed to 2200 trail advocates across the state. Articles about the road and trail intersection study also appeared in Parks & Trails New York's Fall 2005 and 2006 and Spring 2006 issues of *GreenSpace*, its semi-annual newsletter mailed to 5000 persons.

Phase One Follow-up survey

Group Selection

Eighty percent of Phase One survey respondents (140 individuals) indicated they could be contacted for follow-up. Criteria for selecting respondents for further questioning included persons who reported crashes, who indicated they had received complaints about the safety of their road and trail intersections, and who reported no crashes or complaints. Parks & Trails New York was able to follow-up with 34 (87%) of the 39 individuals who had received complaints , all seven persons that reported crashes occurring at road and trail

intersections, and two persons that had not reported any crashes or complaints. Speaking with survey respondents helped Parks & Trails New York obtain more detailed information on the crashes and complaints, design guidelines employed, and dangerous road and trail intersections noted in the original survey responses.

Design

Each participant was asked a set of identical questions about the importance of safety in intersection design, existence of signage and crosswalks at road and trail intersections, and the nature of trail signage used. The follow up surveys also included additional questions specific to each of the subgroups, such as the circumstances surrounding reported crashes or the factors contributing to complaints regarding road and trail intersection safety. Participants were asked to elaborate on crashes and/or complaints received. Participants were also asked for suggestions and comments on improving road and trail intersection safety.

Distribution

Parks & Trails New York contacted follow-up participants by phone and/or email based upon the type of contact information they provided.

Project Promotion

Because each participant was contacted directly for additional information, promotion of the Phase One follow-up survey was unnecessary.

Phase Two Survey

Group Selection

The Phase One survey focused on obtaining data on individual trails. However, responses from key state agency stakeholders were limited. One of the reasons given was that they could not provide data about individual trails because there were too many and too great a variety of types of trails to report on within their jurisdiction. In response, in Phase Two, Parks & Trails New York created a new survey to collect data from state and local agencies about trail networks instead of individual trails. The Phase Two survey was distributed to

108 individuals including: 9 NYSDEC regional foresters, 13 Bicycle and Pedestrian Coordinators at New York State Metropolitan Planning Agencies, 11 regional directors at OPRHP offices, and 13 Bicycle and Pedestrian Coordinators of the NYS DOT, and 64 New York State Traffic Safety Board Chairpersons and Coordinators. The latter group was not included in the original survey distribution. In Phase Two, it was decided to send surveys to NYS DEC regional foresters instead of DEC natural resource directors in order to capture feedback from DEC personnel that were more directly involved with trail management.

Design

The Phase Two survey was divided into three parts.

- **Part One: Basic Trail Information** asked respondents to detail trail uses, whether design guidelines were used to construct trails, if they knew of a crash on a trail, whether crash data is collected by the agency surveyed, and if any complaints had been received regarding road and trail intersection safety. The first part of the survey also featured open-ended questions asking participants to detail complaints and suggestions about the safety of their road and trail intersections. If respondents reported a crash at a road and trail intersection in their region they were directed to the third part of the survey
- **Part Two: Road and Trail Intersection Design** solicited information about the presence of safety devices on roads and on trails at road and trail intersections in areas overseen by each agency surveyed. The second part of the survey asked participants whether a particular safety device was installed at all, most, half, part, some, or none of the road and trail intersections in their region. An additional column allowed participants to note if they were unsure about the presence of a particular safety feature.
- **Part 3: Crash Data** collected more detailed data for crashes at road and trail intersections.

In order to facilitate further probing of responses, the survey concluded by asking if the respondents were willing to be contacted for follow up.

Survey Distribution

The Phase Two survey was mailed to 108 State, County, and regional agencies. The cover letter also provided a web address to access the survey online. The Phase Two survey cover letter also directed respondents to a website, www.surveymonkey.com, where they could respond to the survey electronically. Survey recipients were asked to reply within two months, but surveys were accepted for an additional month beyond the return date of February 1, 2007. See Appendix C for the Phase Two survey form and cover letter.

Project Promotion

Parks & Trails New York used several communication channels to publicize the Phase Two survey effort and encourage maximum participation. Subsequent to mailing the surveys, Parks & Trails New York added a page to its website that explained the purpose and importance of the study and provided contact information for persons seeking additional information. The survey form was also made available on the website in downloadable form and through a link to www.surveymonkey.com where the online survey form was hosted. In addition, an overview of the study was included in the January-February 2007 issue of Parks & Trails New York's electronic newsletter, Parks & Trails E-News, which was emailed to 2200 trail advocates across the state.

VI. Survey Results

Nature of Phase One Survey Responses

In Phase One, Parks & Trails New York received a total of 212 surveys from 174 respondents. Overall response rate was nine percent, which is respectable for a mailed survey with no incentives and where the recipients had no prior knowledge of the study and no or little prior association with Parks & Trails New York.

The surveys represented data on 194 different trails as 18 individuals responded to the Phase One survey even though they did not have a trail within their jurisdiction. Most of

these persons expressed interest in developing trails in the future and in learning the study's outcomes.

Fifty-six of the state's 62 counties were represented in the survey responses, covering every region of the State. Nearly 65 percent of those who returned surveys were local government officials. Many surveys at the local government level were passed along from their original recipient (mayor or supervisor) to others who could better respond. Table One demonstrates that the majority of local government responses came from highway superintendents and public works departments. The fact that local elected officials, some of whom function part-time and without support staff, responded to the survey, or took the time to pass it on to their highway personnel, may indicate that they believe this issue is important. It should be noted, however, that the 113 local officials who responded to the survey represent only seven percent of the 1546 local elected officials to whom the survey was mailed.

Table 1. Profile of Phase One survey respondents

Survey respondents by title	No. Mailed	No. Respondents	With Trails		Without Trails		Total	
	No.		No.	(%)	No.	(%)	No.	(%)
STATE	***43***	***7***	***7***	***4.00%***	***0***	***0%***	***7***	***4%***
NYS DEC Natural Resource Directors	9	4	4	2.30%	0	0.00%	4	2.30%
NYSDOT bike/ped coordinators	21	0	0	0.00%	0	0.00%	0	0.00%
NYSOPRHP	13	3	3	1.70%	0	0.00%	3	1.70%
COUNTY	***112***	***21***	***20***	***11.30%***	***1***	***0.06%***	***21***	***12.10%***
County Highway Departments	57	10	9	5.10%	1	0.06%	10	5.70%
County Parks Departments	*	2	2	1.10%	0	0.00%	2	1.10%
County Planning Offices	55	9	9	5.10%	0	0.00%	9	5.20%
LOCAL GOVERNMENT	***1546***	***113***	***96***	***55.00%***	***17***	***9.80%***	***113***	***64.90%***
Mayor/Supervisor	1546	15	10	5.70%	5	2.90%	15	8.60%
Clerk	*	9	7	4.00%	2	1.10%	9	5.10%
Parks	*	7	7	4.00%	0	0.00%	7	4.00%
Planner	*	5	5	2.80%	0	0.00%	5	2.80%
Highway/Public Works Department	*	77	67	38.50%	10	5.70%	77	44.20%
Regional	***13***	***3***	***3***	***1.70%***	***0***	***0***	***3***	***1.70%***
MPO bike/ped programs	13	3	3	1.70%	0	0.00%	3	1.70%
VOLUNTEER/NON-PROFIT	***182***	***30***	***30***	***17.20%***	***0***	***0***	***30***	***17.20%***
Trails Managers and Friends Groups	182	30	30	17.20%	0	0.00%	30	17.20%
TOTAL	**1896**	**174**	**156**	**89.20%**	**18**	**9.90%**	**174**	**100.00%**

Table 2. Phase One Surveys received

Group to whom surveys were sent	No. Surveys Received	Percent of Total Responses
STATE	**19**	**8.96%**
NYS DEC Natural Resource Directors	5	**2.36%**
NYSDOT bike/ped coordinators	0	**0.00%**
NYSOPRHP	14	**6.60%**
REGIONAL	**4**	**1.89%**
MPO bike/ped programs	4	**1.89%**
COUNTY	**23**	**10.85%**
County Highway Departments	10	**4.72%**
County Planning Offices	11	**5.19%**
County Parks Departments*	2	**0.94%**
LOCAL GOVERNMENT	**134**	**63.21%**
VOLUNTEER/NON-PROFIT	**32**	**15.09%**
TOTALS	**212**	**100.00%**

*Two surveys were returned by County Parks Departments
Note: 18 surveys indicated that they had no trails

Table 2 indicates that local government officials also returned the greatest number of surveys, 63 percent of the 212 received, primarily because of the participation from highway departments. The second greatest number of surveys came from volunteers and nonprofit trails groups, but they were a distant second with 32 returned surveys or 15 percent of the total.

Although, several of the state's 21 NYSDOT Bike-Ped and Transportation Enhancement Program Coordinators were aware of the study and provided helpful advice on survey design at the outset, not one of them returned a survey form. The lack of response from DOT Bike-Ped Coordinators may be because they are not directly responsible for any trails, though they do play an important role in ensuring that MUTCD and AASHTO guidelines are followed for all federally funded trail projects. The Phase Two survey was especially aimed at addressing the lack of Phase One responses from the NYSDOT Bicycle and Pedestrian Coordinators.

Surveys sent to NYS DEC Natural Resource Supervisors were answered by regional foresters. Response from DEC may have been even greater if the survey had been sent directly to the foresters or the operations managers who work more closely with the trails within their region. The Phase Two survey was distributed directly to DEC regional foresters.

Surveys sent to NYS OPRHP Regional Directors were also answered by other regional staff. As with the DEC mailings, responses may have been greater if the surveys had been sent directly to regional engineers or individual park managers. The Phase Two survey was again distributed to OPRHP Regional Directors, however, because Parks & Trails New York could not obtain names and addresses for regional engineers and individual park managers.

