

Best Practices in Campus Bicycle Planning and Program Development

SUMMARY

Universities are not only institutions of higher learning, they are also research and thought leaders and places of great innovation. This can be said about cutting-edge laboratory research, as well as sustainable transportation practices such as bicycle planning and program development. While the bicycle is obviously not a new invention or technology, there is a renewed focus and emphasis on prioritizing bicycling due to its many benefits, including health, economic, and environmental benefits. Additionally, students who become bicyclists during their time at university are more likely to continue bicycling after graduation. This white paper documents best practices in bicycle planning and program development at university campuses throughout the United States.

Campus Bicycle Master Plans

While bicycling can and has emerged at some campuses through fairly organic means, campuses that have planned for bicycling by developing policies, programs and facilities to better accommodate bicycling as a legitimate transportation mode have yielded greater success in increasing bicycling rates. Campus bicycle master plans should be developed to be consistent with other campus planning documents, such as long range development plans or campus master plans. Campus bicycle plans should also establish seamless links with the existing and proposed bikeway networks of neighboring jurisdictions. Campus bicycle master plans typically include the following primary elements:

- Vision, goals and objectives
- Existing conditions assessment
- Opportunities and constraints
- Proposed bikeway network
- Proposed bicycle programs
- Implementation and funding plan

It is recommended that the bicycle plan be developed in coordination with multiple campus departments, including transportation, planning, police, and facilities management, among others. The development of the plan should also include campus outreach efforts, which could include public forums, workshops, and/or online surveys. Many universities have created Bicycle Advisory Committees to guide the development of their bicycle plans, which can be an effective strategy of ensuring that various bicycling issues and concerns are addressed by the plan. Lastly, it is important to note that the work is not finished with the completion of the bicycle master plan. It is vital that universities dedicate adequate staffing and financial resources towards bicycle plan implementation to ensure that the recommended improvements are successfully implemented.

City Coordination

One of the biggest challenges that university campuses face when trying to increase their bicycle commute mode share is working with neighboring communities to create an environment that is safe, comfortable, and conducive to bicycling. Campus bicycle commuters typically log the majority of their miles riding on city streets

en route to and from the campus. Consequently, it is critically important that universities coordinate with the local jurisdiction to create a well-connected, seamless network of bicycle facilities between the campus and neighboring communities. This can sometimes involve multiple jurisdictions, such as the state's Department of Transportation, and city and county governments.

Since the 1960s, the University of California at Davis (UC Davis) has been coordinating with the City of Davis in bicycle planning efforts to create what many have called “The Bicycle Capital of America”. This level of “town – gown” coordination has resulted in a highly integrated network of bikeways that seamlessly transition between the UC Davis campus and the surrounding Davis community. In a city that is only 10 square miles in size, Davis has a remarkably extensive bikeway network – 50 miles of bike lanes and 50 miles of off-street paths. Bicycling rates have historically been among the highest in the nation at UC Davis and in the City of Davis, although bicycling rates have fallen in recent years at the university and within the city. Despite lower bicycle mode share rates than in the past, approximately 50% of UC Davis students still bicycled to campus as their primary transportation option in 2007.¹ While bicycle planning efforts have waned in recent decades at UC Davis and the City of Davis, the strong foundation of bicycling facilities that was established between the 1960s and 1980s continues to be well-utilized by bicyclists.

Establishing a working relationship with staff from local jurisdictions responsible for bikeway planning and implementation is an important step in improving bikeway connections to the campus. It is recommended that universities designate a liaison responsible for interfacing with the city on bikeway planning issues. Many universities have also benefited from partnering with their local jurisdictions on bicycle infrastructure projects or grant applications to advance mutually beneficial bicycling projects.

Innovative Facilities

As the bicycle planning profession advances and matures in the United States, an increasing number of bikeway facilities are available to better accommodate bicyclists by creating a safer and more comfortable riding environment. In fact, several campuses have been on the leading



One-way cycle track at MIT in Cambridge, Massachusetts

edge in developing and experimenting with more innovative bikeway facilities, including one-way cycle tracks at MIT, buffered and colored bike lanes near the University of Arizona, and an entirely segregated system of bicycle paths at UC Santa Barbara. Universities are compact, self-contained communities that have the autonomy to develop specific infrastructure that will benefit the campus most.

