Chapter Six
Social, Economic, and Institutional Assessment

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CHAPTER SIX

SOCIAL, ECONOMIC, AND INSTITUTIONAL ASSESSMENT

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The Lake Tahoe basin lies in the political jurisdictions of Eldorado and Placer counties in California and in Washoe and Douglas counties in Nevada. A small portion of the basin's east shore lies in the Carson City Rural Area, but is largely devoid of development and economic activity. One incorporated municipality (South Lake Tahoe) occupies the southwestern portion of the basin, but several distinctive communities are dotted around the lake's perimeter. Recent population growth has been relatively slow compared to the surrounding area, due in large part to the stringent regulatory environment that determines the locations and types of development. Current population stands at approximately 55,000 permanent residents. A highly transient labor population, combined with unknown numbers of part-time residents, makes it difficult to establish precisely how many people actually live in the Tahoe basin.

Since the early part of the twentieth century the economy has been geared primarily toward recreation and tourism. During the period of rapid development in the 1950s and 1960s, permanent resident populations were projected to reach upwards of 180,000 by 1980 (California Department of Water Resources 1957), nearly four times the population in 1999. An aggressive public land acquisition program, combined with strict constraints on development, has made those early projections seem out of proportion by current standards.

Estimates of the number of people who visit the basin annually have ranged from 2.6 million to 23 million visitor days (Strategic Marketing Group 1994, 1999; Elliott-Fisk et al. 1996).[1] Visitation figures used in planning and marketing decisions tend to vary widely due to differences in the methodologies used (Ribaudo 1999b); however, it is clear that the seasonal influx of visitors and part-time residents has a marked impact on the economy and may have some important impacts on social dynamics in the basin.

Relatively little comprehensive or integrated social and economic analysis has been done in the basin to date. Nearly all the recent economic studies conducted in the basin have been focused either on a specific sector, such as the skiing or gaming industries, or on a particular geographic region of the basin, such as the Tahoe City-Truckee "resort triangle" (R/UDAT 1989). The broad and inconsistent range of socioeconomic data that does exist has been gathered in a piecemeal fashion, funded by the private sector or by public agencies whose missions are to support tourism and recreation (see, for example, RRC 1989, EDS 1990; NLTRA 1995; RRC Associates and Vasey Engineering 1996; and SEDD 1998). Despite the efforts of TRPA and others to foster development of an economic and social agenda for the basin and region, no comprehensive social and economic monitoring program exists. Moreover, there is no apparent consensus about what kinds of indicators should be monitored, even if such monitoring efforts were to be instituted in the basin (Teshara 1998; Ross 1999; SEI Working Group 1999).

There are many gaps in the social and economic information necessary to make well-

[1] The USDA Forest Service uses a standard recreation visitor day (RVD) as a metric, defined as a person recreating for 12 hours, or 12 persons recreating for one hour. Using this measurement, they have recorded up to 3 million RVDs of usage on USFS land alone (see section on recreation trends below).

grounded decisions about facilities, infrastructure, and resource management in the Lake Tahoe basin. This portion of the watershed assessment does not attempt to fill in those gaps; rather, the task is to identify the gaps and to suggest, in some cases, where further research appears to be needed or better methods need to be developed.

The socioeconomic and institutional assessment focuses on the following issue areas:

1. *Issue 1:* The need to determine appropriate indicators and geographic scales for measuring social well-being and economic health as they relate to environmental quality;
2. *Issue 2:* The need to understand patterns of recreation and tourism as they affect environmental quality, social well-being, and economic health;
3. *Issue 3:* The need to understand how land use trends affect the Lake Tahoe basin's environment and socioeconomic dynamics; and
4. *Issue 4:* The need to determine appropriate institutional and organizational aspects of adaptive management in the Tahoe basin context.

Each of these issues is developed by addressing a series of subsequent topic areas, which were identified interactively by the assessment team and a working group that met several times in early 1999. The working group provided essential guidance in formulating issues, read and commented extensively on drafts of portions of this chapter, and helped to identify sources of data.

The socioeconomic and institutional assessment is itself a part of a larger process, one which will transcend the watershed assessment. Decades of negotiation and struggle have resulted in a highly complex and sophisticated set of laws, rules, and procedures to protect the unique environmental qualities of the Tahoe basin's environment. Key social and political dynamics have been an integral part of crafting this complex network of formal and informal authorities, resulting in an intimate weave of scientific information, public processes, and social relations rarely found in a regional community.

Against this backdrop, the political community has produced a suite of proposed projects and land acquisitions under the umbrella of the Environmental Improvement Program (EIP), designed to address the pressing impacts of development and human activities that threaten the health of Lake Tahoe (TRPA 1998). The cost of the EIP is slated to exceed $900 million, approximately a third of which is to be generated by the local economy. And yet the information base on which the social and economic impacts of generating the local share of the EIP might be evaluated is relatively thin. Perhaps more importantly, measurements of the social and economic benefits of spending $900 million, including multiplier effects and positive impacts on recreational opportunities, are complex and difficult to define.

Employment and Income

One of the key concerns raised by the working group focused on the impacts of regulations on employment and business opportunities. In another section, a modeling approach is described in which the basin is broken down into five community regions. Briefly, the community regions are identified by their central economic and social units: Tahoe City, Kings Beach, Incline Village, Stateline, and South Lake Tahoe (the boundaries are discussed in greater detail in the following section). These community regions allow the economy to be analyzed in more accessible units. As well, the models enable a scale of analysis that shows commuting and trade patterns throughout the basin and between the basin and the broader regional economies surrounding it. The community-region models are discussed in greater detail below. However, aggregate figures referencing the basin's economy as a whole are presented here. Note that the data presented below on earnings and employment are the results of the first and second phases of a three-step process. The first phase involved compiling employment and earnings data from standard sources, such as the US Bureau of

Economic Analysis and the state employment services. The second phase involved local experts verifying data. The final phase will involve applying and adapting the models to support policy development and decisions (Robison, forthcoming).