Nature of Phase Two Survey Responses

As illustrated in Tables 3 and 4, if one considers only survey responses from NYS DOT and MPO bicycle pedestrian coordinators and DEC and OPRHP regional personnel, the overall percentage of responses from these groups was greater in Phase Two (25%) than Phase One (18.5%). Phase Two surveys were also sent to NYS County Traffic Safety Board Chairpersons and Coordinators. Response rate for the NYS County Traffic Safety Board Chairpersons and Coordinators was the lowest by group, but their nine Phase Two surveys accounted for nearly half the data collected.

Table 3. Response rates for State and Regional Agency officials*

Survey	Mailed	Received	Response Rate
First Round	56	10	17.90%
Second Round	44*	11	25%

*Phase Two surveys were not mailed to NYSDOT Transportation Enhancement Coordinators

Table 4. Phase One and Phase Two Survey response rates by group

Group	Response Rate for the Phase One Survey	Response Rate for Phase Two Survey	Percent of Total Responses for the Phase One survey	Percent of Total Responses for the Phase Two survey
NYS Traffic Safety Board Chairs and Coordinators*	n/a	**9** 14.10%	n/a	45.00%
NYS DEC Regional Foresters^	**4** 44.40%	**3** 33.30%	2.30%	15.00%
OPRHP Regional Directors▫	**3** 21.40%	**2** 18.20%	1.70%	10.00%
NYSDOT Bicycle and Pedestrian Coordinators®	**0** 0%	**2** 18.20%	0.00%	10.00%
NYS MPO Bicycle and Pedestrian Coordinators○	**3** 21.40%	**4** 30.80%	1.70%	20.00%
Averages	**22.20%**	**17.60%**	**1.40%**	100.00%
* Phase One surveys were not mailed to NYS Traffic Safety Board Chairs and Coordinators				
^ 9 Phase One surveys sent to NYS DEC Natural Resource Directors				
▫ 14 Phase One surveys sent to OPRHP Regional Directors				
® 21 Phase One surveys sent to NYSDOT Bicycle and Pedestrian Coordinators				
○ 21 Phase One surveys sent to NYS MPOs				

Data Review

Trail surface and permitted and prohibited trail use

The Phase One survey asked for information on trail surface and permitted and prohibited uses to determine if there was any correlation between crashes or complaints and a specific type of trail surface or group of primary or prohibited trail users. No such correlations could be demonstrated.

Data was obtained from 53 paved trails, 19 trails with a cinder surface, and 41 stone dust trails. Others were either grass or dirt, especially in the case of snowmobile trails. In a few cases, no trail surface type was recorded.

Table 5 demonstrates that many of the 194 trails surveyed in Phase One are used by several different groups.

Table 5. Types of primary trail users – Phase One Survey

Reported users of the trail	Trails surveyed reporting this use
Pedestrians	122
Bicyclists	91
Cross country skiing	50
Snowmobiles	56
Equestrians	28
Unknown	2
Other	2

A majority (59%) of the 194 surveys returned indicated that they do not permit at least some form of motorized vehicles. Seventy-seven surveys included a general statement that "motor vehicles" were prohibited. Twenty four surveys specifically mentioned ATVs and 4-wheelers as prohibited. Eleven surveys said that snowmobiles were not allowed on their trails.

Presence or absence of traffic control devices on road and on trail

One of the objectives of the Phase One and Two surveys was to determine the existence and type of traffic control devices being used at road and trail intersections. Surprisingly, in Phase One, 57 surveys, (29 percent) indicated that there were no traffic control devices of any kind at their road and trail intersections.

Tables 6 and 7 summarize the data provided by the Phase One survey forms on the nature of traffic control devices being employed on-road and on-trail at state, county and town road intersections. Slightly more than half of the surveyed trails were marked with some type of on-road trail identification sign. A smaller number of trails, between 42-47 percent, were marked with bike-ped signs.

As expected, crosswalks were less numerous but still more prevalent than may have been predicted. For the trails included in the survey, crosswalks were employed on 30 percent of state and 33 percent of local roads but only 23 percent of county roads.

Overall, more than half of all trails had STOP signs. But since STOP signs reinforce assignment of right of way, the fact that 44 percent of state roads, 22 percent of county roads, and 41 percent of town roads had no such controls could increase the exposure to risk at these road and trail intersections. Fewer trails had STOP AHEAD signs, indicating that not everyone feels the need to erect a STOP AHEAD sign when using a STOP sign.

Because they can only be employed with paved trails, the small percentage of trails that had pavement words and symbols was expected. Also not surprisingly, less than 10 percent of all trails were reported to have signalized controls.

Slightly less than half of the trails surveyed had either gates or bollards. This response may seem surprising as gates and bollards are considered standard fixtures on most multi-use trails. However, these results can probably be explained by the fact that the data includes responses from some single use hiking and snowmobile trails that often do not employ gates and bollards.

Table 6. Phase One survey – On-road traffic control devices

	Surveys reporting intersections	On Road		
		Trail ID signs	Bike/ped. signs	Crosswalks
State	73	47 (64%)	32 (44%)	30 (41%)
County	62	37 (60%)	26 (42%)	14 (23 %)
Town	96	55 (57%)	45 (47%)	33 (34%)

Table 7. Phase One survey - On-trail traffic control devices

	Surveys reporting intersections	On Trail					
		STOP signs	STOP AHEAD signs	Pavement words/ symbols	Signalized controls	Gates	Bollards
State	73	41 (56%)	34 (47%)	11 (15%)	7 (10%)	15 (21%)	17 (23%)
County	62	48 (78%)	32 (52%)	7 (11%)	2 (3%)	15 (24%)	14 (23%)
Town	96	57 (59%)	38 (40%)	13 (14%)	6 (6%)	23 (24%)	21 (22%)

Phase Two surveys also sought to determine if any and to what degree traffic control devices existed on-road and/or on-trail, but as the survey was aimed at persons responsible for more than one trail, the response categories included in the survey were less precise (all, most, some, etc.) to accommodate that broader focus. Table 8 illustrates the distribution of responses regarding the presence of safety features at road and trail intersections from the 20 Phase Two surveys returned.

Table 8. Phase Two survey – On-road and on-trail traffic control devices

On Road	All		Most		Half		Some		None		Unknown		N/a	
Are there trail identification signs on the road at your road and trail intersections?	21.10%	4	31.60%	6			31.60%	6	5.30%	1	10.50%	2		
Are there bike pedestrian signs on the road at your road and trail intersections?	10.50%	2	31.60%	6			15.80%	3			21.10%	4		
Are there marked pedestrian crosswalks on the road at your road and trail intersections?	5.30%	1	26.30%	5			10.50%	2			15.80%	3		
On Trail	**All**		**Most**		**Half**		**Some**		**None**		**Unknown**		**N/a**	
Are there stop signs on the trail at your road and trail intersections?	26.30%	5	31.60%	6			21.10%	4	5.30%	1	15.80%	3		
Are there stop ahead sings on the trail at your road and trail intersections?	21.10%	4	15.80%	3			31.60%	6	10.50%	2	21.10%	4		
For paved trails, are there pavement words or symbols on the trail at your road and trail intersections?	10.50%	2	5.30%	1			21.10%	4	21.10%	4	26.30%	5	15.80%	3
Are there signalized controls at your road and trail intersections?			5.30%	1			15.80%	3	68.40%	13	10.50%	2		
Are there gates at your road and trail intersections?	5.30%	1	15.80%	3			47.40%	9	21.10%	4	10.50%	2		
Are there bollards at your road and trail intersections?	15.80%	3	15.80%	3			15.80%	3	15.80%	3	36.80%	7		

More than a third of survey respondents did not know if bollards were present at road and trail intersections within their jurisdiction. More than 20 percent were unaware if bike-pedestrian signs were present.

Just over half, 55%, of the Phase Two survey respondents indicated that they report and document crashes on the trail. Phase One survey respondents were not asked this question.

Table 9. Second round survey data

Table X5: Design Guidelines				Incidents at Road and Trail Intersections		
AASHTO	NYSMUTCD	Federal MUTCD	Unknown Guideline	Report and document Crashes	Crashes Reported	Complaints
6	5	3	13	11	1	6
30%	25%	15%	65%	55%	5%	30%

Complaints regarding road and trail intersection safety

Although complaints are not necessarily representative of actual risk at road and trail intersections, they can be an indication of road users' and trail users' perception of risk or problems associated with trail crossings. Thirty-nine (20%) of the 194 surveys indicated that complaints had been received regarding road and trail intersection safety. Two issues each received nine complaints: speeding vehicles and visibility (sight distance) for cars, pedestrians, or snowmobiles. Other complaints related most often to road and trail intersection design, such as the need for adequate parking, crosswalks, and signage or other means of warning trail users and motorists.

Six (30%) of the 20 Phase Two surveys indicated that complaints had been received regarding road and trail intersection safety. As with the Phase One surveys, speeding vehicles and visibility (sight distance) for motorists and/or trail users were most frequently cited. Failure to yield was also mentioned by two Phase Two survey respondents. See Appendix C for a complete listing of complaints from the Phase One and Two survey forms.

Phase One Follow-up Surveys - Complaints received

Parks & Trails New York followed up with 34 Phase One survey respondents who had received complaints about road and trail intersection safety. One of the reasons Parks & Trails New York undertook these follow up surveys was to discover if there was anything about the management practices for these trails that may have been responsible for the complaints received. See Table 10 for a review of responses to this follow up survey.

The most surprising finding was how little these follow up survey respondents knew about the design of their road and trail intersections. Nearly 60 percent said they had little or no knowledge of what guidelines had been used to design their road trail intersections. Similarly, half did not know if sight and stopping distance were taken into account in their road and trail intersection design. Four persons said that sight and stopping distance were considered, but they were unaware of what guidelines were used. Nevertheless, all respondents were able to identify the entity responsible for road and trail intersection maintenance. As Table 9 illustrates, when Phase Two surveys asked specifically what design guidelines were used when trails were constructed, more than half of the respondents, 65%, answered they were unsure of the guidelines used.

The follow up survey also asked respondents whether they had a clear review process in place if a crash were to occur at their road and trail intersections. Thirty (88%) of those surveyed were unaware of any existing review procedures. Most respondents told Parks & Trails New York that this was a “police matter.” One respondent commented, however, that his trail group was conducting drills with fire and police officials so a coordinated response to on-trail crashes could be created.