The National Association of City Transportation Officials (NACTO) Urban Bikeway Design Guide provides practitioners in cities and towns around the United States with state-of-the-practice solutions for on-street bicycle facilities. NACTO developed the Guide because many of its members found existing design manuals inadequate for their efforts to provide safe and visible bicycle facilities. The state of bicycle facility design has evolved rapidly over the past 15 years and the standard design manuals have been unable or unwilling to keep pace with best practices. To create the Guide, officials from NACTO cities and a team of top planners and designers launched NACTO's Cities for Cycling project. They conducted an extensive survey of expert knowledge, design guidelines from cities around the world, and experience and case studies from innovative projects in the U.S.



The NACTO Urban Bikeway Design Guide website provides a thorough discussion with supporting illustrations of each treatment, including when it should be used, considerations for recommended elements and options for different types of applications. Real-life

¹ T. Buehler and S. Handy. “Fifty years of bicycle policy in Davis, CA”. Submitted to the Committee of Bicycle Transportation.

projects are described for each design category, giving designers insight into best practices on the ground.

Many of the treatments provided within the NACTO Urban Bikeway Design Guide such as cycle tracks and intersection treatments can make existing campus roadways function better for bicyclists, often times providing more direct and faster connections to and across campus. Good on-street bicycle facilities can reduce rates of sidewalk and wrong-way riding and other unsafe bicyclist behaviors that can cause crashes on university campuses.

Bike Parking

Universities throughout the nation share the common challenge of accommodating student, faculty, and visitor vehicular parking demand, often in developed environments with limited available space for expansion. Bicycle parking facilities present a tremendous opportunity to address this demand both in a cost- and space-efficient manner. Providing ample and secure bicycle parking facilities is vital to creating a bicycle-friendly campus environment. Compared with motor vehicle parking, bicycle parking is remarkably space-efficient, as at least ten bicycles can be parked in the space that it takes to park one motor vehicle, and it can be located closer to the user's end destination. Nonetheless, it is not uncommon to have a shortage of bicycle parking facilities on university campuses due to high demand and the often constrained public space. Other campus bicycle parking issues include outdated or inadequate bicycle parking facilities, bicycle parking facilities sited in inconvenient or secluded locations, and high levels of bicycle theft. To mitigate some of these issues, universities can take



Covered vertical bicycle parking

the following steps to improve their bicycle parking facilities:

1. **Adopt a bike rack standard** – to address the issue of outdated and/or inadequate bicycle parking facilities, it is recommended that a bicycle rack standard be adopted by the university campus architect or design review board. The bicycle rack should be securely anchored to the ground, allow locking of the frame and one or both wheels with a U-lock, and support the bicycle in at least two places.² Once a standard (or set of standards) has been adopted, this bike rack type should be utilized for all new installations, and older racks should be replaced as funding allows. Racks can also take on a uniform design and color so that they are easily identified by cyclists.
2. **Assess bicycle parking demand** – determining the optimal amount of bicycle parking for a university campus is as much art as science. There are several techniques available to estimate bicycle parking demand, including basing bicycle parking demand estimates on bicycle mode share, bicycle parking utilization surveys, and residence hall capacity. Establishing minimum bicycle parking requirements for new building construction (and reconstruction) also provides an opportunity to proactively meet parking demand. Regardless of the bicycle parking demand estimation technique utilized, it is recommended that university staff continually monitor bike parking utilization rates and add additional bicycle parking to meet demand as funding allows.
3. **Provide long-term bicycle parking** – long-term bicycle parking typically consists of secure, sheltered bicycle parking to meet the needs of bicyclists that are more concerned about bicycle theft, storing their bicycle in inclement weather and/or storing their bicycle for extended time periods. Long-term bicycle parking can be supervised or unsupervised and can be provided in many different designs, ranging from bicycle lockers to bicycle racks enclosed within a room or “bike cage”. The University of Arizona provides a wealth of long-term bicycle parking options, ranging from lockers to secure, covered “bicycle enclosures”. Long-term bicycle parking is particularly important for on-campus residents, but

² Association of Pedestrian and Bicycle Professionals. *Bicycle Parking Guidelines*, 2nd Edition. 2010.

should also be strategically located around campus for use by off-campus commuters.

4. **Provide high-capacity bike parking** – some universities, especially those with space-constrained environments, are consolidating short- and long-term bicycle parking facilities into larger “high-capacity” facilities. For example, the University of Texas at Austin and Cal Poly San Luis Obispo are both developing several high-capacity “bike stations” throughout the campus in an effort to centralize parking availability while reducing bicyclist/pedestrian conflicts near campus building entrances (where many bike racks currently exist). These centralized parking areas will include weather protection and may provide additional features such as bicycle repair facilities. It should be noted that this centralized high-capacity approach should be balanced with providing bicycle parking in convenient locations.



