IS HIGHWAY FUNDING REALLY SHRINKING?
An Update 1994-2012

Bruce Epperson
BruceEpp@aol.com
May 1, 2015

In an article I wrote for *Bicycle Forum* in 1995 entitled "Bicycle Planning: Growing Up or Growing Old?" I cited a 1989 article by Penelope Lemov in *Governing* magazine. She stated that after the mid-1950s, expenditures on new roads and highways in the United States steadily increased, but started to fall about 1978 and had continued to do so through the late 1980s.[1] Based upon this information, I argued in my 1995 piece that one of the fundamental tenants of vehicular cycling, a reliance on the roadway system in unmodified form as the basic infrastructure for bicycle use, was going to become unworkable if this trend continued. If, I asserted, we were soon going to have a roadway network that was inadequate in scale and scope, poorly maintained, and so obsolete that it couldn't even handle the demands of motor vehicle use, it probably wouldn't be a very good idea to exclusively rely upon it to provide for most, if not all, of the needs of cyclists.

At that time I advocated a heavier reliance on specialized bicycle facilities, an alternative I no longer subscribe to as a general policy goal.[2] However, in early 2014, as I was in the final stages of preparing a book on the history of American bicycle planning, I grew curious about whether Lemov's assertion still held true, so I decided to, as they say, "run the numbers."

Fortunately, the data are far more accessible today than they were back in 1995. The U.S. Department of Transportation's Office of Highway Policy Information began issuing annual statistical reports in paper format in 1995.[3] Later, they added an on-line historical series extending

---

[1] Bruce Epperson, "Bicycle Planning: Growing Up or Growing Old?" *Bicycle Forum* 35 (January 1994): 4-9; Penelope Lemov, Buck Rogers Doesn't Live Here Anymore," *Governing* (November 1989): 23-26.

[2] The reasons for my change of heart are complex, but can be summed up in six words: bad implementation; inadequate implementation; fragmented implementation. First, let me make it clear that I am talking about a general, overall policy: local, specialized exceptions always exist. Today, I am far more skeptical of capital-intensive bikeway programs than I was in 1995 because I believe that their position within the federal-state highway funding and administrative structure has led to an inherently dysfunctional outcome. Bicycle planning and implementation in most localities is incremental and political, not long-term and systematic, and it privileges the recreational interests of affluent suburbs over the basic transport needs of the inner-city poor and mobility-deprived. The basic problem is that under the highway funding and administrative structure created in 1916 and 1921, all money and decision-making must go through state DOTs, and most have an inherent anti-urban bias. Because urban-oriented and alternative transportation programs as Transportation Enhancement, CMAQ and TIGER are seen by most DOTs as wasted money in the first place, they have been allowed to deteriorate into virtual slush funds, ripe for waste, fraud and abuse. Many possible alternatives exist. For example, the Land and Water Conservation Fund of the early 1970s awarded money directly from the federal Bureau of Outdoor Recreation to localities at a rate about ten times higher than the section 214 of the Highway Act of 1973 that was supposed to replace it.

[3] This information can be found at http://www.fhwa.dot.gov/policyinformation/statistics.cfm

some, but not all, of this data back from 1994 to the start of the modern configuration of the highway trust fund in 1957.

I compiled the data from both the post-1995 "annual report" series and the pre-1995 "historical" series, and used the general Consumer Price Index (CPI) to inflation-adjust the dollar amounts, renormalizing the CPI to make 1957 the base year = 1.0. I used the general CPI because it goes all the way back to 1957 in one continuous series. Other CPI series, such as the urban CPI-U and the CPI for construction materials either don't go back to 1957 or have been reset with revised methodologies.

The definition of "highway spending" used by DOT's Office of Highway Policy Information includes federal, state and local expenditures for maintenance, repair and construction, but not law enforcement and emergency response.[4] Almost continuously since the 1960s, maintenance has taken up an ever-larger proportion of total spending, and non-federal sources have slowly but steadily increased their share of total expenditures. (The two are probably linked.) In the 2000's maintenance expenditures sometimes ran as high as 45 percent of capital expenditures (i.e. almost a third of all outlays), indicating the magnitude of the problem of caring for a highway system in which so much was built in such a short time during the '50s and early '60s.