Seventy percent of these follow up survey respondents who had said they had received complaints about road and trail intersection safety, stated that safety was not a factor influencing trail use. The responses to this question may have needed more

probing, but it can be inferred that even though there had been complaints they were not significant or widespread enough to deter use. One might have expected to find fewer traffic control devices on-road and on-trail for those 10 trails where safety was

Table 10. Overview of Phase One follow-up responses

Is safety a factor influencing trail use?	Yes	No				
	10 (29.4%)	24 (70.6%)				
Have you made changes to improve the safety at your road and trail intersections in the past?			Safety a factor and changes	Safety a factor without changes		
	21 (61.8%)	13 (38.2%)	7 (70%)	3 (30%)		
Who is responsible for maintaining your road trail intersections?	State	County	Local	Volunteer	Multiple	Unknown/ N/A
	4 (11.8%)	2 (5.9%)	7 (20.1%)	10 (29.4%)	10 (29.4%)	1 (2.9%)
What guidelines were used to design the trail crossing?	State /MUTCD	Federal/ AASHTOW	Multiple (State and Federal)	County	Unknown	
	8 (23.5%)	4 (11.8%)	1 (2.9%)	1 (2.9%)	20 (58.9%)	
Were sight and stopping distance taken into account for road and trail intersection design?	Yes	Unknown	Yes, with no guidelines cited			
	13 (38.2%)	17 (50%)	4 (11.8%)			
Do you have any special treatments at skewed intersections?	No	Yes with special treatment	Safety not a factor with special treatment	Safety a factor with special treatment		
	23 (67.6%)	5 (14/7%)	6 (60%)	4 (40%)		
If an accident did occur at one of your road and trail intersections, is there a clear process for review?	Yes	Unknown				
	23 (67.6%)	11 (32.4%)				
Trail identification signs present?	Yes	No	Safety a factor without ID	Safety a factor with ID		
	24 (70.1%)	10 (29.4%)	4 (40%)	6 (60%)		
Bike/Ped signs present?	Yes	No	Safety a factor without Bike/Ped	Safety a factor with Bike/Ped		
	17 (50%)	17 (50%)	4 (40%)	6 (60%)		
Crosswalks present?	Yes	No* (5 trails for snowmobile use only)	Safety a factor without Crosswalks	Safety a factor with Crosswalks		
	17 (50%)	12 (35.3%)	5 (50%)	5 (50%)		

Table 10. Overview of Phase One follow-up responses – continued

	Yes	No	Safety a factor without STOP and SA signs	Safety a factor with STOP and SA signs	
STOP & STOP AHEAD signs present?	21 (61.8%)	13 (38.2%)	5 (50%)	5 (50%)	
	Yes	No	N/A	Safety a factor without pavement words and/or symbols	Safety a factor with pavement words and/or symbols
Pavement Words or symbols present?	6 (17.6%)	12 (35.3%)	16 (47.1%)	6 (60%)	4 (40%)
	Yes	No	Safety a factor with out Controls	Safety a factor with controls	
Signalized controls present?	1 (2.9%)	33 (97.1%)	10 (100%)	0 (0%)	

believed to affect trail use. However, as Table 10 indicates, this was not the case. Six of these 10 trails had bike-ped and trail identification signs, and five had crosswalks and STOP and STOP AHEAD signs on-trail. Of the 10 persons who reported safety did affect trail use, seven stated that changes had recently been made to improve the safety of their road and trail intersections.

The entity responsible for maintenance does not appear to have any effect on whether complaints are received or not. For these 34 trails where complaints had been received regarding road and trail intersection safety, maintenance responsibility was rather evenly distributed, 10 (29%) were maintained by volunteers, 10 (29%) by multiple parties, and 7 (20%) by local governments.

The follow up survey was also designed to gather additional information on the design of the road and trail intersections where complaints had previously been received. As Table 10 indicates, most of these intersections had some types of traffic control devices on-trail and/or on-road. At least half had trail identification and bicycle-pedestrian signs on-road as well as crosswalks. When respondents were asked why they did not have safety features such as signs or crosswalks, many replied that they did not have adequate funding for such projects.

Trail identification signs: Seventy-one percent (24 out of 34) had trail identification signs. Three of the respondents without trail identification signs told Parks & Trails that safety was an issue at their crossings. In two of these cases, speeding vehicles was cited as the specific safety issue. All three of these respondents said they intend or would like to erect trail identification signs in the near future.

Bicycle-pedestrian signs: Half of the trails surveyed had bike-pedestrian signs. Five of the 17 that did not have these signs were snowmobile or equestrian trails that explicitly do not allow bicycles or pedestrians. One respondent expressed the desire to have such signs in place, but indicated that the cost was a prohibiting factor.

Crosswalks: Half of the respondents in this follow-up survey did not have crosswalks at their road and trail intersections. However, as with the bike-ped signs, five of the trails without crosswalks were exclusively snowmobile or equestrian trails. Two of these five respondents expressed a desire to install crosswalks.

Phase One Follow-up Surveys – No crashes or complaints received

Contact was also made with two persons on whose trails no crashes had occurred and no complaints had been received. When asked what they felt contributed to the lack of complaints, both persons said that they have paid particular attention to keeping intersections trimmed and mowed.

Suggestions for improving road and trail intersection safety

Forty-nine (25%) of the 194 Phase One and 11 (55%) of the Phase Two surveys included suggestions for improvements to road and trail intersections. These suggestions can be grouped into three major areas, design, maintenance, and enforcement. See Appendix D for the full list of suggestions from the Phase One and Two surveys.

Design Issues: The greatest number of suggestions related to ways to improve road and trail intersection design. In Phase One, various forms of sign-related suggestions were mentioned by 14 people, six of whom asked for more signage at road and trail intersections. Types of signs mentioned included trail or snowmobile crossing ahead, pedestrian crossing signs, and signs instructing vehicles and pedestrians about the need to stop for pedestrians in a crosswalk. Two persons specifically mentioned the need for trail name signs like those in Figure 14 which have been installed by the Steuben County Highway Department at Finger Lakes Trail crossings. Five of eight Phase Two survey respondents who offered suggestions mentioned the need for signage at intersections. One person also noted the need for pre-intersection signage.

Figure 14. On-road trail identification sign

In Phase One, 12 copersons recommended crosswalks, raised, painted, or stamped in the blacktop as a way to improve safety at road and trail intersections. Three of the

eight Phase Two survey respondents recommended crosswalks. Seven Phase One respondents suggested signal systems, three persons suggested providing safer areas for parking, and two persons suggested improving trail intersection alignment.

Maintenance: Suggestions centered on improving visibility and repainting crossings. One Phase Two survey respondent mentioned the need for clearing sight distance to a crossing.

Enforcement: Eight of the nine enforcement-related suggestions included on Phase One surveys noted the need to decrease motorist speeds and/or enforce existing speeding laws. Two comments addressed the need for additional enforcement of crosswalk laws and yielding practices.

Follow up surveys - Crashes

Seven road and trail intersection crashes were reported out of the 194 Phase One surveys received. Sadly, three of these crashes were fatal. Only one crash was reported in the Phase Two surveys returned.

Everyone who reported a road and trail intersection crash received a follow up call or email to learn more about the nature of the crash, the type of road and trail intersection where it occurred, and any actions that were or were not taken as a result. Parks & Trails New York was able to contact all persons who reported a crash in response to the Phase One survey. Unfortunately, Parks & Trails New York has been unable to contact the County Traffic Safety Board member for additional details of the crash reported in response to the Phase Two survey.

Two of the crashes reported in Phase One involved a bicyclist and a vehicle. One of those crashes resulted in a fatality. The fatality occurred at an intersection where the trail did not intersect the road at a 90 degree angle. However, the intersection did have bike/ped signs and crosswalks on the road as well as bollards, STOP, and STOP

AHEAD signs on the trail. As a result of the crash, the county is redesigning the intersection. The motorist was not charged.

There are few details regarding the second crash between a motorist and a bicyclist which reportedly involved "some injuries." The Public Works and City Engineer who responded to the survey based his report on "recollections of City Hall Police" but further commented that since there was no efficient means of searching by location for the crash, he did not posses further details. The intersection where the accident occurred did include trail identification signs, bike-ped signs, and crosswalks on the road as well as bollards, STOP and STOP AHEAD signs, and STOP bars on the trail. No road and trail intersection safety complaints have been received for this trail.

One reported crash involved a pedestrian at a road and trail intersection. Little is known of this incident or the nature of signs and other traffic control devices at the intersection. The survey respondent believed that the pedestrian sustained only minor injuries and may have been standing in the road as part of a charity event. The survey respondent commented that poor alignment between one side of the trail and the other may have contributed to trail users taking a diagonal path across the road rather than using the crosswalk.

Three of the road and trail intersection crashes involved off-highway vehicles (OHV) (ATVs, dirt bike, four-wheeler.) Two of these crashes were fatal. Each of the fatalities occurred on multi-use trails. In one case the ATV rider was not legally permitted on the trail, and the trail was signed to that effect, but there were no trail signs on the road and only STOP signs on the trail. In the other case, there were trail signs on the road and STOP and STOP AHEAD signs on the trail. Trail user error was felt to be the cause. There are few details on the severity of the third dirt bike-motorist crash though it is believed that it was not fatal. On this multi-use trail, there were no traffic control devices on the road but STOP and STOP AHEAD signs on the trail. This is the only OHV crash location where complaints had been received about

intersection safety. The complaints were related to speeding of snowmobiles, dirt bikes and 4-wheelers and the snow left in the roadway by snowmobile trail groomers.

The seventh crash involved a motorist and a snowmobile using a dedicated snowmobile trail. No injuries were reported. The intersection was equipped with trail identification signs on the road and STOP AHEAD signs on the trail. No complaints have been received regarding intersection safety for this trail.

Six crashes reported in Phase One were outside the purview of the study. Data was submitted for two paved, urban trails on which crashes occurred involving a) pedestrians being hit by a bicyclist or a skateboarder, b) bicyclist and skateboarder falls, and c) a bicyclist-bicyclist collision. Two other reported bicyclist-vehicle crashes occurred within an on-road bike lane and another occurred when a bike exited an alley onto the street.

