

The Concept of Carrying Capacity, a White Paper

On numerous occasions in recent months, members of the Planning and Zoning commissions have asked whether there is a “carrying capacity” in the Aspen Area or the Roaring Fork Valley. Staff thinks it’s important to focus on the usefulness and the limitations of this planning concept.

The phrase “carrying capacity” was first used to describe the amount of cargo that could be safely transported on a ship in the 19th century. It was a relatively simple exercise that was perhaps complicated by the routes to be taken, seasonal storm tendencies, the age and condition of the ship etc.

Ecological & Quantitative Applications of Carrying Capacity

The concept of carrying capacity was further developed in the early part of the 20th century in relation to managing livestock ranges in the American West. It has continued to be used to determine the number of animals a given area can support. It’s not unusual for cattle ranches listed for sale to include a carrying capacity such as 2,000 AU (Animal Unit).

More recently, Colorado State University and the Colorado Division of Wildlife have used carrying capacity models to determine whether deer and elk are so numerous as to be damaging ecosystems, and should be culled in various hunting regions in the state. In this context, carrying capacity is the amount of animals that can be sustained in a given environment without starting to degrade the natural resource.

In recent decades, the concept of carrying capacity has been carried outside the realm of shipping cargo and ecosystem analysis. One Austrian study focused on space as a non-renewable resource – in other words, how many people can enjoy a certain beach without degrading the experience.

Social and Qualitative Applications

The language in the Wilderness Act of 1964, including, “outstanding opportunities for solitude,” has led to a number of studies on the social carrying capacity of Wilderness Areas. There remains a divergence of opinion on the usefulness of these studies. For example, some people crave extreme solitude, while others find quality in occasionally encountering other people in the wilderness and sharing stories. It is difficult to impose scientific norms on the experience of solitude. Rather than working with objective standards that result in a reliable, quantitative solution, this kind of analysis provides *context and information* for decision-making.

Not surprisingly, these studies have not resulted in a numerical ceiling established for the number of people visiting Wilderness Areas, but more importantly, the *standard* of experience described in the Wilderness Act has been the basis for taking steps *to minimize the degradation of wilderness areas*, such as the prohibition on vehicles going up Maroon Creek Road in the summer. In this case, it is not necessary to know the population ceiling of a wilderness area – it is enough to know that *less* vehicles and a smaller parking area help us *get closer* to the standard of experience described in the Wilderness Act.

As the notion of carrying capacity has come to include standards for the *experience* of tourists and even the *experience* of locals in a tourist destination, the carrying capacity exercise has grown exponentially more complex.

“Assessment has extended from ecological thresholds to include notions of visitors’ recreational experience, indicators and criteria of psychological satisfaction and so forth,” according to 2004’s *The Challenge of Tourism Carrying Capacity Assessment: Theory and Practice*, edited by Harry Coccossis and Alexandra Mexa. “Note however that in making this shift, much of the determinism characterizing initial ecological limits-based perceptions of carrying capacity is being lost and it can no longer be treated as a scientifically objective concept.”

In 2005’s *Global Tourism*, William F. Theobald talks about the “negative effects” felt by local residents in a tourist environment.

“From a social perspective, carrying capacity refers to a destination’s ability to absorb tourism without unacceptable negative effects being felt by local residents. *Levels at which inappropriate impacts occur are dependent on values determined by the community* as opposed to the visitor. Identifying these values in a tourism destination requires considerable consensus building amongst community stakeholders. From a carrying capacity management perspective it involves *identifying the desired conditions* for a destination area, and deciding how to effectively manage tourism toward those ends.”

A carrying capacity discussion for the Aspen area grows more complex if we consider that the desired conditions for year-round residents may diverge from the desired conditions for visitors – although there is certainly common ground between the two groups. Gauging consensus on community values and identifying a desired future is a critical step in long-range planning and growth management.

Infrastructure Analysis

Conducting an infrastructure analysis to determine how much development can be supported in a given area is similar to the exercise used for calculating freight loads in the 19th century.

In most cases, public infrastructure can be expanded. For example, \$11 million worth of improvements to the Sewer Treatment Plant at the AABC means there is plenty of capacity at this time. Does this mean development should occur until the plant reaches capacity? No. The State Department of Environmental Health requires sanitation districts to draw up plans for expansion when plant capacity reaches 80 percent.

Can we limit the extension of sewer lines? Yes. But that is done by establishing a policy such as the adoption of a Community Growth Boundary, which rests on the concept of protecting rural character from sprawl. Maintaining rural character is a “desired condition” expressed through community consensus; it is *not* a function of inherent limitations on infrastructure.