My conclusions? While the truly catastrophic decline in highway funding that led Ms. Lemov to write her 1989 article notably flattened out after the mid- to late 1980's, in general highway spending, using the best metric available (dollars per million vehicle miles traveled [mVMT], adjusted for inflation) has slowly but steadily fallen over the entire fifty-year period. The flattening has probably been due to two causes: 1) it is well known that higher gas prices and the subsequent implementation of federal Corporate Average Fuel Efficiency (CAFÉ) standards resulted in a drop in average annual miles traveled per vehicle and better average gas mileage from 1973 to 1983. But this also resulted in less revenue for the highway trust fund. But after the mid-1990s low gas prices and the increasing popularity of light trucks and SUVs, which were not covered under the initial CAFÉ standards, reversed much (but not all) of this effect. Thus, the revenue drop flattened out, but never did start climbing again. 2) The brutal double-digit inflation of the late '70s and '80s eased. Between 1978 and 1982 the CPI averaged 9.8 percent per year, and was probably higher for construction materials and labor. But between 1983 and 2011 it averaged less than three percent and in one year, 2009, the general CPI was actually negative.

I evaluate real highway spending using three measures: 1) spending per capita; 2) spending per centerline mile of highway (state and federal); and 3) spending per mVMT.

Let's start with the most straightforward measure, highway spending par capita.

[4] After 1995 these are in the annual reports as a separate category, but do not exist pre-1995.

Highway spending per person has, on the whole, been fairly flat for the last half-century. (Fig. 1) Funding decreased sharply, but irregularly, from 1971 to 1983, which is what led many observers to predict a drastic funding shortage for all forms of local infrastructure. The bump during 1979, 1980 and 1981 occurred during the span of the Surface Transportation Act of 1978. Although the subsequent Surface Transportation Assistance Act of 1982 raised the fuel tax by 5 cents to 9 cents per gallon, those funds merely compensated for the loss of excise taxes on tires, batteries and other maintenance parts, and for lower license fees on heavy trucks. The money, in real terms, was also eaten up by high inflation; the combined Consumer Price Index for the years 1979-83 was over 43 percent. In addition, increases in fuel use slowed after 1979 due to a recession and large jumps in fuel prices. In essence, the highway trust fund (along with matching state funds) was spent down to the bare shelves during '79-'81. After that, despite higher revenues, the trust fund went unreplenished until the late 1980s. Since then, it has been a case of slow, steady growth, a slow shift in burden to the states, and (as we will see later) even more rapid, but steady, growth in vehicle miles traveled.