In 1998, an estimated 47,922 people were employed in the basin; their wages totaled $1.14 billion. About three quarters of those jobs fell into visitor services and amenity categories, and the workers earned nearly $1 billion in 1998 (Table 6-1). By far the largest employment sectors are lodging, eating and drinking establishments, and amusement and recreation providers (some of these categories may seem awkward, but the data are organized in categories that conform to nationwide standards). Together these major industries make up over half the employment (51.8 percent) and approximately 44 percent of the total earnings in the Tahoe basin. There is no question that the basin's economy is focused primarily on recreation and tourism.

It is useful to compare these employment figures to those in the four surrounding counties. The population of the surrounding counties has been growing rapidly over the past decade, at a rate of 2.7 percent per year between 1990 and 1998. Most of this growth has been concentrated on the west slope of the Sierra Nevada between Auburn and Placerville in the foothills and in Sacramento in the valley to the west. In contrast, Tahoe basin population grew at an average annual rate of 0.4 percent over the same period. Table 6-2 shows a comparison of basin and surrounding counties' population in 1990 and 1998.

Employment figures for 1998 show higher basin-to-county ratios in numbers of jobs[2] (12 percent) compared to population (7.6 percent), suggesting a net commuting of workers into the basin. Table 6-3 shows that basin jobs account for an average of 23.4 percent of the total number of jobs in the four-county region. This figure can be deceptive, however, because there is wide variation in the shares of basin jobs across all four counties. For example, over half of the jobs in Douglas County are in the basin, while less than five percent of the jobs in Washoe County are in the basin. Similarly, South Lake Tahoe (including Meyers and other unincorporated basin communities) has more than a quarter of the jobs in Eldorado County, while the basin portion of Placer County accounts for fewer than one in ten Placer County jobs.

These figures also suggest that there may be significant environmental impacts associated with employment in the basin. The fiscal impacts of employment on public infrastructure are difficult to quantify and may be more precisely determined after the subbasin economic models are developed further. However, TRPA's transportation studies have demonstrated the links among patterns of employment, commuting (i.e., vehicle miles traveled, or VMTs), and associated environmental impacts. The 1992 Short Range Transit Study (TRPA 1992) concluded that 24 percent of total basin employees live outside the basin. More specifically, the 28 percent of employees who commute to the Stateline-Zephyr Cove area come from the Carson City-Gardnerville-Minden Valley area, commuting over US Highway 50 and State Route (SR) 207 (Kingsbury Grade). Another 17 percent of commuters come from the same area destined for jobs in South Lake Tahoe (Leigh, Scott & Cleary, Inc. 1993). Similarly, on the north shore, while about nine percent of basin residents commute *to* jobs outside the basin (TRPA 1997), approximately 10 percent of basin employees commute *from* outside the basin (Leigh, Scott & Cleary, Inc. 1997).

It is difficult, even under ideal circumstances, to calculate the full flow of capital and wages in a region. The figures shown in the economic models reflect wages earned and property transferred within the Tahoe basin but do not account well for the impact of income earned or transferred from outside the basin. For example, wages may be reported by place of work because the

[2] "Jobs" include both full and part time, and refer to the annual average of monthly employment. Thus, a person who holds two part-time jobs for the full year will appear as two jobs, while two persons employed for six months each will appear in the table as one job.

Table 6-1—Economic profile of the Lake Tahoe basin: jobs and earnings.

Standard Industry Code (SIC) category	Jobs	%	Earnings	%
			($1,000)	
Agriculture & agricultural services	649	1	8,618	1
Mining, sand and gravel	1	0	14	0
Construction	3,198	7	108,413	9
Food processing	8	0	249	0
Wood products	68	0	2,873	0
Misc. manufacturing	384	1	10,345	1
Transportation	789	2	20,942	2
Publishing and communications	352	1	11,973	1
Public utilities	228	0	16,575	1
Trade	4,410	9	96,283	8
Motels, eating and drinking	19,046	40	433,062	38
Finance, insurance, and real estate	3,943	8	80,815	7
Amusement and recreation	5,684	12	76,571	7
Consumer services	1,440	3	39,957	3
Business services	2,130	4	75,951	7
Medical, educational and social services	2,743	6	77,602	7
Federal government	314	1	9,906	1
State and local government	2,534	5	77,463	7
TOTAL	**47,922**	**100%**	**$1,147,612**	**100%**

Source: US Bureau of Economic Analysis; IMPLAN; Economic Modeling Specialists, Inc.

Table 6-2—Comparison of total county population with basin population.

	1990	1998	% change per year
Four counties' population	581,095	720,268	2.7%
Basin's population	52,591	54,407	0.4%
Basin-to-county ratio	9.1%	7.6%	- - -

Source: 1990 Census; California Department of Finance; Nevada Department of Employment, Rehabilitation and Training; Authors' calculations.

Table 6-3—Comparison of employment in the basin to surrounding counties in 1998.

County	Total Jobs	Basin Jobs	% Basin Jobs in County
Placer	111,115	8,113	7.3%
El Dorado	59,613	15,869	26.6%
Douglas	26,453	14,558	55.0%
Washoe	202,347	9,382	4.6%
Totals	**399,528**	**47,922**	**12.0%**
		Average basin-to-county ratio	23.4%

Sources: IMPLAN; Economic Modeling Specialists, Inc.; Authors' calculations

earnings data come from employers, but this does not account for wages earned by commuters outside the study area. When income data is combined with commuting data, it is possible to calculate the amount of income that accrues to residents in contrast to the income of nonresidents or "incommuters."

Table 6-4 shows an analysis of property and labor income, broken out by sources. While $1.14 billion is earned by wage-earning employees in the basin, many of those jobs are held by nonresidents or incommuters, whose earnings account for about 42 percent of total basin wages. [illegible]s, earnings by full-time basin residents account for about 90 percent of the basin's net inside income. Of the income generated in the basin, almost all of it goes to workers in the basin itself; however, when basin jobs are eliminated from the calculations, approximately 60 percent of all income comes from outside the basin in the form of jobs (outcommuters), property income, transfer payments, and part-time residence income. Property income and transfer payments[3] account for approximately a third of the total income in the basin (32 percent). Earnings by incommuters are almost precisely offset by earnings by outcommuters.