In short, an infrastructure analysis does not yield a “magic number” for how much development can be supported, largely because infrastructure can almost always be expanded. A theoretical

population ceiling or growth limit has much more to do with a shared community consensus on “quality of life.”

Perhaps the most telling example is the transportation system. When more than 750 cars per hour are trying to get in and out of Aspen, the level of congestion starts to rise exponentially. The subject of eliminating the S-Curves in favor of a new alignment to increase roadway capacity has been debated for decades. Many who were opposed to a new alignment explicitly said the S-Curves would limit development. This has not turned out to be a solid premise. The more relevant measure has to do with the threshold of misery that commuters are willing to endure versus their interest in working in the Aspen Area. It turns out that the threshold of misery for commuters has been high enough to endure traffic congestion in Aspen, while many who live in town see their quality of life degraded during the commuter hours to an unacceptable level. Again, the question for the people living in town is more about a “desired condition” than it is about infrastructure limitations. It’s about a shared concept of quality of life, not how many more houses the water system can support.

At the same time, understanding the capacity of our infrastructure is important, especially if we’d like new development to help carry the burden of providing that infrastructure. Mitigation, impact fees and taxes are among the methods for sharing increased infrastructure costs.

Carrying Capacity: It’s not Scientific or Objective

The “conclusions” section of the book: *The Challenge of Tourism Carrying Capacity Assessment: Theory and Practice*, also talks about “*envisioning desired conditions.*”

1. Carrying capacity cannot be about absolute, constant and universal limits, reducible to single numbers. Such a task is beyond the reach of our intellectual capacity and far beyond the resources available for the task.
2. Carrying capacity can not be a scientifically objective concept. This should not be seen as a limitation or a drawback as it is an inherent characteristic of the notion of sustainability. Sustainability is not a universal, value-free objective criterion that can be defined with recourse only to science. It depends also on dynamic perceptions and values and on a plurality of perspectives. *It is through an institutionalized process of dialogue, compromises and value resolution that shared vision should be developed about what citizens want to achieve.* This suggests a move from the identification of thresholds to the envisioning of ‘desired conditions.’
3. The above mark a shift from an assessment of carrying capacity to a broader, multi-dimensional and participatory assessment based on various sources of information and with the use of multiple indicators, the aggregation of which should be part of a politicized, scientific discourse. Development of shared visions can complement strict scientific assessments. Information on the carrying capacity limits and the various thresholds of certain systems can still be vital parts of this discourse, providing guidance for certain impacts to be faced if certain courses of action are followed. The objective should be to inform on trade-offs and to facilitate, not to dictate choice.

Trying to identify a “shared vision” is what the first phase of the AACP public process attempted to do. This is exactly what the 240 people who attended the focus groups were asked to generate – and what the 410 people who attended the “clicker” sessions were asked to comment on.

Theobald adds that, “When applied within planning systems that focus on managing growth for desirable and acceptable change, some components of the carrying capacity management concept offer potential. Knowledge of the consequences of exceeding desired impacts can be used to direct management policies and practices in keeping with a more sustainable tourism.”

Local planning efforts have a track record of some agreement on “limits to growth,” but far less on identifying “desired conditions.” For example, the 2000 AACP established the 1993 traffic levels across the Castle Creek Bridge as a limit beyond which quality of life would be degraded. This was essentially a defensive position – this “limit to growth” was not a scientific number, but a number that the community agreed was the maximum acceptable impact based on their experience of traffic congestion in 1993. Going beyond those limits would be “exceeding desired impacts.” This limit to growth has spawned a number of effective steps, ranging from improvements to the transit system to a vote that approved two dedicated bus lanes in 2007.

Similarly, the 2000 AACP established an average daily population ceiling within the Community Growth Boundary of between 28,000 and 30,000. Again, these were not science-based statistics. Instead, the citizen planners at the time had experienced this average daily population in July 1998, and determined that it was acceptable but shouldn’t be exceeded. Getting at these kinds of judgments was one reason staff asked at the keypad sessions whether there were “too many people in Aspen.” (Interestingly, only 10 percent said yes. Forty-four percent said no, and 46 percent said, “sometimes but I can live with it.”)

Along the same lines, one possible approach to limit construction impacts is to establish a certain year – say 2006 – when there was consensus that construction impacts were seriously degrading quality of life. Staff could explore methods for pacing construction so we don’t reach that unacceptable impact again.