It should be noted that in describing the collision between a trail user and a motorist, this report purposely uses the traffic research term “crash” or “collision” rather than the more commonly used word “accident.” By using the word crash, Parks & Trails New York joins with the National Traffic Justice Initiative of the Center for Bicycling and Walking in their efforts to promote a “safety culture” in transportation practice and system design and redefine society’s perspective on motor vehicle crashes so they are seen as a “deeply violent and anti-social assault on life, health, and community” and not as “unavoidable byproducts of our transportation system.”[13]

[13] BikeWalk.org, *Traffic Justice Initiative*, accessed online at http://www.bikewalk.org/tji.php December 30, 2006

VII. Recommendations

Policy Change and Safety Education Recommendations

- **Improve road and trail intersection crash reporting through public education and more detailed data collection**

Any recommendations for improving road and trail intersection safety must be based on a clear understanding of the magnitude and nature of crashes that occur, for without quality data it is impossible to fully define and take action to address the problem. None of the survey respondents mentioned anything about crash reporting either as a complaint they had received or a suggestion for improving safety at road and trail intersections. Yet, when responding to the question about knowledge of road and trail intersection crashes, 41 Phase One surveys (21%) answered "unknown." On 42 surveys (22%), respondents did not answer the question, which also suggests a lack of information. This means that 43 percent of survey respondents most likely had no idea about any crashes at their road and trail intersections. Similarly, in a follow up survey with those who had received complaints about safety road and trail intersection safety, nearly 88 percent stated that they were unaware if there was any review process in place if a crash were to occur. While future surveys should be distributed to law enforcement and emergency service personnel, as they may be able to provide more crash specific data, it does not negate the need for those responsible for trail design and maintenance to also have this information.

The mechanisms already exist for crash reporting. Section 605 a. of New York's Vehicle and Traffic (V&T) Law requires that if a motorist is involved in an accident in which someone is killed or injured or there is property damage of more than $1000, a report of the accident must be filed with the Commissioner of Motor Vehicles within ten days. This law is generally well known. But, Section 605 b. also states that if a bicyclist is involved in an accident on a public highway that results in someone being killed or suffering serious physical injury, a report of the accident must also be filed in writing with the Commissioner of Motor Vehicles within ten days.

In addition to Section 605, Sections 1240 and 1241 of the New York Vehicle and Traffic Law address leaving the scene of an incident involving a wheeled non-motorized means of conveyance without reporting in the second degree – a violation (Section 1240) and the first degree – a class B misdemeanor (Section 1241). Both Vehicle and Traffic Law Sections 1240 and 1241 state:

> *"any person age eighteen years or older operating a wheeled non-motorized means of conveyance, including, but not limited to bicycles, in-line skates, roller skates and skate boards, who, knowing or having cause to know, that serious physical injury, as defined in subdivision ten of section 10.00 of the penal law, has been caused to another person, due to the operation of such non-motorized means of conveyance by such person, shall, before leaving the place where the said serious physical injury occurred, stop, and provide his name and residence, including street and street number, to the injured party if practical, and also to a police officer, or in the event that no police officer is in the vicinity of the place of said injury, then such person shall report said incident as soon as physically able to the nearest police station or judicial officer."*

Strict adherence to Sections 605, 1240, and 1241 should result in the information needed to more fully understand crashes that occur at road and trail intersections. But how many crashes, especially minor ones, are actually reported? How many average recreational bicyclists are aware of the need for reporting? When reports are submitted, is the information provided specific enough to characterize crashes as occurring at a road and trail intersection? Even when the information included in the report is detailed, is it coded or filed such that data retrieval efforts can distinguish crashes that occur at road-trail intersections?

Trail groups and trail managers should ensure their constituents are aware of the requirements of New York Vehicle and Traffic Law Sections 605, 1240, and 1241, possibly by including a short reminder in trail brochures, newsletters, or other organizational materials. Similarly, efforts should be undertaken to ensure that law enforcement personnel include trail names and locations when preparing reports for crashes that occur at road and trail intersections. Finally, state accident report forms should be reviewed to determine if alterations can be made to make it easier to identify whether a crash occurred at a road and trail intersection.

- **Increase awareness and understanding of Vehicle and Traffic Law Section 1151 with trail users, motorists, and law enforcement officials**

New York already has an important law regarding pedestrians in a crosswalk that can do much to ensure safety at road and trail intersections. Section 1151 of the New York State Vehicle and Traffic Law states:

"When traffic-control signals are not in place or not in operation the driver of a vehicle shall yield the right of way, slowing down or stopping if need be to so yield, to a pedestrian crossing the roadway within a crosswalk on the roadway upon which the vehicle is traveling, except that any pedestrian crossing a roadway at a point where a pedestrian tunnel or overpass has been provided shall yield the right of way to all vehicles. No pedestrian shall suddenly leave a curb or other place of safety and walk or run into the path of a vehicle which is so close that it is impractical for the driver to yield. Whenever any vehicle is stopped at a marked crosswalk or at any unmarked crosswalk at an intersection to permit a pedestrian to cross the roadway, the driver of any other vehicle approaching from the rear shall not overtake and pass such stopped vehicle."

Simply put, in the case of trails with marked crosswalks, motorists must yield to pedestrians in the crosswalk.

Pedestrians and motorists are beginning to understand that they must stop for pedestrians in a marked crosswalk, especially in cities and villages that have erected "yield to pedestrians" signs. But, how many people realize that the law also applies where a trail crossing is marked with a crosswalk, even in a rural location? In response to the survey question of how to improve safety at road and trail intersections, answers such as "yielding practices need to be enforced," "better enforcement of crosswalk laws," and "need signage saying NYS law –cars must stop for pedestrians in crosswalk" indicate that some trail managers recognize the law needs greater attention.

Need to be in the crosswalk for Vehicle and Traffic Law Section 1151 to apply

Section 1151 refers to "a pedestrian crossing the roadway within a crosswalk on the roadway upon which the vehicle is traveling." The law is no doubt written this way

as the driver needs some indication that the person actually intends to cross the road, but is the average pedestrian, let alone trail user, aware that they must actually step into the roadway for the law to afford them the right of way? This may not be much of a problem in an urban or village setting where traffic speeds are relatively low and there are numbers of people crossing, but where a trail crosses a road in a rural area and speeds are higher, pedestrians may be more apprehensive about stepping into the crosswalk as a vehicle is approaching, especially if they have no assurances that the driver will slow down or stop. Therefore, merely marking a crosswalk at a trail intersection does not realistically give pedestrians precedence over vehicles.

Trail managers should work with highway officials to begin a public education campaign that promotes awareness and greater understanding of the meaning of Section 1151. They should also work to install "yield to pedestrian signs" at crosswalk-marked road and trail intersections. News releases and articles in trail newsletters should also be used to inform the public of Vehicle and Traffic law Section 1151 and how it also applies to road and trail intersections.

Figure 15 pictures a road and trail intersection on the Harlem Valley Rail Trail which uses signage to remind motorists that they must stop for pedestrians in the crosswalk.

Figure 15. On-road signage reminding motorists to stop for pedestrians in the crosswalk, Harlem Valley Rail Trail, Millerton, NY.

- **Refine or clarify Vehicle and Traffic Law to address the unique needs of road and trail intersections**

New York Vehicle and Traffic Law Section 1151 regarding pedestrians in a crosswalk will neither be obeyed nor fully enforced unless everyone understands how it applies to road and trail intersections. To provide the fullest measure of safety for road and trail intersections, the following sections of the New York State Vehicle and Traffic Law may need to be amended or clarified:

Unmarked crosswalks

Most motorists and pedestrians may think of crosswalks only as defined in Part (b) of Section 110 of the Vehicle and Traffic Law:

> *"Any portion of a roadway at an intersection or elsewhere distinctly indicated for pedestrian crossing by lines or other markings on the surface."*

They may not know that crosswalks can exist even without pavement markings as defined in Part (a) of Section 110:

> *"That part of a roadway at an intersection included within the connections of the lateral lines of the sidewalks on opposite sides of the highway between the curbs or, in the absence of curbs, between the edges of the traversable roadway."*

As part (a) does not mention the need for road markings, it can be assumed to define an unmarked crosswalk. The existence of sidewalks on opposite sides of the highway, whether curbs are present or not, is part of the definition. However, the law says nothing about whether the definition in this part also applies when a trail, rather than a sidewalk, is located on opposite sides of the highway.

Does Section 1151 apply to pedestrians in a marked or an unmarked crosswalk as defined in parts (a) and (b) of Section 110? It appears that it does, as Section 1152 (a) states:

> *"Every pedestrian crossing a roadway at any point other than within a marked crosswalk or within an unmarked crosswalk at an intersection shall yield the right of way to all vehicles upon the roadway.*"

But, because the definition of an unmarked crosswalk does not address trails, does it mean that Vehicle and Traffic Law Section 1151 only applies to trails with marked crosswalks? Does it also mean that where there are trails without marked crosswalks, Section 1152 applies and pedestrians must yield to vehicles?

To make road and trail intersections as safe as possible, New York Vehicle and Traffic Law should be clarified or amended so that road and trail intersections with unmarked crosswalks are treated the same as road intersections with unmarked crosswalks. Also, Vehicle and Traffic Law Section 110 part (a) should be amended to include pedestrian and bicycle paths as well as sidewalks within the definition.

Trails users other than pedestrians

Section 1151 refers only to pedestrians, but multi-use trails have users other than pedestrians. Section 1234 (c) of the Vehicle and Traffic Law states:

> *"Any person operating a bicycle who is entering the roadway from a private road, driveway, alley or over a curb shall come to a full stop before entering the roadway."*

The law says nothing specific, however, about what a bicyclist should do when entering from a trail or bicycle path. It is assumed that because bicyclists are subject to all the duties applicable to the driver of a vehicle that Section 1143 applies regarding a vehicle entering a roadway. Section 1143 states that

> *"the driver of a vehicle about to enter or cross a roadway from any place other than another roadway shall yield the right of way to all vehicles approaching on the roadway to be entered or crossed."*

As illustrated in Figure16, some trail managers advise bicyclists to dismount. Ironically when they do, they become pedestrians and, when located in a crosswalk, vehicles must yield as defined by Vehicle and Traffic Law Section 1151.