[illegible]mating the Impacts of Part-time Residents [illegible] their Incomes on the Basin Economy

Communities in the Tahoe basin include large numbers of part-time residents (PTRs), who are likely to have a substantial economic influence on local spending patterns and an impact on the demand for local services. Few studies have attempted to identify the numbers of PTRs, due in large part to the difficulty of gathering and analyzing appropriate data. PTRs in the basin can be divided into two very different groups. A high income group occupies the many recreational homes and condominiums that line the shoreline and occupy other amenity-rich parts of the basin. This assessment refers to this portion of PTRs as "nonworking PTRs." [illegible]n contrast, the second group of PTRs includes [illegible]wer income wage earners, consisting primarily of seasonal (in some cases, migrant) workers, referred to here as "working PTRs."

Tracking PTR jobs and income, particularly those of nonworking PTRs, is an important ingredient for understanding the functioning of community region economies in the basin. During periods of basin residency, PTRs patronize local businesses for the usual purposes of household operation and personal lifestyle maintenance. [illegible] money they spend, particularly that spent [illegible] relatively affluent nonworking PTRs, can amount to a significant share of local business income and thus plays an important part in local economies.

[illegible] proportion of total residents in each commun[illegible] region who are PTRs was estimated based on the average proportion of utility bills that are mailed to nonbasin addresses from utility districts serving the Tahoe basin [illegible]quette 1999; Loding 1999; Roenspie 1999; G[illegible]fson 1999a; Forsythe 1999; England 1999). These data were used in conjunction with data on housing vacancy rates reported in a recent housing needs assessment for the basin (TRPA 1997a). Vacancy rates, as defined by the US Census Bureau, refer to housing units for which no occupants qualify as permanent residents (i.e., people who reside locally at least six months of the year). Based on this definition and on the character of part-time residency in the basin, vacancy rates bear a close relationship to the share of housing units occupied by PTRs. The proportion of PTRs in each community region, expressed as a percentage of full-time residents (FTRs), is shown in Table 6-5. These results show that part-time residency is generally more predominant in communities on the California side of the basin than on the Nevada side. A fuller explanation of the methodology used to calculate the numbers and incomes of PTRs is in tables 6-5 and 6-6.

The community region models provide an accounting mechanism to translate resident incomes into total consumer expenditures and in turn to translate these into community region expenditures. This accounting procedure is usually applied only to PTR incomes in economic models. However, PTRs in the basin make a significant contribution to the

[3] Property Income is defined as income from the ownership of privately held equities and real estate; transfer payments are payments (typically from the government) not associated with current production and for which no services are currently rendered (such as retirement, annuities, etc.).

Table 6-4—Property and earnings income analysis from inside and outside the Lake Tahoe basin.

	Earnings X $1,000	% of Subtotal	% of Total
Labor Income by Place of Work	$1,147,612		
Less Incommuting Income	-$479,113	42.0	
Labor Income by Place of Residence	$668,499	89.5	
Property Income	$78,529	10.5	
Total Inside Income	**$747,028**	**100%**	**41.3%**
Property Income	$307,112	28.9	
Transfer Payments	$197,849	18.6	
Outcommuting Income	$460,610	43.3	
Income of Non-working Part-Time Residents	*$96,979*	*9.1*	
Total Outside Income	**$1,062,551**	**100%**	**58.7%**
Total Residents' Income	**$1,809,579**		**100.0%**

Source: Economic Modeling Specialists, Inc.

Table 6-5—Methodology for estimating part-time residents in the Lake Tahoe basin. This table shows the steps in estimating the total number of PTRs (working plus nonworking) by each community region. The first column shows community region populations assembled from estimates for 1990, as reported in Table 6-8 (population figures for each community in the greater Tahoe Basin, Doak and Kusel 1996). Column 2 shows these estimates projected to 1998, assuming the declining basin population trend exhibited in Figure 6-1. Column 3 displays a set of semi-subjective estimates of total PTRs in each community region, expressed as a percentage of FTRs.

In column 5, the fraction of nonworking PTRs is estimated by community region. These are subjective estimates conditioned by interviews and expert knowledge from each community region. Kings Beach, for example, is generally recognized as a location for basin-working PTRs, while Incline Village is known locally as a location for high proportions of nonworking PTRs. The percentages in column 5 reflect a breakdown between working and nonworking PTRs. Column 6 shows the total of the PTRs (column 4) and the nonworking PTRs (column 5) and thus shows estimates of nonworking PTRs by community region. Column 7 adds FTRs (column 2) to total PTRs (column 4) and thus provides an estimate of what might be termed "peak-season populations"; that is, populations when FTRs and PTRs are both present in the community regions. The three final columns are computed as a reasonableness check. They show the mix of peak-season residents according to the percentage of FTRs, working PTRs, and nonworking PTRs.

Community Region	FTRs 1990	FTRs 1998	PTR as % of FTR	PTR Total	Non-working PTR (%)	Non-working PTR Total	Peak Season All Residents	Peak Season FTR (%)	Peak Season Working PTR (%)	Peak Season Non-working PTR (%)
Tahoe City	6,679	7,153	75%	5,365	50%	2,682	12,044	55%	22%	22%
Kings Beach	2,365	2,533	100%	2,533	20%	507	4,898	48%	41%	10%
Incline Village	7,856	8,414	25%	2,103	95%	1,998	9,959	79%	1%	20%
Stateline	5,630	6,030	30%	1,809	90%	1,628	7,439	76%	2%	22%
South Lake Tahoe	28,823	30,870	75%	23,152	30%	6,946	51,975	55%	31%	13%
Totals	**51,353**	**55,000**		**34,962**		**13,761**	**86,315**			

Source: Economic Modeling Specialists, Inc.; Authors' calculations

FTR = Full time resident
PTR = Part time resident

Table 6-6—Nonworking part-time resident incomes in the Lake Tahoe basin. This table illustrates how PTR incomes are derived. Column 1 shows total nonworking PTRs by community region and is the same as Table 6-5, column 6. Column 2 estimates the number of PTR families, based on average family size estimates in 1998 of 3.24 members per family (US Census Bureau 1999a). The model assumes that the average annual family income of PTRs is $137,000, the lower limit of annual incomes (in 1997) of the top five percent of all US family incomes (US Census Bureau 1999b). Column 4 estimates the total income of PTRs while they are residing in the basin. These estimates are based on the assumption that the average PTR family spends two months per year in the Lake Tahoe basin. The figures in column 4 appear as nonworking PTR income in the community region economic models.

