

CROSSROADS



WISCONSIN TRANSPORTATION INFORMATION CENTER – LTAP at the University of Wisconsin–Madison

Study data justifies speed limit changes



*Artificially low speed limits tend to increase crash risk due to more variability in travel speeds on the road. The closer all drivers adhere to what is generally termed a **rational** speed, the lower the risk.*

POSTED SPEEDS that are right for the roads they control help make drivers and passengers safe on Wisconsin's roadways. Studies show that artificially low speed limits, in particular, tend to increase crash risk due to more variability in travel speeds on the road. The closer all drivers adhere to what is generally termed a **rational** speed, the lower the risk.

Current statewide Speed Management Guidelines give local governments a template for establishing speed zones that reflect conditions and typical travel speeds on local streets and highways. Ongoing research on how rational and irrational speed limits affect safety on Wisconsin roads also provides local road officials with useful safety data to support improvements.

Time to evaluate

Taking the speed management guidelines and his own observations into account, Douglas County Highway Commissioner Paul Halverson decided last year it was time to evaluate a disorderly array of speed zones in his jurisdiction. He contracted with Wisconsin-based Jewell Associates Engineers, Inc., to conduct a countywide speed management study last summer. The consultants scrutinized speed zones on 27 county highway sections and recommended changes to bring certain ones into compliance with the guidelines.

The northwestern Wisconsin county is one of the first in the state to conduct a formal speed management study that guides decisions about setting or modi-

fying speed limits to meet the new recommendations. The immediate result was an ordinance establishing new speed zones at 15 of the study locations, higher limits in most cases. The County Board passed the ordinance in November 2011 and crews replaced the speed limit signs before winter set in.

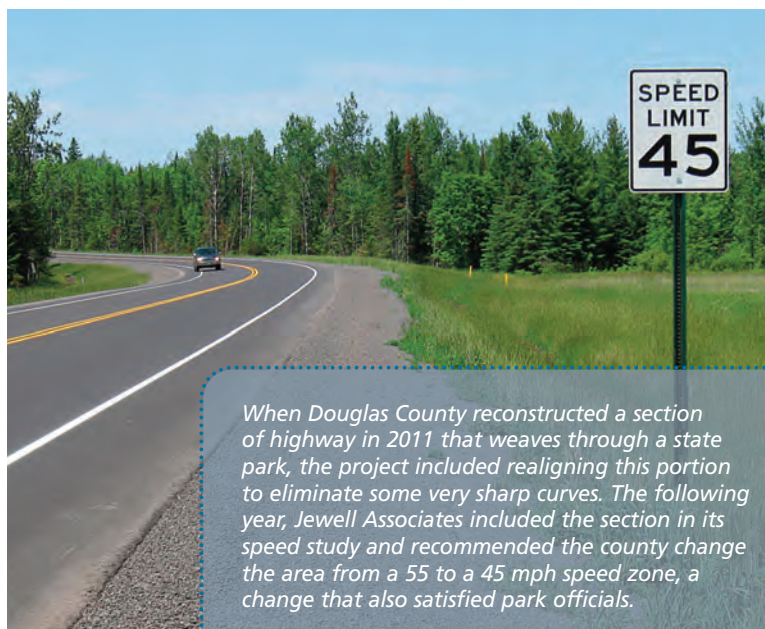
Enforceable and defensible

Halverson says a preliminary review he did of specific roadways on the list showed a mix of posted limits set through informal agreements, some of which made no sense and others that simply did not meet state guidelines. Road safety was an issue but not the only one motivating the county to act.

"We really needed to reconsider many of these speed zones to decide if they were legitimate and appropriate for the flow of traffic and road uses," he explains.

The data-driven approach examined roads across the entire county to give the County Highway Department a complete picture of speed zone inconsistencies. Halverson emphasizes that "I had a good idea what some existing limits should be, based on what I know about these locations, especially those with limits that were too low for no good reason," he notes. "But we needed someone with expertise to survey and analyze everything with an objective eye."

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When Douglas County reconstructed a section of highway in 2011 that weaves through a state park, the project included realigning this portion to eliminate some very sharp curves. The following year, Jewell Associates included the section in its speed study and recommended the county change the area from a 55 to a 45 mph speed zone, a change that also satisfied park officials.

Speed limit changes

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Basing decisions to modify speed zones on information from the engineering study helps ensure the new statutory limits are enforceable and defensible.

Identify 85th percentile

Tony Kemnitz provided the objectivity. The traffic engineer led the Douglas County speed study for Jewell Associates. He and company President Greg Jewell describe it as an effective way of taking into account all factors, including speed limits, that keep traffic flowing freely and without conflicts or problems.

They considered safety but because the county had no real crash issues on the roads studied, Kemnitz says the primary focus remained on travel speeds. He found many roads in the study with little traffic where posted limits seemed random. On roads with lower limits, most vehicles traveled about 20 to 30 mph above the posted limit. On those with higher limits of 45 and 55 mph, drivers tended to travel closer to the posted speed.

Profiling travel speeds in this way on all sections, Kemnitz identified the 85th percentile speed, or the speed at or below which 85 percent of observed traffic travels. In one case, on a remote highway with only two driveway access points, few drivers observed the posted 25 mph limit but traveled at 40 mph or more. "They naturally

There was no ordinance on the books to cover the previous 25 mph speed limit on this causeway. The road is a popular area for visitors and lake users so it sees lots of pedestrian traffic. But based on the analysis of study data, Douglas County decided to raise the limit through the entire section to 35 mph—so far, without complaint.



adjusted to the speed the majority of motorists are comfortable driving on that road," Kemnitz says. The new limit, modified by ordinance, is 45 mph.