Figure 16. Sign asking bicyclists to dismount, Harlem Valley Rail Trail, Millerton, NY

- **Increase attention to, funding for, and improve communication surrounding maintenance of road and trail intersections**

Several survey respondents mentioned maintenance when making suggestions for ways to improve road and trail intersection safety. Comments centered on maintaining sight distance and repainting crosswalks.

Other surveys indicated that presently there is not good communication among the groups and levels of government that are responsible for varying aspects of trail intersection maintenance. Some survey respondents did not know who was responsible for striping crosswalks or maintaining the trails within their community or what funds were available to assist with maintenance and how to obtain these funds.

To maintain proper sight distance, volunteer trail adopters should be encouraged to assist with regular trimming at road and trail intersections. These efforts can only be successful, however, if first everyone involved, from volunteers to trail managers to highway officials, knows who is ultimately responsible for the trail's maintenance, who will monitor the volunteers' efforts, and how much and what type of trimming is required.

Trail crosswalks must be repainted when roads are repaved and when other road markings are repainted. Communication between trail managers and highway crews at all levels of government is essential to ensure that everyone understands their roles and responsibilities and that funds for trail crosswalk repainting or signage have been included in highway budgets. Such efforts will help avoid situations like that illustrated in Figure 17 where the road was repaved but the trail crosswalk was not re-striped.

Figure 17. Crosswalk not repainted after road repaving, Pat McGee Trail, Little Valley, NY

Trail managers should be encouraged to meet periodically with state, county and local highway officials to discuss roles and responsibilities regarding maintenance and safety at their road and trail intersections. Trail managers and trail groups should be encouraged to work with highway officials to find new and creative sources of funding for maintenance and management of trails.

Design Recommendations

The overarching goal is to design road and trail intersections that minimize risk for both trail users and motorists. The following recommendations are not intended to replace or conflict with current guidelines and standards, but to supplement and clarify these guidelines and standards for all those responsible for design, construction and maintenance of road and trail intersections. While this report uses the word trails throughout and the survey data was obtained from all types of trails, including single use trails such as snowmobile trails, the design recommendations presented have been developed for multi-use trails. However, these recommendations may be applicable to other types of trail situations as well.

- **Design Intersections of trails and roadways with the appropriate assignment of right of way**

One of the questions often raised by trail managers is how precedence is assigned at an intersection of a trail and roadway. Assignment of right-of-way at a trail crossing especially becomes a consideration when the volume of roadway traffic is so high that the trail users have difficulty crossing the roadway.

The assignment of right-of-way at a trail intersection with a roadway where no traffic control signals are installed is based in the New York Vehicle and Traffic Law. Section 1231 of the Vehicle and Traffic Law states

> *"Every person riding a bicycle or skating or gliding on in-line skates upon a roadway shall be granted all of the rights and shall be subject to all of the duties applicable to the driver of a vehicle."*

Furthermore, Section 1143 states

> *"The driver of a vehicle about to enter or cross a roadway from any place other than another roadway shall yield the right of way to all vehicles approaching on the roadway to be entered or crossed."*

Therefore, it is reasonable to conclude that bicyclists approaching a roadway from a trail are required to yield the right-of-way to vehicles in the roadway.

In the case of pedestrians, the assignment of right-of-way is more specific. Section 1152 states

> *"Every pedestrian crossing a roadway at any point other than within a marked crosswalk or within an unmarked crosswalk at an intersection shall yield the right of way to all vehicles upon the roadway."*

When a crosswalk is marked at a trail intersection, the issue of precedence is not as clear in the Vehicle and Traffic Law. Section 1151 of the Vehicle and Traffic Law requires motorists to stop for pedestrians in a crosswalk. However, pedestrians are prohibited from stepping into the roadway if it is not practical for the vehicle to yield. Merely marking a crosswalk at a trail intersection does not realistically give pedestrians precedence over vehicles.

Trail Signing

At unmarked or uncontrolled trail intersections, bicyclists and pedestrians are required to yield to vehicles in the roadway. This requirement can be reinforced by placing STOP signs or yield signs on a trail approach to an intersection to specifically assign the right-of-way to vehicles in the roadway. Fifty-six to 78 percent of the Phase One surveys reported having on-trail STOP signs where trails intersected town, county, and state roads.

Marked Crosswalks

Phase One and Phase Two surveys suggested crosswalks as a way to improve safety at road and trail intersections. Crosswalk markings have two functions: 1) to provide guidance for pedestrians who are crossing roadways, and 2) to alert road users of a pedestrian crossing point across roadways not controlled by highway traffic signals or STOP signs.[14] Crosswalks should not be installed specifically to assign right-of-way to trail users. If there is a need to assign right-of-way to trail users (see following section), STOP signs or YIELD signs and appropriate pavement marking should be used in conjunction with a marked crosswalk.

Traffic Controlled Intersections

If trail users need to wait for long periods of time before acceptable gaps in traffic occurs, they will take greater risks by attempting to cross during unacceptable gaps. When the volume of vehicular traffic becomes so great that trail users have difficulty crossing the roadway, consideration should be given to assigning right-of-way to trail users.

Assignment of right-of-way to trail users should also be considered when there are large volumes of trail users. Greater numbers of trail users increases the exposure to risk, even under normal traffic conditions. In addition, larger queues occur at

[14] FHWA, Manual on Uniform Traffic Control Devices, 2003 Edition, p. 3B-27.

crossings which increase the risk by having larger numbers of trail users crossing at the same time.

Right-of-way can be assigned with STOP signs mounted on the roadway at the trail intersection. Traffic studies should be completed before these devices are used to assure that the capacity of the roadway is not unduly affected.

Traffic Signals

Seven Phase One surveys suggested some type of signal system as a way to improve safety at road and trail intersections. The signal has an advantage over STOP signs in that it alternates right-of-way allowing less of an impact on the roadway capacity. Pedestrian-actuated signals can be installed to allow the signal to change right-of-way only when actuated.

The MUTCD provides eleven warrants that outline the minimum conditions under which a traffic control signal is justified. Warrant 3 relates to minimum pedestrian volumes. The warrant is based on the number of acceptable gaps in traffic, the number of pedestrians over a period of time, and the anticipated pedestrian walking speed.

- **Design intersections of trails and roadways to alert trail users and road users of an approaching crossing**

Perhaps the greatest number of complaints and at least one accident were related to providing advance warning or notice of intersections of roadways and trails. Phase One and Two surveys most frequently noted additional signage as a way to improve safety and road and trail intersections.

Roadway facilities should be designed to allow road users to be aware of approaching trail crossings so that appropriate actions can be taken to avoid conflicts. Likewise, trails should be designed to allow trail users to take appropriate actions to avoid conflicts with road users.

Visibility

Phase One and Two survey respondents indicated that sight distance was a complaint they had received regarding road and trail intersection safety. Sight distance is probably one of the most important considerations when designing a trail/roadway intersection in order to provide the greatest amount of advance warning for motorists and trail users. A motorist must be able to see a trail user preparing to cross a roadway in time to yield or take evasive action. Likewise, trail users must be able to see oncoming traffic in time to safely cross a roadway. Although not always possible, having a clear view of trail users approaching an intersection will allow a motorist to recognize a potential conflict and take evasive action if the trail user, especially a bicyclist, darts out into the roadway.

Intersection Geometry

Three Phase One surveys mentioned better trail alignment as a way to improve road and trail intersection safety. Many trail right-of-ways cross a roadway at a skewed angle. Crossings should be designed to be perpendicular to the roadway so trail users will be in a position where they can readily see approaching traffic from both directions.

Warning Signs

Warning signs are used to alert motorists to the presence of a crossing ahead. They are especially effective at mid-block crossings in rural areas where pedestrians and trail users are not anticipated. Warning signs are universally diamond shaped with yellow background and black symbols. The NYS MUTCD specifies warning signs for bicycle crossings (W5-6), pedestrian crossings (W5-1) and snowmobile crossings (W5-8). Forty-two to 47 percent of the intersections included in the survey responses, reported having on-road bike-ped signs.

Marked Crosswalks

As previously discussed, one of the functions of marked crosswalks is to alert motorists of a pedestrian crossing point not controlled by highway traffic signals or STOP signs. However, recent research by FHWA has concluded that pedestrian crash rates at uncontrolled intersections on two-lane roadways with marked crosswalks alone are no different compared to unmarked crosswalks. The study states that marked crosswalks may be used "at non-signalized locations where engineering judgment dictates that the number of motor vehicle lanes, pedestrian exposure, average daily traffic (ADT), posted speed limit, and geometry of the location would make the use of specially designated crosswalks desirable for traffic/pedestrian safety and mobility.[15]"

The study further states that marked crosswalks without other safety improvements should not be used under the following conditions:

- Where the speed limit exceeds 40 mph.
- On a roadway with four or more lanes without a raised median or crossing island that has (or will soon have) an ADT of 12,000 or greater.
- On a roadway with four or more lanes with a raised median or crossing island that has (or will soon have) an Average Daily Traffic of 15,000 or greater.[16]