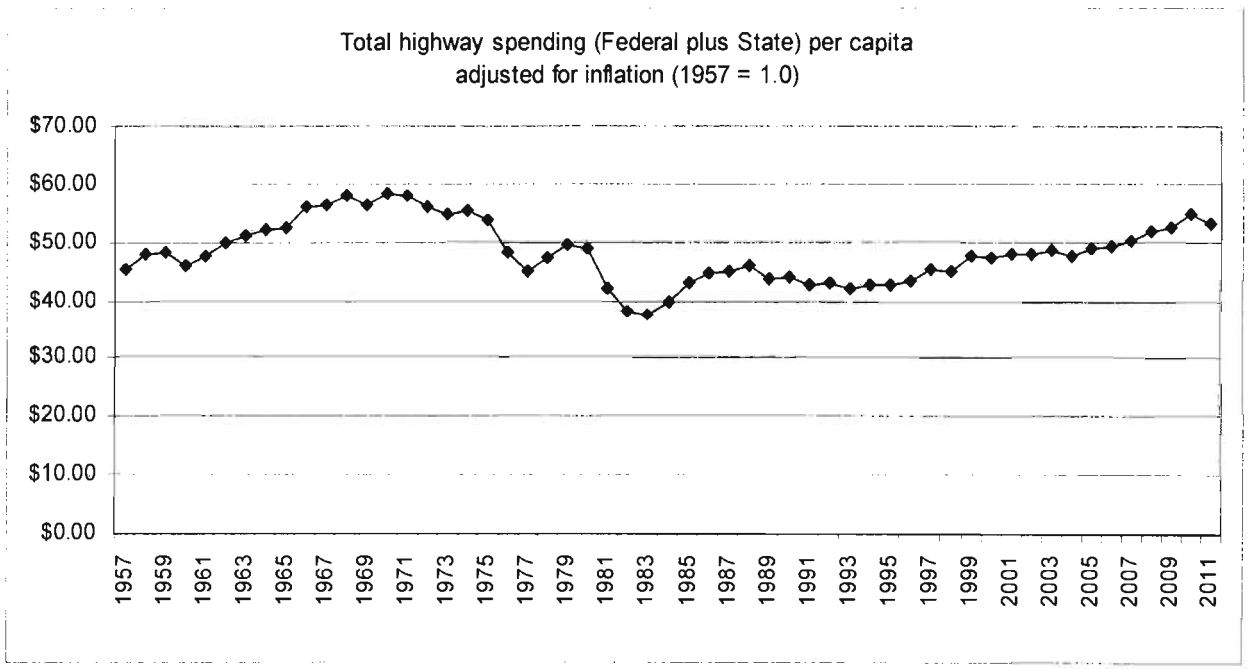

Figure 1: Real Highway Spending, Per Capita, 1957 to 2011.

However, spending per capita, while straightforward, is a terrible way of measuring transportation outlays. The number of people in the United States, or in any geographic subdivision such as a state or county, is poorly correlated with the number of roads, the number of

lane-miles, or the vehicle miles traveled, which are the actual indicators of the load being placed on the roadway system. In turn, each of these have, at best, a tenuous relationship to each other.