	Non-working PTR Total	Non-working PTR Families*	Total Non-working PTR Family Incomes ($1,000)	Basin Portion of Non-working PTR Family Incomes** ($1,000)
Tahoe City	2,682	828	$113,427	$ 18,904
Kings Beach	507	156	21,421	3,570
Incline Village	1,998	617	84,496	14,083
Stateline	1,628	502	68,841	11,473
South Lake Tahoe	6,946	2,144	293,693	48,949
Totals	**13,761**	**4,247**	**581,878**	**96,979**

Source: Economic Modeling Specialists, Inc.

FTR = Full time resident
PTR = part time resident
* Assumes 3.24 persons per family
** Assumes 2 months' residency in the basin

region's economy, thereby justifying application of this accounting procedure.

As discussed above, nonworking PTR incomes are likely an important aspect of the community region economies. Accordingly, the assessment team constructed community region economic models with an account for nonworking PTR incomes. The account includes an estimate of nonworking PTR incomes for the average period PTRs spend in the Lake Tahoe basin, which is assumed to be two months. This assumption, in addition to the assumptions made about average levels of income among nonworking PTRs, probably underestimates the actual contributions of PTRs to the basin economy. Table 6-5 shows the assumptions made and the procedures used for deriving the nonworking PTR income estimates that appear in the community region model summary, shown in Table 6-4.

An estimated $97 million in income accrues to nonworking PTRs' each year during their basin residency. Income earned by working PTRs represents an unknown share of the labor income component of the basin's inside income, as shown in Table 6-4. Further development of the community region models will enable a more accurate portrayal of the roles that nonworking and working PTR incomes play in the economy of the basin.

Population and Demography

The population of the basin has remained relatively constant over the last decade, reaching an estimated 55,000 in 1998. Early population projections now seem astronomical from a current perspective. In 1960, the Eldorado County general plan anticipated a city of 200,000 along the south shore (Griffenhagen-Kroeger, Inc. 1960). A 1961 study of the feasibility of regional government in the basin assumed a population by 1980 of 418,000 (Wilsey, Ham and Blair, Inc. 1961), but those high estimates were revised three years later down to 313,000 (Wilsey, Ham and Blair, Inc. 1964). Seasonal variation notwithstanding, the permanent resident population has grown since the 1960s from just under 20,000. The per-year growth rate, however, has declined dramatically over the past three decades, from a high of seven percent from 1965 to

1970 to less than one percent projected between 1995 and 2000 (Figure 6-1). About two thirds (67.6 percent) of the basin's population is concentrated on the south shore, including Eldorado and Douglas counties and the city of South Lake Tahoe (Table 6-7, Figure 6-2). However, 81 percent of the total jobs in the basin (26.4 percent in Douglas County, 54.6 percent in Eldorado County) are on the south shore, suggesting again a significant amount of incommuting. Transportation and commuting patterns have been well established by earlier studies on both the north and south shores (Leigh, Scott & Cleary, Inc. 1993, 1997; TRPA 1997). Figures reflecting the geographic distribution of jobs by sector are presented in the section describing the community-regions model.

The social and cultural composition of the Tahoe basin is thought to be changing as both visitor bases and labor force populations change in California, Nevada, and nationwide. During the assessment process, community leaders often raised a concern that services and infrastructure in the community may not adequately reflect preferences and customs representative of ethnic minorities. Standard census figures are used to present what little is documented on the basin's ethnic and racial picture.

Table 6-8 shows the geographic distribution of the basin's population broken out by percentages of race/ethnicity represented in each county. Clearly, non-Hispanic whites predominate in numbers throughout the basin, comprising almost 90 percent of the total population. Note that "Hispanic" is not a race category recognized by the US Census Bureau; however, Hispanics are an important ethnic group and, using figures extrapolated from the 1990 census, represent 14.1 percent of the total population in the basin.

A significant proportion of Hispanics and Asian/Pacific Islanders are thought to be employed