High-capacity bicycle parking near housing

Bike Sharing

Bike sharing systems are comprehensive mobility systems that use a fleet of bicycles and stations spread over an area to provide inexpensive and accessible transportation to communities. They have been described as a “system of individual public transport” and are well-suited for short trips, typically three miles or less. Bike sharing systems are energy efficient and zero emission, and are quick and cost-effective to implement compared with other types of transportation infrastructure. Bike share programs provide safe, convenient access to bicycles for short trips, transit-work trips, and/or tourist



Washington State University’s “Green Bike” Bike Share program features student cards to access the system and a local mechanic.

trips. The international community has experimented with bike share programs for nearly 40 years. Until recently, bike share programs worldwide have experienced low to moderate success because of theft and vandalism. In the last five years, innovations in technology that bring increased accountability along with proprietary, non-standard bicycle designs have given rise to a new generation of technology-driven bike share programs with enhanced security. Modern bike sharing can dramatically increase the visibility of cycling and lower barriers to use, requiring only that the user have a desire to bike and a smart card, credit card or cell phone.

Bike sharing systems are particularly well-suited to many campus environments due to the following factors:

- Strong commitment to sustainability and green transportation options
- High concentration of people in a fairly compact campus environment
- High percentage of students living on or near campus who often do not have access to a motor vehicle
- Accommodate intra-campus travel needs of faculty, staff, and visitors
- Existing bicycle infrastructure

UC Irvine has led the way with a campus bicycle share system with stations to accommodate 40 bikes located at several locations around campus. The \$40-per-year program is open only to UCI affiliates with a current employee or student identification number. The first 250

subscribers received a helmet, safety light, lock and water bottle. Washington State University installed a \$140,000 automated system for its bike program. Students swipe their identification cards to unlock a bike from one of four docking stations on campus. The convenience has drastically boosted the use of the program.

Bicycle Programs

Developing and fostering a strong and sustained campus bicycling culture requires more than simply providing bicycle facilities to better accommodate campus cyclists. Concurrent to adding bikeway facilities, it is vital to also develop campus programs, policies, and incentives to provide information and resources that can be effective in increasing bicycling rates. Bicycle programs should be developed to advance the four programmatic “E’s” of bicycle planning: encouragement, education, enforcement, and evaluation. Following is a brief description of the purpose of focusing on each of these “4 E’s”:

- **Education:** community understanding and respect for the roles and responsibilities of cyclists and other transportation users, such as pedestrians and motorists.
- **Encouragement:** increase bicycle ridership and foster the creation of a strong bicycle advocacy community and bicycle culture.
- **Enforcement:** support for a safer environment for cyclists and other nonmotorized transportation modes.



Speed feedback signs on shared facilities

- **Evaluation & Planning:** institutional support and collaboration to track rates of bicycling and encourage additional growth.

Table 1 provides a summary of some of the more interesting bicycle programs in place at various universities.

Evaluation and Monitoring

After putting forth efforts to create a more bicycle friendly campus, universities should dedicate resources toward evaluating and monitoring campus bicycling trends. Data collected through evaluation and monitoring efforts paint a picture of how the campus community is responding over time to bicycling needs and university investment. At the very least, universities should collect data on bicycling activity rates to track bicycling usage over time. If resources exist, universities may also want to collect data on bicycle related crashes, bicycle theft, and other safety related issues such as user conflicts. The

Table 1: Innovative Bicycle Programs at U.S. Universities

University	Enrollment	Bicycle Program
Emory University	13,381	<ul style="list-style-type: none"> • Bicycle safety classes • Bicycle events calendar • Mobile bicycle repair center
Harvard University	21,225	<ul style="list-style-type: none"> • Interactive bicycle map • Departmental bicycle program • Bicycle safety classes
MIT	10,384	<ul style="list-style-type: none"> • Bicycle commuter benefit program • Bicycle fix-it stations
Stanford University	15,319	<ul style="list-style-type: none"> • Campus bicycle coordinator • Bicycle repair stands • Helmet discounts • Bike safety pledge program
University of Arizona	38,767	<ul style="list-style-type: none"> • Bicycle safety videos • Campus bicycle station • Bike valet program
University of California, Davis	32,153	<ul style="list-style-type: none"> • Bicycle coordinator • Bicycle barn • Bike auctions
University of California, San Diego	29,176	<ul style="list-style-type: none"> • Pedal club • On campus bike shop • Campus commute challenge
University of Washington	42,907	<ul style="list-style-type: none"> • Bike safety classes • Ride in the rain challenge • Bike rooms, lockers and shelters
University of Wisconsin, Madison	42,099	<ul style="list-style-type: none"> • Campus bicycle coordinator • UW bike swap • Bicycle lockers and cages

University of Colorado, Boulder has a hotline for “near misses” between bicyclists, skateboarders, and pedestrians, and enters all information from these calls into a database for tracking purposes.