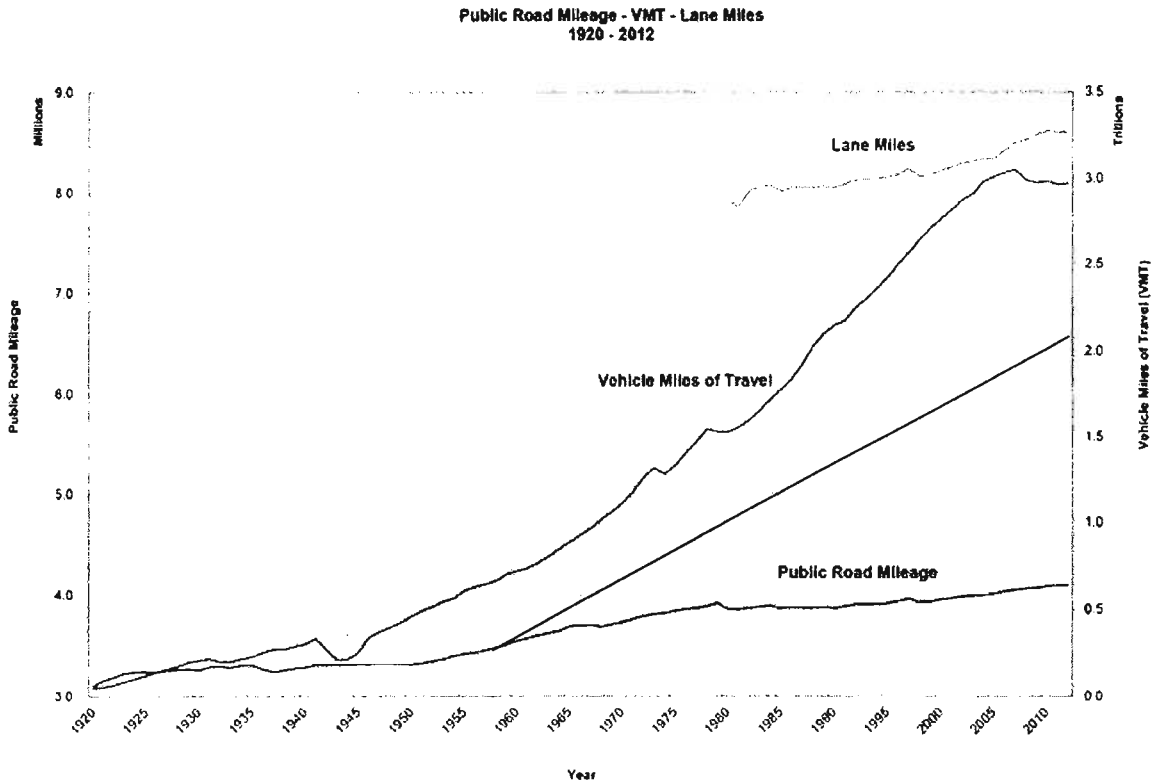

FIGURE 2: Changes in base information used in this report, 1920-2012 (the straight line represents relative change between change in VMT and population 1957-2012.
SOURCE: U.S. Dept. of Transportation Office of Highway Policy Information.

Let's turn to Figure 2, a graph prepared by the USDOT's Office of Highway Policy Information. I have made one addition, the straight line just below the curve for mVMT, which is labeled "Vehicle Miles Traveled". This line is intended to give some idea of the relative growth in U.S. population between 1957 and 2011 (73 percent) versus the growth in centerline highway mileage (17 percent). (Note that the population line can't be compared directly to the graph for mVMT, except in a general way; the scalar for mVMT is much steeper.) I also wanted to include this figure because it has a little-used statistic: the total quantity of available *lane-miles* as opposed to the availability of total *centerline* highway miles. I suspected beforehand that that the number of centerline miles of highway (here labeled "Public Road Mileage") would be fairly flat; there just haven't been many all-new highways created since 1980. However, I was surprised at how relatively flat the amount of lane-miles also was. I would have thought that lacking the ability

to lay down new green-field highways, state DOTs would have expanded the number of lanes on existing roads more aggressively, especially in suburban and exurban areas. Instead, the increase between 1980 and 2012 was only about 6.5 percent, less than 0.2 percent per year, or on average around 7,500 new lane miles per year.

It is apparent from these data that between 1980 and 2012 there has been a sharp rise in the amount of motor vehicle traffic on what is essentially the same quantity of roadway. While new lane miles during this 32-year period increased by 6.5 percent, or 0.20 percent per year (not compounded), mVMT increased from 1.56 million to 3.1 million, an increase of 99 percent, or 3.1 percent per year (not compounded). In other words, each lane-mile of public highway in 1980 was carrying 194,413 vehicle miles of traffic (not mVMT, just miles) per year. In 2012 each lane-mile of public highway was carrying 913,481 vehicle miles of traffic per year (again, not mVMT, just miles), or an average of 2,503 vehicle miles per day. So yes, if you long-timers think that traffic has gotten worse on your favorite stretch of highway, it probably has—on average, it is carrying about four and a half times the load it was back in 1980, and remember, that's a per-lane measurement, not a per-centerline measurement .

* * *

With this explanation out of the way, let's go to the second variable, expenditures per centerline of highway.

After reviewing the history of the growth (or to be precise, the lack thereof), in the centerline miles of state and federal highway miles since 1957, this graph shouldn't be surprising. It indicates why there was such a grave concern in the late 1980s and early 1990s about federal highway funding: after fifteen years of steady growth, there was a very real, very drastic fall in highway expenditures per mile of roadway starting with the fall in gasoline sales after the first price shock of 1972-73 and the previously programmed revocation of excise taxes on automotive-related products (a factor that tends to be forgotten in discussions of highway funding). By 1985 dollars per mile had fallen by almost a third. But after 1985 there was an upturn (also reflected in Figure 1). Many planners believe that the 1990-91 ISTEA act was the revitalization of highway funding, but as Figures 1 and 2 show, the release of highway trust fund monies impounded by the Reagan administration, but obligated to the states by the end of the previous 5-year highway act had as much to with providing relief as anything else.