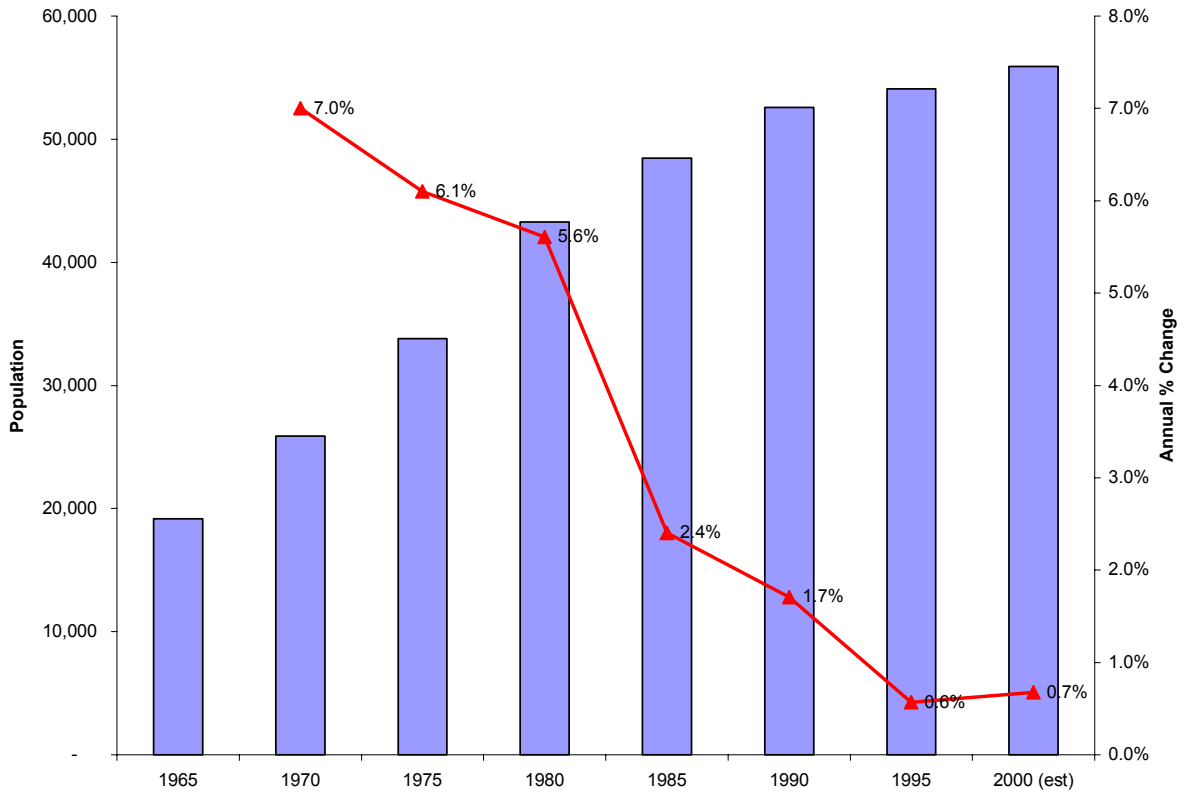


Figure 6-1—Basin historical population trend, 1965 to 2000.

Table 6-7—Population of basin, 1990, 1995, and 2000.

Population	1990 Census	1995 TRPA Projections	2000 TRPA Projections
El Dorado/CSLT	29,652	30,343	31,326
Placer	9,257	9,473	9,835
Washoe	7,567	7,959	8,270
Douglas	6,115	6,308	6,480
Totals	**52,591**	**54,083**	**55,911**

Sources: US Census Bureau; University of Nevada Bureau of Business and Economic Research; TRPA Transportation Model and Affordable Housing

Table 6-8—Geographic distribution of population by ethnicity/race.

	El Dorado	Placer	Washoe	Douglas	Basin
White	86.0%	89.7%	94.4%	88.3%	**89.6%**
Black	0.9%	0.4%	0.3%	0.6%	**0.6%**
American Indian	1.2%	0.8%	0.4%	1.2%	**0.9%**
Asian/Pacific Islander	6.5%	0.7%	1.4%	5.1%	**3.4%**
Other	5.4%	8.4%	3.5%	4.8%	**5.5%**
Hispanic*	*18.6%*	*16.8%*	*9.0%*	*11.8%*	***14.1%***

Sources: US Census Bureau; University of Nevada Bureau of Business and Economic Research; Authors' calculations; TRPA 1997a

* The US Census considers "Hispanic" an ethnic category and not a race. Hispanics are distributed throughout the five races above.

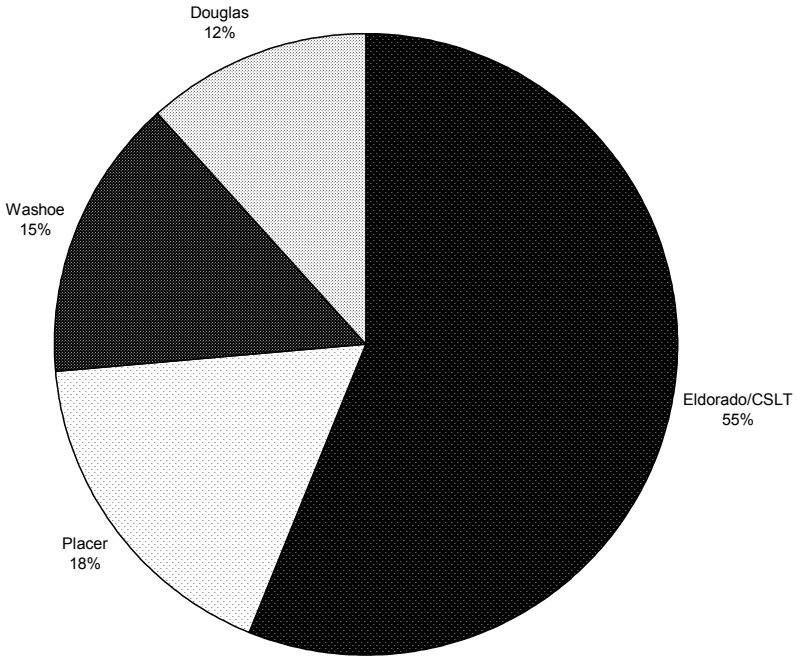


Figure 6-2—Distribution of basin population.

in the service sector, particularly working in hotels, casinos, and restaurants in the basin. However, no data are collected that permit a basinwide analysis of jobs in each industry by ethnicity or race.

Housing

Social equity concerns have been expressed about concentrations of inadequate or substandard housing and the degree to which occupation of substandard housing correlates to race or ethnicity. Because the data on distribution of owner-occupied and rental housing are not correlated to race or ethnicity, no analysis is possible to determine whether this presents a problem of social equity.

Housing data from the US Census Bureau is correlated to income by census tract. A recent study by TRPA analyzes the availability of affordable housing using 1990 census data. Under the Housing Subelement of the Land Use Element of the Regional Plan, Policy #1 states that "Local governments will be encouraged to assume their fair share of the responsibility to provide lower and very low income housing" (TRPA 1986). While "fair share" is a fundamental concept in the basin's regional plan, clearly defining what it means for the availability of affordable housing had not been undertaken prior to the study. The study was initiated because of growing concerns among the basin's jurisdictions that providing their "fair share" of affordable housing may not be feasible under the development restrictions imposed by the regional plan.

Using employment and census data to determine low and very low household incomes,[4] the study correlates those income categories to the commuting patterns integrated into the TRPA transportation planning model. Each jurisdiction was analyzed for its employment opportunities and the availability of affordable housing. The standard definition of affordability from the US Department of Housing and Urban Development is used by the study, applied to rental and owner-occupied housing. Rental housing is considered affordable when it does not place a cost burden of more than 30 percent of a household's gross monthly income on the renter. Owner-occupied housing is considered affordable when the total cost of the home does not exceed 2.5 times a household's annual income.[5] Median income is calculated for each of the five basin jurisdictions (Eldorado County is distinguished from the city of South Lake Tahoe) to accommodate geographic variation in the basin.

The figures shown in the tables are adapted from the TRPA study in order to present some of the data on which the study's conclusions are based. Note that Eldorado County and the city of South Lake Tahoe are merged in order to correspond more closely with other data presented in this section.