There are four basic approaches to evaluating campus bicycle commute mode share and activity. Following is a brief discussion of each approach:

I. Campus Cordon Counts – this survey methodology consists of conducting actual physical counts of bicyclists (and other transportation users if desired) at various entrances to the university campus. It is recommended that the following issues be considered in designing the cordon count methodology:

- a. Survey the peak morning commute period at a minimum.
- b. Mid-week days are best to survey – avoid Monday and Friday as they are not representative commute days
- c. Select a time of year that is fairly typical for campus – September, October, and April are often good months to survey.
- d. Follow the same approach every year – once counting methodology is established, remain consistent so that data can accurately be compared from one year to the next.
- e. Hire students – students are often looking for valuable work experience and this is a good opportunity to provide it to them and complete the survey at a reasonable cost.
- f. Hope for decent weather – however, if weather is not ideal, make note of rain or inclement weather as lower bicycling counts could be attributed to the weather. It is also possible to adjust count volumes for weather or seasonal variations if sufficient background data exists.



Depending on the volume of bicycle activity, this survey methodology can provide the opportunity to collect secondary information, such as gender or helmet usage. If resources do not exist to complete a full campus cordon



Bike rack signage can provide useful information

count, this survey methodology has been successfully utilized to measure bicycling rates by counting bicyclists at several key locations on campus.

2. Bicycle Parking Utilization – this survey methodology is similar to campus cordon counts except instead of counting cyclists entering the campus, surveyors are counting parked bicycles on campus. The issues listed above apply to this survey effort as well. Additionally, the following items should be considered as part of this survey effort:

- a. Prior to conducting a utilization survey, complete an inventory of bicycle parking facilities to identify parking capacity.
- b. Develop a survey route to make efficient use of the surveyor's time.
- c. Instruct surveyors to look for “rogue” bicycles parked outside of designated bicycle parking areas and include them in the count effort.

3. Online Commute Survey – unlike the two approaches described above, this survey methodology does not include field work and instead relies on survey respondents to self-report their commuting activity. The following issues should be considered when developing the online survey:

- a. Provide respondents with a full menu of commute options, including multi-modal options such as transit/bike (e.g., bicycling to a transit stop, then taking transit for the remainder of the trip).
- b. Request no more than one week's worth of

Table 2: Summary of Bicycle Activity Survey Methods

Survey Method	Advantages	Disadvantages
Cordon Count	<ul style="list-style-type: none"> • High degree of accuracy • Fairly easy to design and administer survey • Provides location specific commute data • Dataset can easily be compared between years 	<ul style="list-style-type: none"> • Can be time and resource intensive • Difficult to categorize bicyclists by affiliation (e.g., students, staff, etc.) • Difficult to capture all bicycle trips due to temporal/spatial gaps • Does not capture intra-campus bicycling activity
Bike Parking Utilization	<ul style="list-style-type: none"> • High degree of accuracy • Fairly easy to design and administer survey • Provides location specific data on bicycle parking demand • Dataset can easily be compared between years 	<ul style="list-style-type: none"> • Can be time and resource intensive • Difficult to categorize bicycles by affiliation (e.g., students, staff, etc.) • Difficult to capture all bicycles parked on campus due to temporal/spatial gaps • Misses bicycles that people bring into buildings (e.g., offices or residence halls)
Online Survey	<ul style="list-style-type: none"> • Can categorize bicyclists by campus affiliation • Not very time or resource intensive to conduct • Can easily ask for additional information • Can better capture nuances of multi-modal trip making behavior 	<ul style="list-style-type: none"> • Dataset is not as accurate when people self report trips • Greater potential for survey error, such as multiple respondents, sample size issues, etc. • More challenging to obtain location specific data
Automated Counter	<ul style="list-style-type: none"> • Can provide consistent and long-term sources of user data • Can be used to understand weather and seasonal variability • Can be used to track long term growth in bicycling • No volunteers to coordinate 	<ul style="list-style-type: none"> • Can be somewhat expensive for a permanent installation • Typically used in fewer areas than with cordon counts

commuting activity, as survey respondents may not accurately recall their travel patterns beyond this time period.