Kemnitz then documented secondary factors that define a roadway and affect travel speeds. "People see speed limits as the issue and want to lower them as a way to make roads safer," Kemnitz says. "But other factors often matter just as much or more."

He analyzed things like roadway design and the number of driveways and side roads that intersect the roadway. Land use along study corridors, proximity to schools, density of traffic controls and other features also helped determine speed zone recommendations. Kemnitz says when secondary

factors rather than the 85th percentile speed influenced a change, he recommended the county increase law enforcement on those roads to help modify driving behaviors.

Running the study

Commissioner Halverson drove every location on the list with Kemnitz at the start of the study to share key facts about each road and any specific concerns.

Kemnitz used a laser speed gun and traffic data recorders to measure the actual travel speeds

at study sections. To document results on secondary factors, he analyzed five years of crash data for the entire county. He did a field survey to establish roadway alignments and record safe travel speeds based upon existing roadway features. A closer study of driveway spacing, and land use and zoning along the test corridors provided more data to support potential changes.

After noting that traffic at the study locations typically traveled above posted speeds, Jewell Associates final report noted that 12 of the 27 speed zones met statewide guidelines but recommended raising limits on the other 15 locations. Kemnitz based 60 percent of the suggested increases on factors like the number intersecting access points and roadway geometrics rather than travel speeds.

Role of speed variability

In a separate but related study released by the Wisconsin Department of Transportation in June 2011, Senior Traffic Engineer John Campbell of Traffic Analysis and Design, Inc. (TADI) compared the safety impacts of rational and irrational speed limits on five pairs of rural and urban corridors across the state.

The terms *rational* and *irrational* describe posted speed limits that affect the free flow of traffic on a roadway. Engineers generally base rational speed limits on observed

Speed study findings showed this rural school zone did not comply with current statewide speed management guidelines. Previously posted with an urban limit of 25 mph/15 mph when children are present, Douglas County modified the road section near a school to a 35 mph speed zone. Public response to the change, which reflects actual travel speeds the consultants observed during the study, is positive.



travel speeds, the geometry of a road and the type of traffic it carries. As the Douglas County speed study found, these are the speeds most drivers feel safe driving on a given stretch of road. Irrational limits appear unreasonable based on engineering standards or are remnants of a time when the road had different uses.

When rational travel speed meets irrational posted limit, traffic can move at varying rates of speed, creating more potential for conflicts and crashes. The TADI study showed that this “speed variability,” common on irrational corridors, creates a greater risk of crashes. It also found that more drivers comply with posted speeds on highways with rational limits.

The safety study compared crash histories of the five corridor pairs. Each pair featured one rational and one irrational corridor based on observed travel speeds and results from USLIMITS, a web-based software available free from the Federal Highway Administration website <http://safety.fhwa.dot.gov/USLIMITS/>. Campbell also analyzed speed variability on an additional 32 rational and 23 irrational corridors.

He explains a goal of the study was to collect evidence specific to Wisconsin that reinforces other studies indicating lower limits do not guarantee a safer road. Lowering a limit without data to justify the change does not have much impact on the speeds most

drivers travel, notes Campbell. They will decide instead what feels right and rational based on experience, road features and the surrounding environment. Roadways with irrational speed limits tend to have greater differences in travel speeds and a higher collision risk because more vehicles are passing and changing lanes.

Beyond the limits

Campbell suggests public agencies consider safety countermeasures as part of a road safety assessment, that they go beyond modifying speed limits. In matching corridors for the WisDOT study, he looked at additional factors that influence the relationship between speed limits and safety: roadway alignment, transition zones, pedestrian and bicycle activity, the amount of on-street parking and other characteristics.

Countermeasures like dynamic speed signs, adequate warning signs, turn lanes, consolidated driveways, clearly marked pedestrian crossings and other applications combine with rational speed limits to improve road safety. Campbell recommends local governments make the USLIMITS program a starting point for determining appropriate speed zones on local roads and streets.

Serving the public good

Speed limits are set by facts, not personal opinion, observes Douglas County’s Halverson. For



Which speed is the rational speed? Two versions of the same photo illustrate road characteristics, like four travel lanes divided by medians on a mostly commercial roadway, that factor into deciding the answer to that question on this corridor is 40 mph. Taken from a statewide study comparing the safety impacts of rational and irrational speed limits that analyzed the difference between posted speeds and actual speeds on a variety of roads across Wisconsin.

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Resources

<http://safety.fhwa.dot.gov/USLIMITS/>

Federal Highway Administration link to working with the web-based system for setting reasonable, safe and consistent speed limits for specific segments of roads.

<http://transportal.cee.wisc.edu/>

Managed by the Wisconsin TOPS Laboratory, this site gives local road agencies access to timely crash data.

his department, conducting the countywide speed management study was essential to tackling long-standing speed zone issues. The data it produced gave him justification for modifying existing limits and made it easier for the County Board to support the changes. Since making the changes last year, he says most community feedback is positive.

“Results from the engineering study gave us a good status report on our highway speed zones and a factual basis for enforcement,” Halverson says. “But it also shows residents and visitors that we pay attention to serving the public good.” ■

Douglas County found that some county roads, like this section of rural highway, had posted speeds that made little sense. Commissioner Paul Halverson says one theory he heard for the ordinance governing a long-standing 45 mph limit on this road was that two people who liked to walk along the road requested it to slow traffic going past them. Study results called for raising the speed limit to a safer 55 mph, a move that earned kudos from many nearby residents.