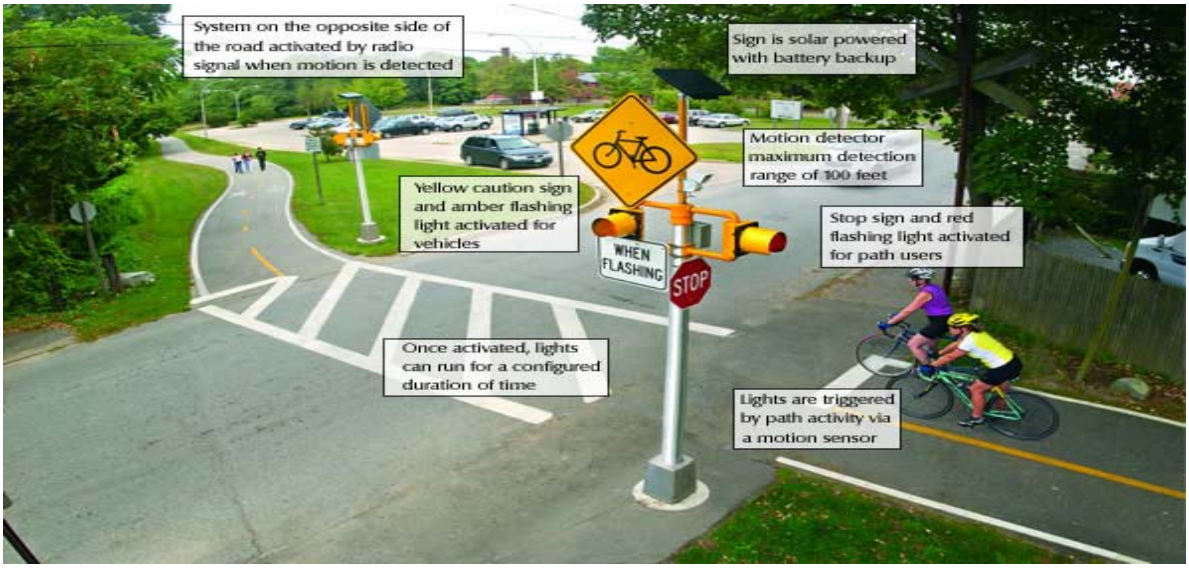
[15] FHWA Publication No. HRT-04-100, Safety Effects of Marked Verses Unmarked Crosswalks at Uncontrolled Locations, September, 2005, p.36.
[16] Ibid., p.50.

If marked crosswalks are used, they should be one of the high contrast types specified in the MUTCD that will provide the greatest amount of visibility.

Flashing Signals (Cross Alert)

A new warning system for trail crossings that is gaining popularity is a system of lights that is activated when trail users approach a sensor mounted on the system at a roadway crossing. One Phase One survey respondent mentioned it as a safety suggestion. The Cross Alert © system consists of a red LED light and STOP sign on the trail for trail users and an amber, or yellow, Light Emitting Diode light and warning sign on the roadway to warn motorists. The system was designed not to alter the flow of vehicular traffic, but to only forewarn oncoming vehicles that trail users are near or in the crosswalk. Figure 18 illustrates the Cross Alert © system.

Figure 18. The Cross Alert System [17]



[17] Cross Alert, http://www.crossalert.com/oursystem.html

- **Design roadways and trails to minimize risk at crossings**

Intersection Geometry

As discussed previously, some trail right-of-ways cross a roadway at a skewed angle. At these intersections, the trail should be aligned with curves on the approaches so that the trail crosses the roadway at a perpendicular angle which will provide a trail user with the shortest crossing distance.

Refuge Islands

The task of crossing multiple lane roadways or even high volume two-lane roadways can be made much simpler and safer by providing a pedestrian refuge island in the middle of the road. The refuge island, as illustrated in Figure 19, should be a minimum of six feet wide to allow the complete length of a bicycle to be within the refuge area. The crossing area in the refuge island should be slightly skewed towards oncoming traffic. This configuration will allow a trail user to focus their attention on oncoming traffic. At crossings of high volume or high speed multi-lane roadways, consideration should be given to completely offsetting the crossing to keep trail users from "darting out" into the lane of traffic on the opposite side of the refuge island.

Figure 19. Use of a refuge island at a trail crossing, www.pedbikeimages.org/ - Dan Burden

Vehicular Access Controls at Trail Intersections

With the exception of maintenance, police, and emergency vehicles, motor vehicles are prohibited from multi-use trails. A ten-foot wide asphalt paved multi-use path is wide enough to be easily mistaken as a driveway or a street to the motorist, and

vehicles can erroneously or deliberately enter a trail. The type of access control is a significant design consideration and should not be overlooked.

The use of barriers at the entrance to a trail with a separate means of access for authorized vehicles is routinely used by trail designers. The barrier usually consists of a series of bollards spaced approximately five feet apart to allow a bicycle with a trailer or a wheelchair to pass through. Authorized vehicle access is often accommodated through a separate gate or by removing the center bollard. This type of barrier treatment effectively eliminates all motor vehicles except ATVs.

However, barriers present other problems for trail users and trail managers. First and foremost, the barrier is an obstacle to trail users. Many unskilled and young bicyclists have difficulty passing through the bollards without catching a handlebar or pedal on the bollard. Although these types of collisions are not severe, they can be very discouraging to many trail users. A more severe type of collision with the barrier can occur at night or when the trail user is inattentive or distracted. Although lights are required by law at night, many bicyclists do not use lights and many lights are not strong enough for effective use at high speeds.

Another disadvantage is the difficulty of access by emergency vehicles when barriers are used at the entrance to a trail. Although some bollards are designed to be knocked over in an emergency, most devices require an emergency responder to stop and unlock a gate or bollard to gain access. Distribution and availability of keys in an emergency compounds the problem of access for emergency responders.

An alternative to the erection of barriers is the splitting of the trail into two separate narrower paths at the entrance as illustrated in Figure 20. The paths can be separated by a raised island or an area landscaped with low shrubs, ground covers or perennial flowers. With this treatment, the roadway user or motorist should not confuse the trail with a driveway or roadway and erroneously enter the trail. An emergency vehicle can conveniently enter the trail by straddling the island. If landscaping is damaged, it can be replaced inexpensively.

Figure 20. Trail split into two separate narrower paths at the entrance

The design of a trail access that does not rely on barriers may not keep the occasional vandal or thrill seeker from entering a trail with a vehicle. However, the risk of this type activity may be offset by the threat of collisions with barriers and the need for efficient emergency vehicle access.

Descending Approaches to Trails

This condition occurs frequently on rail trials where an old railroad bridge over a roadway has been removed leaving a steep descent to a crossing of a roadway. Unskilled and young bicyclists and bicyclists with faulty brakes could have difficulty stopping at the bottom of the descent and could “dart out” into the roadway. Another risk that has been observed is bicyclists that use their downhill momentum to ascend the hill on the other side of the roadway crossing. Bicyclists will wait at the top of the ascent until there is a gap in traffic, and then coast downhill and cross the roadway at a high rate of speed.

The solution for a steep descent approaching a crossing is to design a curve or bend in the trail at the bottom of the descent with a barrier to keep the bicyclists from leaving the trail and coasting into the roadway. An out-of-control bicyclist might collide with the barrier. However, this collision would most likely be less severe than a collision with a motor vehicle in the roadway.

Traffic Calming

Where feasible, traffic-calming measures can significantly increase trail user safety by slowing vehicles as they approach road and trail intersections. A traffic-calming element can be as simple as a textured or raised crosswalk or as innovative and elaborate as a roundabout or planting median. A raised pedestrian crosswalk can act as a "speed hump," as opposed to a "speed bump," which can be dangerous for pedestrians and cyclists. The speed hump is different from a speed bump in that it ramps up and backs down with a longer and wider top width to safely carry a trail user across. Raised crosswalks are usually accompanied by warning chevrons before they ramp up and gently slope back down to the level of the roadway as illustrated in Figure 21.

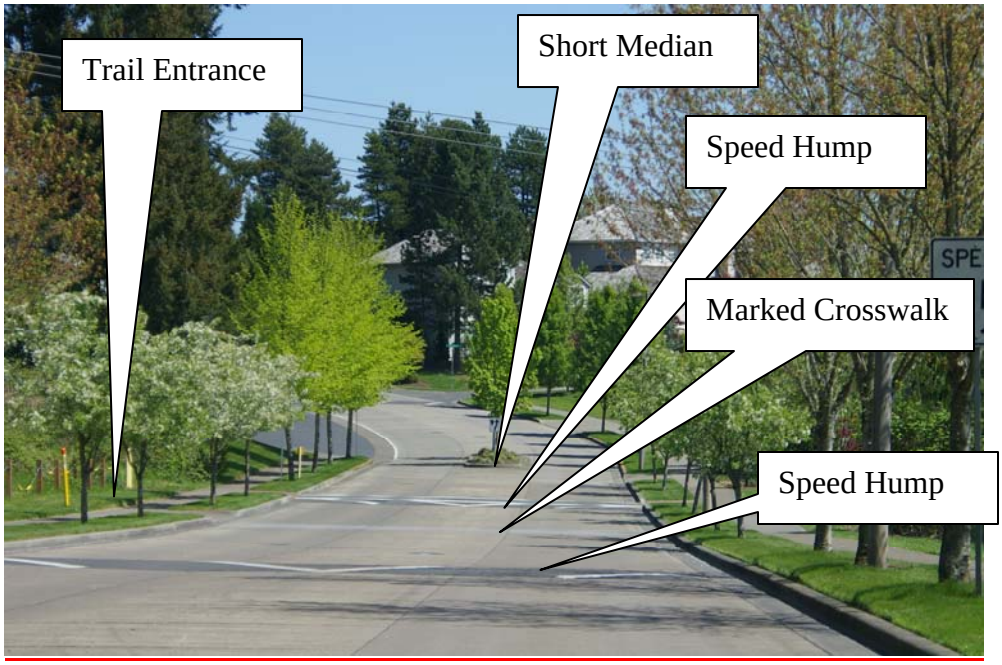


Figure 21. Use of speed humps, medians, and marked crosswalks as traffic calming

VIII. Conclusions and Next Steps

Publication of this report concludes Phases One and Two of Parks & Trails New York's study of road and trail intersection safety. It will serve as the basis for additional activities designed to raise awareness of road and trail intersection safety and as a vehicle for stimulating conversation and examination of this issue that will lead to actions that can provide lasting benefit for everyone.

