be integrated into and coordinated with the overall transportation planning process. Transportation improvements can provide an opportunity to enhance the safety and convenience of bicycle travel.

Improvements made for bicyclists often result in better conditions for other transportation users. For instance, paved shoulders, wide curb lanes, and bike lanes not only provide improved conditions for bicyclists, but also increase motorist comfort. However, these can increase crossing distances for pedestrians. Between intersections, bike lanes and paved shoulders result in more consistent separation between bicyclists and passing motorists. Bike lanes improve sight distance for motorists at driveways and provide a buffer area between sidewalks and traffic lanes, making streets more comfortable for pedestrians. Communities that have improved conditions for bicycling have seen positive results for all users.

Plans for implementing bicycle projects often need supportive policies in a community's general plan, master transportation plan, zoning ordinances, and subdivision regulations. These may need to be amended to support bicycle-compatible roadway design, encourage shared use path connections between neighborhoods, require bicycle parking, and create land-use policies that keep destinations closer to home and work.

Providing for bicycling touches on many different aspects of community planning, and a good bicycle plan reflects this dynamic. Depending on the community, a bicycle plan may involve many diverse aspects, such as signal timing and progression, safety education, building codes and parking facility design, land-use policies, school busing policies, social marketing to promote flexible transportation options, roadway maintenance and transit access, and many others.

2.3 FACTORS INFLUENCING BICYCLING BEHAVIOR

Many characteristics have been used to classify different types of bicycle riders. Among the most common are comfort level, physical ability, and trip purpose. These characteristics can be used to help develop generalized profiles of various bicycle user types. People will not fit into a single category, and a rider's profile may change in a single day; for example, as a commuter switches to a parent who takes a child for a recreational ride. Still, these profiles provide a way to gauge approximate level of comfort on and preference for specific facility types.

2.3.1 Trip Purpose

Utilitarian/Nondiscretionary

Utilitarian or nondiscretionary trips are trips that are needed as part of a person's daily activities. These commonly include commute trips to work or school, work-related non-commute trips, shopping and errands, or taking a child to school. Depending on the length of trip and quality of bicycling conditions on transportation facilities, among other factors, bicycling trips can replace or seamlessly link with other transportation modes such as transit or motor vehicle trips.

While some people may choose to bicycle for transportation, others may use bicycles for utilitarian trips because they do not have access to an automobile or possess a driver's license, have no transit available, or are otherwise dependent upon bicycling.

School trips are a special type of utilitarian trip that involve younger riders and call for careful attention to their characteristics. School children can and do use the transportation system to bicycle to and from school. There is significant variation in their size and ability. It is important to

take into account the type of school (i.e., high, middle, or elementary school) that will be served and the roadway(s) that access it (e.g., is it an elementary school accessible from a local residential street or is it a large or regional high school accessible from an arterial). School policies such as those that provide students with information about preferred bike routes and bicycle safety education are also important to consider. Even so, most children will not have the same understanding of the rules of the road as adult bicyclists, so facilities planned near schools may need special accommodations to provide for the needs of young bicyclists.

Recreation/Discretionary

Recreational and discretionary trips include trips made for exercise and/or leisure. Recreational users cover all age groups from children to adults to senior citizens, and will have varying levels of comfort when riding in traffic. Recreational trips can range from short trips within a neighborhood, to long rides lasting several hours and covering many miles. Children will generally ride within their neighborhood, with friends or parents, and on streets, sidewalks, or shared use paths. Adult recreational trips cover a wide range depending on the user's comfort and fitness level, with average adult users looking for moderate to slow-paced riding on quiet streets or shared use paths. A smaller number of adult bicyclists go on long-distance recreational trips, sometimes in groups or as part of a bike club, seeking out scenic and/or challenging terrain for sport and fitness, and sometimes at higher speeds.

Mountain bicyclists fall into the category of recreational riders but are considered a unique and independent group due to their regular use of natural surfaces in addition to paved surfaces. Mountain bikes are generally designed for use on both types of surfaces. This guide will cover the use of mountain bikes for recreational or utilitarian travel on paved surfaces but does not discuss mountain bike use on narrow or single track natural surfaces.

Utilitarian vs. Recreation

It is difficult to differentiate between utilitarian and recreational bicycling because the same transportation system can be used for both purposes. Just as roads are designed for various motor vehicle trip purposes, roads and pathways should be designed to facilitate various bicycle trip purposes.

People who use a bike for transportation get exercise they may not have otherwise had time for, or that would have taken additional time and expense, such as going to a fitness center. Unlike driving, which is typically not viewed as a recreational activity but rather as a means to an end, many people choose to bicycle because it achieves more than a single purpose, such as exercising while reaching a destination. Bicycling is a multifaceted recreational activity for millions of people nationwide, young and old, cutting across many socioeconomic and demographic categories. Some users may never go beyond recreational rides on shared use paths or low-volume roads, while others may advance their skills and become bicycle commuters. That is why understanding and planning for the needs and abilities of all bicycle users is important for designing successful bicycle networks.