Median incomes were developed for each of the jurisdictions using US Census data and projection techniques developed by the University of Nevada's Bureau of Business and Economic Research (TRPA 1997; Bonnenfant 1999). Table 6-9 presents per capita income, median household income, and average household income, for each of the four counties. As one might expect, there is significant regional variation. When compared to the regional distribution of jobs by sector (showing places of employment as distinct from places of households), a typical pattern becomes apparent. Where there are higher paying jobs, housing costs tend to be higher, shifting lower cost housing to more affordable regions.

The affordable housing study concluded that "(t)he region appears to have enough affordable housing stock, however the displacement of the low income households into non-affordable situations results in an ineffective use of this housing stock" (TRPA 1997a). After analyzing the suitable sites and the expected construction allocations for each jurisdiction, the study finds that sufficient opportunities exist within the basin itself to provide for affordable housing needs. The solution proposed is not so much concentrated in building new units as it is in reinvesting in existing stock. The report

[4] "Low" and "very low" income are defined by the US Census and US Bureau of Labor Statistics. Low income is household income at 51 to 80 percent of the median income in the region of concern. Very low income is household income below 50 percent of median income.

[5] "Cost burden" is defined in the report as "the total financial impact of the housing unit on the inhabitants, including rent (or mortgage), utilities and any applicable "taxes" (TRPA 1997: 1.1).

Table 6-9—Per capita, median household, and average household income.

	El Dorado	Placer	Washoe	Douglas	Basin Averages
Per capita income	$ 15,750	$ 19,237	$ 27,278	$ 29,537	$ 22,951
Median household income	33,752	36,604	49,835	46,525	41,679
Average household income	40,437	46,606	65,650	67,719	55,103

Sources: TRPA 1997a; Authors' calculations

concludes by urging local governments to make "rehabilitation of sub-standard housing and promoting more opportunities for home ownership" a higher priority (TRPA 1997a).

Socioeconomic Well-being and Community Capacity

The term "social capital" has evolved from a rather specific application in sociology (Coleman 1990; Putnam 1993) to a broad rubric for the human aspects of a region's resources and sources of wealth (Sierra Business Council 1997). The Sierra Nevada Wealth Index is a series of social, economic, and biophysical indicators compiled in 1996 to measure the relative health of the entire Sierra Nevada range. This study developed a composite of fifteen social indicators, including population, age distributions, voter participation and volunteerism, access to health care, educational achievement, and crime.

This assessment effort recognizes that the basin's community has worked for some time to develop a series of indicators appropriate to its own priorities and conditions. The Sierra Business Council is updating the wealth index and is exploring adapting the index to the basin. A discussion of potentially useful indicators identified by the socioeconomic working group follows this section.

Two additional measures bear mention in this brief overview of the basin's socioeconomic dynamics. In their work with the Sierra Nevada Ecosystem Project (SNEP), Doak and Kusel (1996) developed two categories for evaluating socioeconomic dynamics in the Sierra Nevada. The first, socioeconomic status, results in a numerical score combining coefficients of several measures, including housing tenure, poverty, education, employment, and households receiving public assistance (Doak and Kusel 1996). The second category is community capacity, a measure developed by Kusel by focusing on forest-dependent communities. Community capacity refers to "the collective ability of residents in a community to respond . . . to external and internal stresses; to create and take advantage of opportunities; and to meet the needs of residents, diversely defined. It also refers to the ability of a community to adapt to and respond to a variety of different circumstances" (Kusel 1996: 369).

Kusel links the exercise of community capacity analysis to the interaction of physical, social, and human capital. The capacity of a community to respond to change depends on its ability to use the skills, education, and experience of its individual members (human capital), to tap into networks of exchange and reciprocity (social capital) (Putnam, Leonardi, and Nanetti 1993: 164), and to use the physical and fiscal resources at its disposal to achieve collective ends.

Doak and Kusel found that in order to measure socioeconomic well-being and community capacity new spatial units of analysis had to be developed. County level data were too gross to be useful, while smaller units of analysis (such as census tracts and "places"[6]) needed to be grouped into more socially and economically meaningful units. Their social assessment approach to the Sierra Nevada required establishing a statistically viable unit of analysis based on census data and local knowledge and correcting the data through a public

[6] Places are formally defined by the US Bureau of Census as incorporated areas or unincorporated population centers identified by name and known as census-designated places (CDPs). Doak and Kusel find CDPs inadequate for several reasons, including identification and sense of place among local residents.

involvement process closely akin to the community indicator efforts discussed later in this chapter. Their "community aggregation" metric allowed them to identify 180 distinct aggregations in the Sierra Nevada, sixteen of which make up the Greater Lake Tahoe basin region.

Five of the sixteen aggregations in the Greater Lake Tahoe basin identified in SNEP lie outside the definition of the basin assumed for this analysis (i.e., TRPA regional boundaries). However, the remaining eleven aggregations are presented in tables 6-10, 6-11, and 6-12, with the socioeconomic and capacity scores assigned them by Doak and Kusel's analysis. Further interpretation of the socioeconomic score would require an examination of each of the indicators (discussed above) and their relative weight in determining the numerical outcome.

Similarly, community capacity scores are composites of indicators derived from local expert knowledge (Table 6-10). Each capacity score represents the culmination of a seven-step process in which knowledgeable members of each aggregation or community collectively rank a number of indicators and develop a composite score on which they can agree. The usefulness of the capacity score is in its ability to capture a qualitative, but disciplined, reflection of the community's sense of its own abilities to use social, human, and physical capital to increase collective well-being.

Doak and Kusel include home ownership and tenure in their calculation of socioeconomic score. In the basin, due to high vacancy rates typical of resort communities, this factor will drive the score down slightly. Vacancy rates in the basin run as high as 52 percent when short-term rental units are included in the stock. Home ownership and tenure (i.e., how long residents in a community have lived there) has an indeterminate effect on overall socioeconomic well-being and community capacity in the basin. Further research would have to be carried out to examine whether vacancy rates and high turnover of the resident population have a measurable effect on capacity or well-being.