In Phase Three, Parks & Trails New York plans to:

- Organize regional forums where stakeholder groups can meet and discuss the report's recommendations and explore ways to acquire resources for road and trail intersection safety enhancements
- In cooperation with the NYS Canal Corporation and County Traffic Safety Boards and trail organizations, continue to implement a driver/trail user/law enforcement personnel road and trail intersection safety education campaign in Canalway Trail and other New York communities
- Develop a policy agenda based on the report's recommendations

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Appendix A. Survey cover letters and surveys

Name
Title
Organization/Group/ Agency Address
Line I
Address Line 2

Dear (Organization/Group/ **Agency),**

With support from the NYS Governor's Traffic Safety Committee, Parks & Trails New York-a statewide non-profit organization-is undertaking a project to improve the safety of trail and road intersections and we need your help. The purpose of the enclosed survey is to gather basic information on your trail and information about any accidents that may have occurred at its road and trail intersections. Please take a few minutes to fill out an enclosed survey for each trail you manage. It will take only 15-20 minutes. Additional forms can be downloaded and printed from our website at www.ptny.org. If available, please include sketches and/or photographs of your road and trail intersections and return all forms by **March 10, 2006**.

Intersections between roads and trails used by pedestrians and bicyclists present unique hazards and are the most likely locations for injury .With more vulnerable populations such as school children and senior citizens using trails, road and trail safety takes on added significance. Best practices recommendations exist for safety devices and design elements at road/trail intersections. However, these recommendations have not been universally accepted across New York State or by different levels of government.

Parks & Trails New York's road and trail intersection project includes three components:

- gather information on accidents at road/trail intersections,
- research existing road/trail intersection design recommendations nationwide, and
- develop best practice recommendations for road/trail intersections throughout New York State.

Parks & Trails New York is the only statewide organization dedicated to making New York's parks and trails bigger, better, and more accessible to all. As a result of our work and the efforts of many others across the state, the number of multi-use trails and trail users has grown substantially. However, as the popularity of trails grows, so does the responsibility for ensuring a safe trail experience, especially at road and trail intersections.

Thank you for supporting the growth of New York's trails and ensuring their safety!! We hope that you will continue to help by completing the enclosed survey. If you have any questions or would like to share your ideas and thoughts, please do not hesitate to contact Jennifer Ceponis at roadtrails@ptny.org. If you are not the best person to fill out the enclosed survey, please pass it on to the appropriate person.

Sincerely,

Executive Director
Enc.

Parks&Trails New York

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12207
518-434-1583
www.ptny.org

NAME: _____
TITLE _____
AGENCY/ _____
ORGANIZATION: _____
ADDRESS: _____
_____
PHONE: _____ **FAX:** _____
EMAIL: _____

PART 1: BASIC TRAIL INFORMATION

TRAIL NAME:	**LOCATION:** (City / Town / Village)			
LENGTH:	**PRIMARY USERS OF THE TRAIL:**	**PROHIBITED USES:**	**EST. ANNUAL TRAIL USE:**	**TRAIL SURFACE MATERIAL:**
DATE OPENED:	☐pedestrians ☐bicyclists ☐x-c skiers ☐snowmobiles ☐equestrians ☐unknown ☐other: _____			

PART 2: ROAD & TRAIL INTERSECTION DESIGN

QTY. OF ROAD & TRAIL INTERSECTIONS	**ROAD WIDTH** (No. of lanes)	**SPEED** (mph)	**ARE THERE ANY TRAFFIC CONTROL DEVICES?**
On State Roads: _____	☐ 2	☐ > 50	<u>on road</u>
	☐ 3	☐ 40-45	☐ all ☐ some ☐ none
Average Daily Traffic: ☐ <2,000	☐ 4	☐ 30-35	<u>on trail</u>
☐ 2,000 to 10,000 ☐ >10,000	☐ >4	☐< or = 25	☐ all ☐ some ☐ none
On County Roads: _____	☐ 2	☐ > 50	<u>on road</u>
	☐ 3	☐ 40-45	☐ all ☐ some ☐ none
Average Daily Traffic: ☐ <2,000	☐ 4	☐ 30-35	<u>on trail</u>
☐ 2,000 to 10,000 ☐ >10,000	☐ >4	☐< or = 25	☐ all ☐ some ☐ none
On Town Roads: _____	☐ 2	☐ > 50	<u>on road</u>
	☐ 3	☐ 40-45	☐ all ☐ some ☐ none
Average Daily Traffic: ☐ <2,000	☐ 4	☐ 30-35	<u>on trail</u>
☐ 2,000 to 10,000 ☐ >10,000	☐ >4	☐< or = 25	☐ all ☐ some ☐ none

PART 3: SAFETY OF ROAD & TRAIL INTERSECTIONS

QUESTIONS:

Have you received complaints regarding the safety of the road & trail intersections? ☐ yes ☐ no ☐ unknown

What is the general nature of the complaint(s)? _____

Have there been any reported crashes at the road & trail intersections? ☐ yes ☐ no ☐ unknown

(Please attach any information you may have available about the crash)

Time of day crash occurred: ☐dawn ☐mid-day ☐dusk ☐evening ☐unknown

Age range of the victim: ☐under 10 ☐11-20 ☐21-35 ☐36-50 ☐51-65 ☐65+ ☐unknown

Severity of the crash: ☐fatal ☐serious injuries ☐minor injuries ☐no Injury ☐unknown

Type of trail-user: ☐pedestrians ☐bicyclists ☐equestrians ☐unknown ☐other:_____

Is it okay to contact you regarding the road & trail intersections? ☐ yes ☐ no

What is the best method to contact you? ☐ email ☐ phone

Do you have any suggestions for improving the safety at road and trail intersections? _____

(Please continue on back if more space is needed)

Parks&Trails
New York

29 Elk Street Albany,

NY **12207**

P **518.434.1583**

F **518.427.0067**

www.pmy.org

December 6, 2006

Name
Title
Organization/Group/ Agency Address
Line I
Address Line 2

With support from the New York State Governor's Traffic Safety Committee, Parks & Trails New York is undertaking a project to improve the safety of trail and road intersections. In February of this year we mailed almost 1900 surveys to bicycle pedestrian coordinators, highway superintendents, elected officials, county planners, state agency personnel, and trails organizations in order to gather basic information about trails and the design and safety of their road and trail intersections.

We received more than 200 responses which have been incorporated into a draft report, *Road and Trail Intersection Safety: An examination of present practice, Recommendations for future actions*. The report is now available on our website at www.ptny.org. I encourage you to read the draft report and email, call, or fax us any comments or suggestions you may have. We are especially interested in your feedback on the recommendations we have made.

As we refine the draft report, we want to be sure we hear from all of the stakeholder groups we initially identified as having much to contribute to an examination of this issue. As a result, we are enclosing a follow up survey more specifically tailored to your roles and responsibilities than the February survey, which was designed for organizations and individuals with direct responsibility for trails. We invite you to fill out this survey and return it to us by February 1, 2007. The survey should take only 15-20 minutes. The survey can also be found online at http://www.ptny.org/roadtrailsurvey/dec.shtml.

Parks & Trails New York is the only statewide non profit organization dedicated to making New York's parks and trails bigger, better, and more accessible to all. As a result of our work and the efforts of many others across the state, the number of multi-use trails and trail users has grown substantially. However, as the popularity of trails grows, so does the responsibility for ensuring a safe trail experience, especially at road and trail intersections.

We hope that you will help us in our efforts to ensure the safety of our road and trail intersections by completing the enclosed survey. If you have any questions, please contact Martin Daley at (518) 434-1583 or via email at roadtrails@ptny.org. If you are not the best person to fill out the enclosed survey, please pass it on to the appropriate person. Thank you for assisting with our study of this important issue.

Sincerely,

Robin Dropkin
Executive Director

Appendix B. Phase One Follow up surveys

Follow up Survey #1

Trails which have experienced crashes at road and trail intersections

General Safety

1. Is safety a factor influencing trail use? If yes, why? If no, why not?
2. Have you made changes to improve the safety at your road and trail intersections in the past?
3. How do you maintain road and trail intersections? Do you mow or trim to optimize sight distance? Do you assess safety conditions of signs and other structures on trail(s)? How often?
4. What guidelines were used to design the trail crossing?
5. Were sight and stopping distance taken into account for road and trail intersection design? If so, how? What did you to?
6. Do you have any special treatments at skewed intersections?

On Road

7. Trail identification signs- If you have them, why? Where are they and what do they say? If you don't have them, why not?
8. Bike/Ped Signs- If you have them, why? Where are they and exactly what do they say/depict? If you don't have them, why not?
9. Crosswalks- If you have them, why? How are they striped? Color (yellow/white)? If you don't have them, why not?

On Trails

10. STOP & STOP AHEAD signs- How did you decide where to put them? If you don't have them, why not (they are standard)?
11. Pavement Words &/or Symbols (only for paved trails)- If you have them, why? What do they say/depict? If you do have paved trails but do not have words or symbols on them, why not?
12. Signalized controls- If you have them, why? Who funded them? What type of control is it?

Follow up Survey #1 – continued

Trails which have experienced crashes at road and trail intersections

Crash Details

13. What was the outcome of the crash (degree of injury)?
14. What type of user(s) was involved in the crash?
15. How was the crash documented?
16. Were any contributing factors identified (i.e. alcohol, darkness, speed, etc.)?
17. Was the driver of the vehicle charged? Was the trail user charged?
18. Were there changes in road and trail intersection design or maintenance as a result?

Follow up Survey #2

No crashes have occurred at road and trail intersection but complaints have been received

General Safety

1. Is safety a factor influencing trail use? If yes, why? If no, why not?
2. Have you made changes to improve the safety at your road and trail intersections in the past?
3. How do you maintain road and trail intersections? Do you mow or trim to optimize sight distance? Do you assess safety conditions of signs and other structures on trail(s)? How often?
4. What guidelines were used to design the trail crossing?
5. Were sight and stopping distance taken into account for road and trail intersection design? If so, how? What did you to?
6. Do you have any special treatments at skewed intersections?
7. If an accident did occur at one of your road and trail intersections, how would you respond? What would be done in reaction?

On Road

8. Trail identification signs- If you have them, why? Where are they and what do they say? If you don't have them, why not?
9. Bike/Ped Signs- If you have them, why? Where are they and exactly what do they say/depict? If you don't have them, why not?
10. Crosswalks- If you have them, why? How are they striped? Color (yellow/white)? If you don't have them, why not?