c. Distribution is critical to generating a representative sample – utilize campus email distribution lists and social media opportunities such as Facebook and Twitter to reach a broader campus population for greater accuracy in data extrapolation.

d. Offer a prize through a raffle – this will also increase the response rate, especially if a valued prize is offered, such as an iPod or book store gift certificate.

e. Send reminders to respondents – send at least one to two survey reminders to survey respondents before closing the online survey.

f. Provide a hard copy survey option – some people may not have access to a computer.

4. **Automated Counts** – passive detection such as infrared scanners, pneumatic tubes, video detectors, slab sensors, or embedded loop detectors can be configured to count cyclists at specific locations approaching or within campus. These devices can provide a more complete picture of usage patterns rather than a snapshot.

a. Can be used to track seasonal variability and weather variability.

b. Data collected in a few locations can be useful to better understand information collected via any of the means above.

It should be noted that each of the survey methodologies described above has advantages and disadvantages. Table 2 presents a summary of the different survey approaches.

Bicycle Friendly University

The League of American Bicyclists (LAB) has recently added the Bicycle Friendly University (BFU) program to its Bicycle Friendly Community program in which cities apply for recognition as bicycle-friendly communities. The BFU program was developed to recognize universities that promote and provide a more bicycle-friendly campus for students, staff, faculty, and visitors. Similar to the Bicycle Friendly Community program, LAB recognizes universities with four levels of bicycle friendliness – bronze, silver, gold and platinum. Most universities find the BFU application process to be educational, as they learn what is required to become bicycle-friendly; it also serves as a barometer of their progress. In addition to recognizing applicants for their efforts to provide a bicycle-friendly campus, the LAB also provides individualized feedback on how each applicant can create a more bicycle-friendly campus environment.

Table 3 presents the universities that were recognized in 2011 through the first round of BFU applications.

Table 3: 2011 BFU Award Winners

University	BFU Award
Stanford University	Platinum
University of California, Davis	Gold
University of California, Santa Barbara	Gold
California State University, Long Beach	Silver
Colorado State University, Fort Collins	Silver
Portland State University	Silver
University of Arizona	Silver
University of California, Irvine	Silver
University of Minnesota, Twin Cities	Silver
University of Oregon	Silver
University of Washington	Silver
University of Wisconsin, Madison	Silver
Boise State University	Bronze
Cornell University	Bronze
Emory University	Bronze
Indiana University	Bronze
Michigan State University	Bronze
University of North Carolina, Greensboro	Bronze
University of California, Los Angeles	Bronze
University of Maryland	Bronze

Conclusion

In many ways, bicycling is the ideal mode of transportation for university campuses – it's quiet, it's clean, it's inexpensive, it's sustainable and it's space efficient. Universities interested in becoming more bicycle-friendly can do so at fairly low cost by prioritizing bicycling as a viable mode of transportation for the campus community. As discussed above, working on the following bicycling issues will “get the wheels spinning” and improve bicycling conditions on university campuses:

1. **Develop a plan** – creating a bicycle plan provides the campus with the blueprint towards becoming more bicycle-friendly
2. **Work with local jurisdiction to improve bicycle facilities** – while this can be challenging, this coordination pays huge dividends for campus bicycle commuters
3. **Innovate** – sometimes the tools in the toolbox are inadequate to address the unique travel patterns at university campuses, so experimenting with innovative treatments may be an effective approach to improving bicycling conditions
4. **Meet bicycle parking demand** – providing safe and secure bicycle parking facilities is a key element of creating a more bicycle-friendly campus
5. **Consider bicycle sharing** – while not as critical as some of the other topics discussed, a campus bicycle sharing system is a valuable resource and demonstrates a strong commitment to bicycling by the university
6. **Develop bicycle programs** – to complement bicycle infrastructure improvements, it is strongly recommended that bicycle safety classes, bicycling incentives, and other related programs be developed
7. **Set up evaluation/monitoring programs** – this is an important step to ensure that university campuses can document the impact that their efforts are having on bicycle activity on campus
8. **Apply for BFU designation** – to reap the rewards of creating a more bicycle friendly campus, it is recommended that universities apply for recognition through the BFU program

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