Scores can be correlated to population levels to show geographical distributions of socioeconomic well-being in the Tahoe basin. For example, as Table 6-11 indicates, about a fifth of the basin's population resides in areas with socioeconomic scores of five or more, indicating high levels of income, low levels of unemployment, and low levels of families with children receiving public assistance. In contrast, half of the basin's population lives in two areas (South Lake Tahoe and Kings Beach) with socioeconomic scores of less than four (refer to Table 6-10). These scores indicate concentrations of poverty, public assistance needs, and relatively low average levels of education, among other measures. It is interesting to note that of the two aggregations with scores of less than four, Kings Beach also has the lowest capacity score, while South Lake Tahoe carries a capacity score of four. On the one hand, this indicates that participants in the Kings Beach exercise measured the community's capacity to respond to change at a relatively low level and has expressed little confidence in its ability as a community to use a combination of human, social, and physical capital. The South Lake Tahoe participants, on the other hand, evaluated their ability to respond to change at a much higher level, despite demographic and social characteristics that gave them a lower socioeconomic score. Because the method for measuring capacity is based largely on community participation and expert opinion, this score could change, depending on the composition of experts gathered for the rating exercise.[7]

Finally, Doak and Kusel's socioeconomic and capacity scores are useful in illuminating a greater picture of overall social and institutional capacity in the basin (Table 6-12). Pockets of poverty, concentrations of low and very low income jobs and needs for affordable housing underscore areas for further development of social policy in the basin. At the same time, this quantification of socioeconomic status and the disciplined measure of community capacity corroborate other evidence of a highly sophisticated, well-educated and socially

[7] One might hypothesize, for example, that a workshop held in Spanish at the Kings Beach headquarters of La Comunidad Unida, a major Hispanic community service organization on the north shore, would produce different capacity scores.

Table 6-10—Socioeconomic and community capacity scores for the basin.

Doak and Kusel Aggregation	Population 1990 census	Socioeconomic Score (1 to 7)	Capacity Score (1 to 5)
Echo/Upper Truckee	2,425	6	3
Glenbrook	393	7	4
Incline/Crystal Bay/Brockway	7,856	4	5
Kings Beach	2,365	1	2
Montgomery Estates/Tahoe Paradise/Meyers	3,079	5	3
North Tahoe	2,630	5	3
South Lake Tahoe	23,319	2	4
Stateline Kingsbury	3,153	4	4
Tahoe City	2,587	4	3
West Shore	1,462	4	3
Zephyr Cove/Skyland	2,084	6	2
Totals / Averages	**51,353***	**4.36**	**3.27**

Source: Modified from Doak and Kusel 1996

* Total population figure does not match total basin population in other 1990 census calculations in this assessment because of aggregation techniques using different census blocks.

Table 6-11—Socioeconomic score distribution by population (scale = 1-7).

Socioeconomic Score	Population	% of population
< 4	25,684	50.0%
4	15,058	29.3%
> 5	10,611	20.7%

Sources: Doak and Kusel 1996; authors' calculations

Table 6-12—Capacity score distribution by population (scale = 1 to 5).

Capacity Score	Population	% of population
2	4,449	8.7%
3	12,183	23.7%
4,5	34,721	67.6%

Sources: Doak and Kusel 1996; authors' calculations

aware regional community. As is discussed in the institutional assessment below, the relatively high levels of social and human capital in the system likely contribute to a manifest disposition to cooperation and institutional collaboration.

Issue 1: Determining Appropriate Indicators and Geographic Scales for Measuring Social Well-being and Economic Health as They Relate to Environmental Quality

Economic Information and Models to Inform Socioeconomic Decisions

Recent social science contributions to ecosystem assessment work have pointed out critical problems with establishing both the methods and scales at which data are acquired (Bright et al., forthcoming). Many socioeconomic questions in the Lake Tahoe basin require an examination of patterns of income, spending, and employment at the community and subregional scale. However, public economic data is most commonly available to researchers at the county level. As mentioned above, the basin portions of the four counties represent only a small percentage of the total demographic, social, and economic regional picture. Acquiring useful data at the subcounty level requires a substantial investment of time and resources (Bonnenfant 1999; Robison, forthcoming).

While there are many state and federal agencies that gather economic and social data, four are responsible for tracking economic data that are most relevant to the basin's needs: California's Economic Development Department (EDD), Nevada's Department of Employment, Training and Rehabilitation (DETR), the US Bureau of Labor Statistics (BLS), and the US Bureau of Economic Analysis (BEA) (both in the Department of Commerce). Confidentiality rules often require data at the subcounty level to be aggregated or "rolled up." Industry-level data must represent three or more firms in order to mask proprietary information. Further, if any single employer represents 80 percent or more of the employment in a single industry within the unit of analysis, the data must be suppressed or aggregated.

Employment and earnings data are presented by Standard Industry Classification (SIC) codes, which are assigned to each firm by the type of business it represents. Each industry or SIC code is broken down into several subcategories. Employers report once per year during March and in some cases have some discretion in which codes they use to report the kind of business they represent. The data represent only firms that pay into state-maintained unemployment insurance accounts; therefore, sole proprietorships are not tracked in the same data sets.

Until recently, socioeconomic assessments in rural areas in the United States have been conducted on the county and multicounty scale. However, increasing economic diversity at the subcounty level, the growing demand for local services, and a broad range of social and economic needs in rural counties require more sensitive measurements and models. In the Tahoe basin, as well as in the Sierra Nevada region, increasing population, changes in economic behavior, and different social expectations create diversity among local economies that is not meaningfully measured at the county level (Duane 1996; Doak and Kusel 1996; Robison 1997)

In the Tahoe basin, social and economic data is gathered in ways that are either specific to a particular economic sector or driven by a specific problem or issue. The assessment working group's discussions and other interviews indicate an increasing demand for social and economic modeling that will more accurately track the flow of capital, investment, and discretionary spending in the basin, both at the micro scale and the larger regional scale.

The EIP proposes to invest over $900 million in an array of projects and land acquisitions intended to bring the Tahoe basin closer to attainment of the TRPA thresholds. Over $250 million of that investment will come from local sources, with an additional $100 million required over ten years for operation and maintenance. Providing the local share of the EIP will create as yet unknown burdens in the local economy. Public policy will need to determine how that burden will be shouldered equitably. However, the paucity of data at useful scales makes it difficult to show how the economy of the basin actually functions and therefore to anticipate likely outcomes from impacts on the local economy.