Table 2-1 outlines common characteristics of recreational and utilitarian trips. The descriptions below provide a general idea of typical differences between trip purposes; however it should be noted that some trips combine purposes and do not fall into these distinct categories.

Table 2-1. Recreational Trips vs. Utilitarian Trips

Recreational Trips	Utilitarian Trips
Directness of route not as important as visual interest, shade, protection from wind.	Directness of route and connected, continuous facilities more important than visual interest.
Loop trips may be preferred to backtracking; start and end points are often the same.	Trips generally travel from residential to schools, shopping, or work areas and back.
Trips may range from under a mile to over 50 miles.	Trips generally are 1–10 miles in length.
Short-term bicycle parking is needed at recreational sites, parks, trailheads, and other recreational activity centers.	Short-term and long-term bicycle parking is needed at stores, transit stations, schools, and workplaces.
Varied topography may be desired, depending on the fitness and skill level of the bicyclist.	Flat topography is desired.
(Individuals) May be riding in a group.	(Individuals) Often ride alone.
(Individuals) May drive with their bicycles to the starting point of a ride.	Use bicycle as primary transportation mode for the trip; may transfer to public transportation; may or may not have access to a car for the trip.
Typically occur on the weekend or on weekdays before morning commute hours or after evening commute hours.	Some trips occur during morning and evening commute hours (commute to school and work), but in general bicycle commute trips may occur at any hour of the day.

2.3.2 Level of User Skill and Comfort

Another way to look at user types is by comfort and skill level. Rider age often influences comfort and skill level.

Rider Age

Adults do not have uniform cognitive and perceptual abilities. However, in comparison to children, adults generally can start and stop movement of their bicycle more quickly, are more visible to motorists, can interpret directionality of sounds with greater accuracy, and have a greater awareness of potential conflicts. In addition, most adults also operate motor vehicles and have the advantage of understanding the "rules of the road" from a driver's perspective. Seniors are a special type of adult rider, who may ride at a slower pace and have longer reaction times when faced with sudden conflicts or objects in their path.

Children have a wide range of skills and cognitive capabilities. Generally, children are slower in recognizing and responding to rapidly changing situations. This leads to the possiblity of crashes in common situations that children face when riding bicycles, such as crossing streets.
Children tend to:

- Have a relatively narrow field of vision.
- Have difficulties accurately judging the speed and distance of an approaching vehicle.
- Assume the driver of a motor vehicle can see them if they can see the vehicle.
- Have difficulty concentrating on more than one thing at a time.
- Have difficulty understanding risks.

- Have difficulty determining the direction of auditory input.
- Have little experience with the rules of the road because they do not drive motor vehicles.

These are development characteristics which change as children mature.

Experienced and Confident

This group includes bicyclists who are comfortable riding on most types of bicycle facilities, including roads without any special treatments for bicyclists. This group also includes utilitarian and recreational riders of many ages who are confident enough to ride on busy roads and navigate in traffic to reach their destination. However, some may prefer to travel on low-traffic residential streets or shared use paths. Such bicyclists may deviate from the most direct route to travel in their preferred riding conditions. Experienced bicyclists may include commuters, long-distance road bicyclists, racers, and those who regularly participate in rides organized by bicycle clubs.

Casual and Less Confident

This group includes a majority of the population, and includes a wide range of people: (1) those who ride frequently for multiple purposes; (2) those who enjoy bicycling occasionally but may only ride on paths or low-traffic and/or low-speed streets in favorable conditions; (3) those who ride for recreation, perhaps with children; and (4) those for whom the bicycle is a necessary mode of transportation. In order for this group to regularly choose bicycling as a mode of transportation, a physical network of visible, convenient, and well-designed bicycle facilities is needed. People in this category may move over time to the "experienced and confident" category. Table 2-2 outlines general characteristics of experienced versus casual bicyclists.

Table 2-2. Casual/Less Confident vs. Experienced/Confident Riders

Experienced/Confident Riders	Casual/Less Confident Riders
Most are comfortable riding with vehicles on streets, and are able to navigate streets like a motor vehicle, including using the full width of a narrow travel lane when appropriate and using left-turn lanes.	Prefer shared use paths, bicycle boulevards, or bike lanes along low-volume, low-speed streets.
While comfortable on most streets, some prefer on-street bike lanes, paved shoulders, or shared use paths when available.	May have difficulty gauging traffic and may be unfamiliar with rules of the road as they pertain to bicyclists; may walk bike across intersections.
Prefer a more direct route.	May use less direct route to avoid arterials with heavy traffic volumes.
Avoid riding on sidewalks. Ride with the flow of traffic on streets.	If no on-street facility is available, may ride on sidewalks.
May ride at speeds up to 25 mph on level grades, up to 45 mph on steep descents.	May ride at speeds around 8 to 12 mph.
May cycle longer distances.	Cycle shorter distances: 1 to 5 miles is a typical trip distance.