Setting a Goal, Moving Toward It

Identifying desired conditions is a greater challenge. The 1993 AACP included a policy that 60% of employees should be housed above Aspen Village. This may sound like a desired condition, but it was derived from a previous local condition, experienced in the mid-1980s. The community has been unable to reach this 60% goal again, but has taken many steps in pursuing it. The value of defining a shared vision is the resulting ability to simply move toward it.

Regarding affordable housing, the 2000 AACP decided the goal was 800 to 1300 more units – a very ambitious figure that took months of haggling and debate to establish. This is no surprise, because there is no scientific method to establish such a number. However, we can try to establish “desired conditions” to help plan for an ultimate affordable housing ceiling.

The P&Zs went through an exercise where members identified a number of *social indicators* for strong community, such as having enough year-round residents so there is healthy political

debate on shaping the future, or the after-work recreation programs are heavily populated. These indicators are difficult to scientifically measure, but some can be tracked, and others can be gauged through annual opinion surveys.

Establishing a pseudo-scientific number for an affordable housing target may be a waste of breath – does anyone think such a number will prevail when the community is debating a major affordable project in 2018? Does anyone think the upper limit of 1,300 additional units established in the 2000 AACP remains a “hard” upper limit today?

More relevant is the current rate at which free market inventory is being “gentrified” by new buyers and no longer available for locals to rent, or the rate at which people will retire in their housing, or the housing price trends in downvalley communities. Also relevant is any public consensus-building exercise, such as the conclusions of the 2007 Housing Summit, which called for moving forward with public land-banking and affordable housing development as rapidly as possible.

Perhaps the simplest answer is that when the community thinks the job has been done on providing affordable housing, this sentiment will start emerging over time in citywide elections on the subject.

There is a similar challenge when it comes to lodging. While lodging consultants use the concept of “unaccommodated demand” to estimate how much more lodging a community can accommodate, the public might use another kind of standard for decision-making. Some might say they don’t want Aspen to grow any further as a resort. Others might say the downtown restaurant and retail environment depend on short-term visitors to thrive. Still others might want more lodging that is relatively affordable so a new generation can discover Aspen. Some might want to provide public financing; others might see this as providing an unfair competitive edge.

Essentially, we are left with attempting to build a shared consensus. Yes, the occupancy rates are relevant, the condition of the existing lodge product is relevant, costs are relevant – as is the desire to welcome the next generation. Feeling our way through these issues, armed with relevant information, is OK.

Community Character

The Aspen Area community has debated the issue of carrying capacity before, and it emerged with a consensus that it is not an effective tool in planning for growth. The conclusion instead favored a “community character analysis” that focused on community “identity.”

“The paper on limits to growth illustrated the difficulty of establishing finite limits to growth in the Aspen Area by examining the drinking water supply, wastewater treatment, roads and air quality,” according to the 1993 AACP. “The results of this evaluation indicate that based upon existing conditions, future demand, desired level of service standard, funding for facilities and the legal and other institutional forcers that affect these facilities, a purely technical carrying capacity analysis is not the appropriate tool to place real limits on growth. Another tool, ‘community character analysis,’ was thus examined as the fundamental underpinning of the Aspen Area Community Plan.”

The 1993 AACP described community character analysis as an exercise in defining the community's "identity."

"Community character is a comprehensive representation of an area that includes the relationship between the natural and built environment," according to the 1993 AACP. "It deals concurrently with all aspects of the community – land use, public facilities, social and economic features and the physical environment. Community character analysis provides a model for describing a community's identity and addressing the land use and economic development issues that affect it. Community character analysis can be used to predict the impact of various land use alternatives on the future character of the planning area."

Population Analysis

Of course, statistics play an essential role in long-term planning.

Looking back, statistics can identify trends that might confirm our sense of how the community is changing. Statistics should be considered as we decide if we want *more* of something, or *less* of something else. They can help us strike a balance of uses that reflects community values.

One approach is to use a variety of methods to gauge the average daily population in the Community Growth Boundary (CGB), generating (for example) a ratio that illustrates the existing balance between the number of people who live and work in the CGB, the number of commuters, the number of visitors staying in lodges, the number of part-time homeowners etc. We can examine how this ratio has shifted over time, and whether the trends match our desired "identity" for the future. If we don't like the trends, we can examine the tools at hand that might reshape the community's future.

Statistics can help tell us how we got to this point, but they can't tell us where we want to go. *It is through an institutionalized process of dialogue, compromises and value resolution that shared vision should be developed about what citizens want to achieve.* Once that heavy lifting has been done, statistics can tell us in the future if we're getting closer to that shared destination.