But like population, dollars per centerline mile doesn't tell us very much about the intensity of use of the highway system. We know population increased about 73 percent between 1957 and 2012, but that doesn't say anything about how many of those people owned and used cars. (Car registration increased 250 percent just between 1970 and 2008, while at the same time population

grew by 49 percent.[5] As indicated in Figure 2, the highway mileage on the state and federal systems only grew from about 3.4 million miles to slightly over 4 million miles between 1957 and 2011, so any increase in spending would show up as growth in spending per mile. In this context, it is apparent just how catastrophic the cuts in highway spending between about 1973 and 1985 truly were. As Figure 3 indicates, spending per mile didn't return to 1972 levels until about 2001.

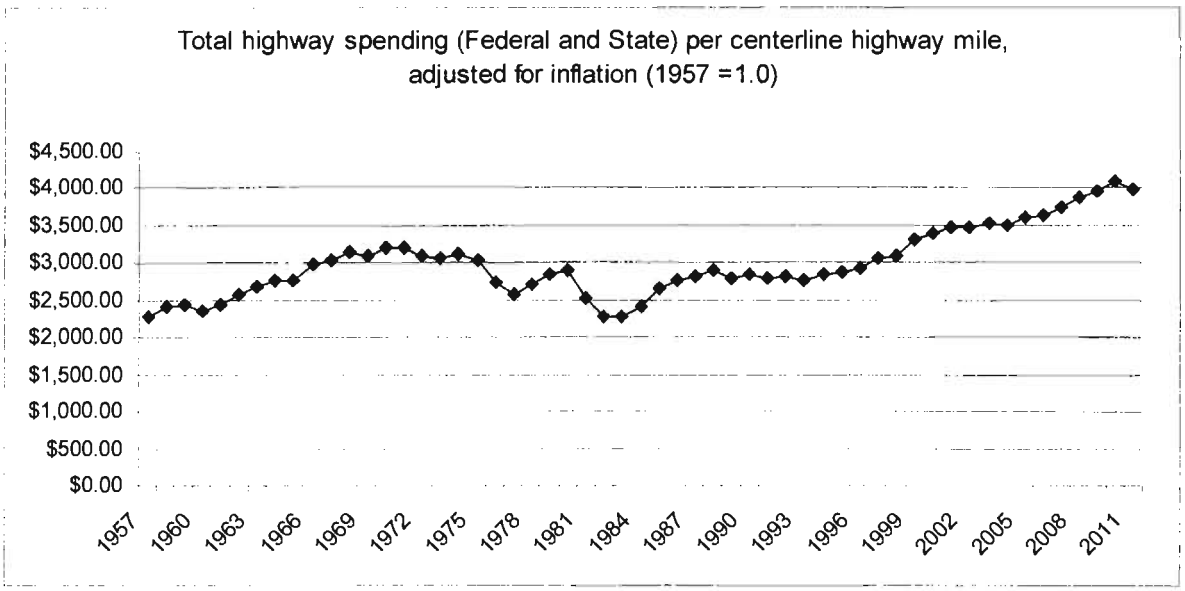

FIGURE 3: Total Highway Spending Per Centerline Mile of Highway, 1957-2011

But what about the final measurement, dollars per million vehicle miles traveled?

This is clearly the best measure of both the amount and intensity of demand for transportation infrastructure. In short, it indicates both how many people are using the highway system, and how much they are using it. Measuring how much money is being spent per mVMT is nearly the ideal metric for measuring real outlays for highway spending. About the only shortcoming is that it does not measure pure fixed costs: a roadway will depreciate over time, even if nobody uses it, so it has a fixed life-cycle cost independent of volume, but with today's roadway engineering and (especially) maintenance procedures, that is a very long cycle, in some cases approaching 60 years.

Dollars per mVMT confirms what the previous graphs have strongly hinted at: highway funding per mile of use decreased more-or-less continually after 1966. There is the same anomalous fall-bump-fall-rise cycle between about 1974 and 1975 we saw with per-capita and per

[5] Oak ridge National Laboratory, *Transportation Energy Data Book* (Oak Ridge: Edition 26, 2007): Tables 3.3, 3.4 and 8.1.

mile of highway graphs. However, the decline after 1974 is much more pronounced, and instead of a recovery after 1985, the graph just flattens out at a "new normal" of about $5,500, after which there is a slow decline again until 2003, after which there is almost equally slow climb. At about $5,500 per mVMT, highway spending is now about half of what it was in the early 1960s.