On Trails

11. STOP & STOP AHEAD signs- How did you decide where to put them? If you don't have them, why not (they are standard)?
12. Pavement Words &/or Symbols (only for paved trails)- If you have them, why? What do they say/depict? If you do have paved trails but do not have words or symbols on them, why not?
13. Signalized controls- If you have them, why? Who funded them? What type of control is it?

Follow up survey #3

No crashes have occurred and no complaints have been received about road and trail intersection safety

General Safety

1. Is safety a factor influencing trail use? If yes, why? If no, why not?
2. Have you made changes to improve the safety at your road and trail intersections in the past?
3. How do you maintain road and trail intersections? Do you mow or trim to optimize sight distance? Do you assess safety conditions of signs and other structures on trail(s)? How often?
4. What guidelines were used to design the trail crossing?
5. Were sight and stopping distance taken into account for road and trail intersection design? If so, how? What did you to?
6. Do you have any special treatments at skewed intersections?

On Road

7. Trail identification signs- If you have them, why? Where are they and what do they say? If you don't have them, why not?
8. Bike/Ped Signs- If you have them, why? Where are they and exactly what do they say/depict? If you don't have them, why not?
9. Crosswalks- If you have them, why? How are they striped? Color (yellow/white)? If you don't have them, why not?

On Trails

10. STOP & STOP AHEAD signs- How did you decide where to put them? If you don't have them, why not (they are standard)?
11. Pavement Words &/or Symbols (only for paved trails)- If you have them, why? What do they say/depict? If you do have paved trails but do not have words or symbols on them, why not?
12. Signalized controls- If you have them, why? Who funded them? What type of control is it?

Follow up survey #3 – continued

No complaints regarding road and trail intersection safety

13. How do you think you've been successful in making these intersections safe? What have you done to assure their safety?
14. If an accident did occur at one of your road and trail intersections, how would you respond? What would be done in reaction?

Appendix C. Complaints received regarding the safety of road and trail intersections

Phase One Survey

Design Issues

- Sight distance (9)
  - Not enough visibility for cars and pedestrians at trail crossings (5)
  - poor sight distances (3)
  - snowmobiles hard to see
- Poor trail access (3)
- Parking (3)
  - Need adequate parking area at trailhead (2)
  - Access past parked cars
- Signage
  - need for additional signage at public intersections
  - not enough signs
  - no signage for snowmobile crossing ahead to warn drivers
- Crosswalk
  - need a designated crosswalk with advance signaling system
  - no crosswalk
- Un-aligned, skewed intersections (2)
- Should be a gate or better barrier at road crossings
- Users of trail have no warning or dedicated lane/crossing for autos
- Need for lighting at public intersections

Complaints received regarding the safety of road and trail intersections

Phase One Survey

Safety/Enforcement

- Speeding vehicles (9)
- Heavy traffic (2)
- Lack of patrol, enforcement
- Safely located parking areas
- Elderly residents
- Safety
- Cars don't stop, accident waiting to happen
- Snowmobiles stop too close to road when attempting to cross
- Bicyclists fail to stop at intersections
- Property damage
- Cars in roadway

Complaints received regarding the safety of road and trail intersections

Phase One Survey

Maintenance

- Paint on road crossings has worn away
- Overhanging branches after storm

Snowmobile/motorized user specific concerns

- Snowmobile groomer leaves snow in roadways (2)
- Speeding of sleds, dirt bikes and 4wheelers
- Bridge crossing
- Snowmobiles crossing too close to intersections and cause icing at brake time for the STOP sign
- Little room for snowmobiles to stop and look for traffic
- Pavement damage (2)
- Shoulder damage

Site specific concerns and other complaints

- Our 2 entry trails cross residential property and a golf course. We receive complaints about near misses from golf balls.
- Complaints that a specific intersection is dangerous (3)
- We had complaints about entering the shoulder of NYS Route 12 to cross over from the towpath trail to Erwin Park. We corrected this problem by applying for a grant through NYS Parks to build a covered bridge over the canal to the park for the safety of our travelers. Our other complaint is that there is no safe way to cross from our downtown area to the trail system.

Downtown Boonville is located on the east side, along with the village park- Erwin Park. It is very difficult for children and adults to cross Route 12 as the highway gets over 4600 travelers per day (according to a NYSDOT survey). We have been trying to come up with some means of slowing the traffic through this area and make them aware of the park and risks of children crossing.

Complaints received regarding the safety of road and trail intersections

Phase Two Survey

Design

- insufficient sight distance (2)
- Some intersections need safety improvements

Safety/enforcement

- Usually regarding snowmoble trails: speeding and DWI
- Speeding,
- Our property only allows state vehicles, or maintenance vehicles through the property so the traffic is always very very light. However our Forest Ranger did recieve a complaint that some motorists travel too quickly down the paved roads.
- Vehicles not yielding to bikes or pedestrians, etc. (2)

Maintenance

- debris on roadway from trails;
- improper maintenance;
- drainage problems

Appendix D. Suggestions for improving the safety at road and trail intersections

Phase One Survey

Design

- Signage (14)
  - Proper Signage for both road and trails
  - Improved and consistent signage
  - Needs to be more signage at all trail/road intersections (6)
  - Get highway signage alerting motorist a trail crossing ahead, chartreuse signage with blinking caution lights
  - Snowmobile crossing ahead signs
  - Snowmobile signs should be in place on the roads where the trail crosses over the road
  - Have trail I.D. signs on state and town roads
  - We would love pedestrian crossing signs on roads, plus trail name signs facing traffic. (trail name signs have been stolen) or trail signs like Steuben county put up for the FLT (County paid for these and erected them).
  - The new NYS Pedestrian crossing law gives right of way at cross walk, but on bikes, unless they walk their bike to cross road. Need signage instructing both vehicles and pedestrians on new law. Need signage say "NYS Law-cars must stop for pedestrians in crosswalk

- Crosswalks (12)
  - Need cross walks painted on road (3)
  - Pavement markings
  - Maybe something painted on the road to alert drivers of the trail intersections approaching
  - Crosswalk is stamped with patterned blacktop and paint
  - Raised Crosswalks (3)
  - Paving crosswalks and parking areas
  - Paint safety instructions
  - Better markings

Suggestions for improving the safety at road and trail intersections

Phase One Survey

Design (continued)

- Signal systems (7
  - On demand signal control (3)
  - Advanced signal system like Cross Alert
  - Blinking light (2)
  - The installation of traffic signal devices where and when recommended
- Parking (3)
  - Keep parking areas on same side of road as the trail (2)
  - Provide safe areas for parking
- Alignment (2)
  - Realignment of road/trail , better trail/road alignment design Preconstruction
  - Construct intersections at 90 degree angles
  - Trail offsets at intersections with signage deter through traffic
- Improve grade of trail adjacent to road and provide longer flat section adjacent to road
- Better lighting
- Separate intersections by grade as much as possible - bridge underpass
- Possible wooden guard rails setup like a chicane to slow bikes down and let them know there is a road crossing coming up
- Intend to install gates, or bollards
- Locate STOP signs lower so bicyclists with their head down will notice
- Improve width and shoulders

Suggestions for improving the safety at road and trail intersections

Phase One Survey

Maintenance

- Keep visibility open for both trail users and motorists, keep mowed and trimmed back, etc
- Keep vegetation trimmed to maximize sight distance
- Repaint crossings
- Road maintenance improvements

Enforcement

- Enforcement! Speed and yielding practices need to be enforced
- Reduction of speeds (2)
- We have reduced speed limit
- Speed signs
- Need to empower our code enforcement officers with the authority to issue moving violations
- Drivers do not adhere to the posted speed and crossing is difficult.
- More vigilant patrolling and enforcement of traffic control and speeding laws
- Better enforcement of crosswalk laws

Phase One Surveys

Education

- Education
- Educate trail users through snowmobile/4-wheeler safety courses

Suggestions for improving the safety at road and trail intersections

Phase One Survey

Site specific suggestions

- Cut trees on Route 54 looking toward Route 49 evergreens"
- State needs to build a parking area at Moose River Road
- No town road intersection
- The intersection at state 213 is by permit access only, but is used frequently without permits. The primary complaint by residents is that drivers do not adhere to the posted speed and crossing is difficult
- Dutchess County is redesigning the Route 343 crossing
- Intersection of Ridge Rd. and Outlet Rd. requires that trail users to look 3 directions and move quickly. County and Town of Milo Should sign this area.
- Slow down traffic
- Build bridge just for snowmobiles take box beam guide rail off bridge like it used to be (better visibility)
- Trail location may change from year to year due to farm crop rotation and land owners consent
- Install signs on RT 28 to alert motorist of snowmobiles trail crossing (2); improve grade of trail adjacent to road and provide longer flat section adjacent to road
- New signalized crossing at intersection of Trail;/Mason- Loud/NY31 will be provided by NYSDOT along with highway improvements currently under construction
- Less acceleration and flying back snow from spinning track

Suggestions for improving the safety at road and trail intersections

Phase Two Survey

Design

- Each intersection will need individual attention.
- Right of Way of Pedestrian must be stressed.
- Make sure all signage and road crossing pavement marking requirements are followed
- If necessary speed bumps, speed limit signs, and bollards may be used.

- Signage
  - Consistent warning signs
  - Grade separating if feasible and cost effective otherwise signals and signage
  - Increased signage
  - Possibly a sign could be developed through NYSDOT to identify trail crossings at state highways and county or town intersections
  - Sign intersections and use pre-intersection warning signs
  -
- Crosswalks
  - Painting intersections as white cross walks is something we are interested in doing in the future.
  - Use high visibility marked crosswalks
  - Use in-road lighting crosswalk at heavily used locations

Maintenance

- Clear sight distance to the crossing

Education

- Increased education needed
- Educating the walker/bicyclist/ATV or snowmobile rider
- Educating general public about such intersections (from viewpoint of motorist as well as viewpoint of trail user).

Suggestions for improving the safety at road and trail intersections

Phase Two Survey

Site specific suggestions

- I do not believe that the Erie Canal has a posted speed limit
- Snowmobile clubs set trail to cross busy Rt. 232 at a traffic light. Good Planning!
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