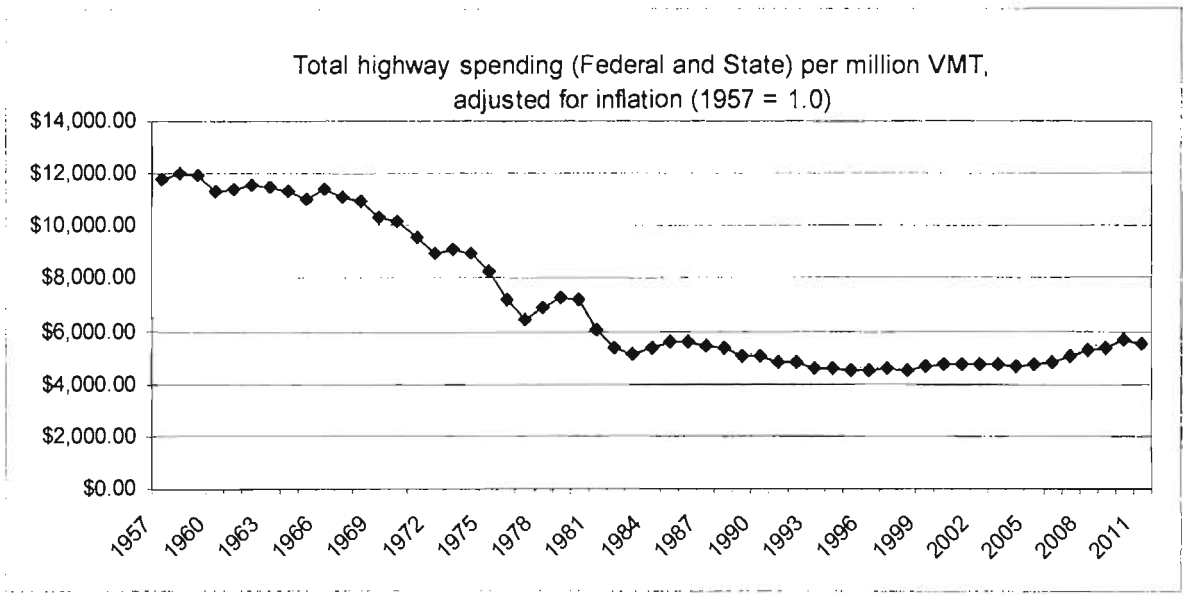

FIGURE 4: Total Highway Spending Per Million Vehicle Miles Traveled, 1957-2011

Moreover, in 2011 maintenance accounted for 46 percent of total highway spending; in 1964 it was 37 percent. It can be plausibly argued that 1) new materials and technologies are more cost efficient than those of the '50s and '60s; and 2) many highway costs are fixed, so they do not increase on a one-for-one basis with mVMT (clearing after a snowstorm or replacing an obsolete guardrail does not cost twice as much just because there are twice as many cars using the road), but I would maintain that it is simply not possible to maintain and upgrade a roadway system to the same quality level while spending only 50 to 55 percent as much as in the 1950s and 1960s, especially at the same time that higher engineering standards have significantly raised the costs of new construction and down-to-the-roadbed reconstruction. There is just not that much room for either technological improvement or economies of scale.

Given the steady shift from construction to maintenance, and the corresponding change in the share of funding (not indicated in these data) from federally-based to state-based funding (which includes county and local governments) it is my belief that a correspondingly greater amount of money is going into maintenance and support--including first responder, repair and replacement of roadway safety devices, and stormwater management (both more volume and

better water protection)--than was the case fifty years ago. For those who base their bicycle plans on the use of the unmodified roadway system (or, far more commonly, those localities who, through a policy of benign neglect, default to a vehicular cycling paradigm), the indicators are clear: they are pinning their hopes on a transportation resource that has been shrinking for more than thirty years, is already marginal for its primary task of conveying motor vehicles, and lacks any real hope of a trend reversal in the foreseeable future.

Does this mean vehicular cycling should be abandoned? No, like many things, data just explains reality, but doesn't do much to project the impact of changes. The primary driving force behind the current situation is a lack of highway money, but most of the alternatives to vehicular cycling proposed so far are predicated on the assumption that a lot of highway money can be made available for alternative uses. With bridges regularly collapsing and entire urban freeway networks being sold to privatized expressway authorities for conversion to toll roads, the prospect of a well funded, long-term, nationwide bikeway program doesn't seem to be on the horizon.[6] In addition, with so much more traffic on a roadway system that has barely grown, and that isn't being financially supported, every bike ride is becoming a high-traffic interaction ride, so you can argue that vehicular cycling skills are becoming analogous to swimming lessons: you don't send your kid to swim class at the "Y" because you hope she'll make her high school's swim team in ten years; you send her because you don't want to find her on the bottom of some neighbor's swimming pool.

So what are my conclusions? It's hard to predict. First, I suspect that recreational cycling has a pretty grim future ahead of it. There are about half the bike shops there were a dozen years ago, and I don't buy the rhetoric that all of this shrinkage is due to mail-order, big boxes and bicycle super-stores: the National Sporting Goods Dealer Association reports that golf and cycling are the two fastest shrinking large sports among "very frequent" (50+ times per year) user groups. As far as bicycle *planning* is concerned, I believe the discipline should simply give up on the idea that it a specialty area within of the profession of highway planning or engineering, the presumption it has been based on for forty years now. It should, instead, move towards embracing a vision of itself as an extension of transit planning. The engineering aspects are less important than the economic. Transit is what economists call an inferior good: one that consumers use

[6] What is "well funded?" As I explain in my recent book *Bicycles in American Highway Planning* (2014), I take as a benchmark the sidewalk curb cut program required under Section 504 of the Rehabilitation Act of 1973 and the Americans With Disabilities Act: between 1973 and 2013, roughly $330 billion on all levels of government, or $8.25 billion per year. How much has been spent on bicycle facilities? Hard to calculate, because an increasing number of bike lanes are being "designed into" new or rebuilt highways. My best estimate is $20 to $40 billion (around $400 million to $900 million per year), again on all levels of government, between 1969 and 2013.

because they cannot afford more preferred options. The economics of urban transportation are particularly volatile. Is owning a car too expensive in dense (but hip) Williamsburg, Brooklyn? In the short run, the answer is to ride the bus or take a bike. In the long run the answer is to move out to Montauk or Islip—or Miami. But many bicycle users are "pure transit dependents"; those who would have to take the bus whether they lived in New York, L.A., or Odessa. They are also the largest single category of utilitarian bicycle trip-makers.

Bicycle planning should be based around bikes-on-bus service, making the bus network the underlying base grid, and facilitating access trips to and from each transit stop. This assumes that the rational bicycle user desires, to the maximum extent feasible, to avoid riding his or her bike as much as possible, a presumption that is not very popular with most bicycle planners, advocates and advisory committees who can't understand why everyone doesn't love to bicycle everywhere, all the time. Any facilities planning or roadway modifications then fan out from each transit stop only to the extent necessary to connect the cyclist from his or her origin/destination and the nearest transit interface.

Since this probably isn't sellable as a bicycle planning policy, we'll likely just continue down the road we are headed on now. We'll muddle through the best we can using the road system we have, with most bicycle projects either expensive suburban/exurban trails put together by co-ops of local governments that are willing to work together for mutual benefit over the long haul, or one-off single-point urban projects that are of little actual benefit to cyclists, but are of great advantage to community redevelopment agencies, chambers of commerce, downtown redevelopment administrations, or anyone else looking for a million or two in seed money to kick-start a commercial redevelopment project to make a few landowners some serious money and generate some tax revenues in the bargain. Increasingly, this is where I am seeing Transportation Enhancement money going on inner-city projects. They are useless as bicycle/pedestrian projects, but nobody really cares, because they are intended to use USDOT money as economic development funds, just as interstate highway money was treated by big-city mayors in the 50s and 60s as a gigantic slum removal project.