In this section we present five community-region models for the Lake Tahoe basin. A community-region model is the most localized of the modeling scales appropriate for the Tahoe basin for tracking and monitoring social and economic indicators. A second scale is across the entire basin region, including Truckee-Donner, the Highway 89 corridor, including Olympic and Squaw valleys and the Reno-Carson and Gardnerville-Minden areas. A third scale of analysis compares economic data across industries and analyzes the basin's economy in comparison to other similar regions (for example, see NLTRA 1995, 1997). Currently, the skiing and gaming industries collect marketing data at the second and third levels. However, a broader based model would track similar data for all recreational and other significant economic activities that affect the generation of revenue and local spending patterns in the basin. At this time no institutional mechanism exists that can coordinate or integrate the three scales of modeling and analysis.

The community-region model recognizes that economic activity tends to be spatially organized in patterns of trade hierarchies. An economically dominant center (a downtown or otherwise commercially developed area) hosts the bulk of the region's goods and services producing activities. In many rural areas in which this model is implemented, a surrounding region of isolated homesteads, neighborhoods, and suburbs relies on the goods and services of the center, and the center relies in varying degrees on the region for its workforce. In some cases the surrounding region includes smaller areas of commercial activity (towns or villages), and each of these exhibits a subcenter-region organization. The operative principle is that the region as a whole, the larger community-region, exhibits a measure of economic cohesion and otherwise functions as a distinct and semi-independent economy. In the Lake Tahoe basin, these modeling assumptions require significant adaptation because a great deal of interaction takes place among different geographic centers.

The strength and direction of trade links within community regions often are described in terms of gravity theory. Accordingly, links are strongest near the commercial center of community regions and become weaker toward the outer edges. At some point, moving outward from the center, the influence of a neighboring community center appears, and shopping and commuting flows begin to go both ways. In this area of overlapping influence, community-region boundaries appear as shaded zones rather than distinct lines (Robison 1997).

A significant share of the data needed to build community region models is provided by sources with zip code level detail. Much of the data collected by the state employment development agencies (e.g., EDD and DETR) can be obtained under the right authorities down to the zip code or even census block level. However, as mentioned above, the display of Tahoe data is subject to confidentiality tests that limit its conveyance and use. The problem to be confronted is that zip code area boundaries are distinct lines; they miss the two-way trade flows that characterize the sometime shaded zone boundaries of community-regions. In implementing the model, one must be mindful of this limitation and make adjustments where needed to reflect its effects on the model's economic outputs.

The basin was divided into community-region models based on the following criteria:

- Commuting patterns;
- Shopping travel patterns;
- Locations of commercial centers; and
- State boundaries.

The most important boundary that divides the basin economically is an imprecise line separating the north and south shore areas. The Tahoe basin's population is concentrated near the southern and northern shores of the lake, with relatively sparse population densities along the east and west shores. The roughly 30-mile distance separating the north and south shores, combined with challenging highway conditions typical of mountain roads (including frequent winter highway closures), severely limits travel between these areas for work and shopping.

Within the north and south shore areas are distinct communities containing commercial centers. The principal commercial centers in the north shore

area are associated with the communities of Incline Village, Nevada, and Tahoe City and Kings Beach, California. South Lake Tahoe, California, and Stateline, Nevada, feature the principal commercial centers in the south shore area. The community regions for which economic models have been developed are defined by these five commercial centers. Each region consists of a node (i.e., the commercial center) surrounded by a developed area, typically including several distinct neighborhoods and villages. The boundaries of each community region are defined by zip code areas, as shown on the maps in figures 6-3 through 6-7.

State lines are political boundaries that may or may not have socioeconomic significance. Land use patterns, for example, are relatively similar on both sides of the California-Nevada boundary in both the south and north shore areas. An important justification for separating the California and Nevada sides of the basin into separate community regions, however, is the prominence of legalized gaming in Nevada. The relative economic importance of casinos and related visitor services in Nevada argued for dividing the community regions of the south and north shores along state lines.

The specific geographic locations of the five community regions are as follows:

Tahoe City—Figure 6-3 shows the zip code areas used to model the Tahoe City community region. From the south, the region begins just south of Meeks Bay and extends north and north-eastward past the main commercial center. The boundary continues beyond Tahoe City to just past Dollar Point. The west and northwest boundary extends up Highway 89 to include Squaw Valley.

Kings Beach-Carnelian Bay—Figure 6-4 shows the zip code areas used to model the Kings Beach-Carnelian Bay community region. It includes Kings Beach, Tahoe Vista, and areas to the southwest to just beyond Carnelian Bay. The northwest boundary extends north over the Tahoe basin hydrologic divide to include the Northstar Ski Resort area.

Incline Village—Figure 6-5 shows the zip code areas used to model the Incline Village community region. The area extends south as far as the Sand Harbor State Park, north to the Mt. Rose Ski Resort, and west to the Nevada-California border.

Stateline—Figure 6-6 shows the zip code areas used to model the Nevada side of the South Lake Tahoe-Stateline community region. It includes the area south and southeast of Tahoe Village, encompassing Edgewood and the Kingsbury Grade and the area north along the shoreline to and including Glenbrook.

South Lake Tahoe—Figure 6-7 shows the zip code areas used to model the California side of the South Lake Tahoe community region. The region includes an area up the western shoreline nearly to Meeks Bay in Placer County. To the southwest, it includes Echo Lake and the US Highway 50 corridor to just beyond Strawberry to take in the economic activities surrounding Sierra-at-Tahoe (formerly Sierra Ski Ranch). Many skiers at this facility combine their activities there with visits to the basin, although the exact proportion of skiers coming from and returning to the Central Valley and Bay Area to the west is unknown at this time.

Limitations of assessment time and resources precluded modeling economic influences in the areas immediately adjacent to the Tahoe basin. Following initial implementation of the community-region models within the formal TRPA boundaries of the basin, models linked to surrounding communities are expected to be deemed appropriate. Several important economic and social influences exist between Truckee-Donner, Reno-Carson, Gardnerville-Minden, and the Tahoe region. A fuller understanding of regional economic dynamics will require implementing at least rudimentary versions of the community region model in those communities.

The five selected community regions clearly have multiple links that must be taken into account

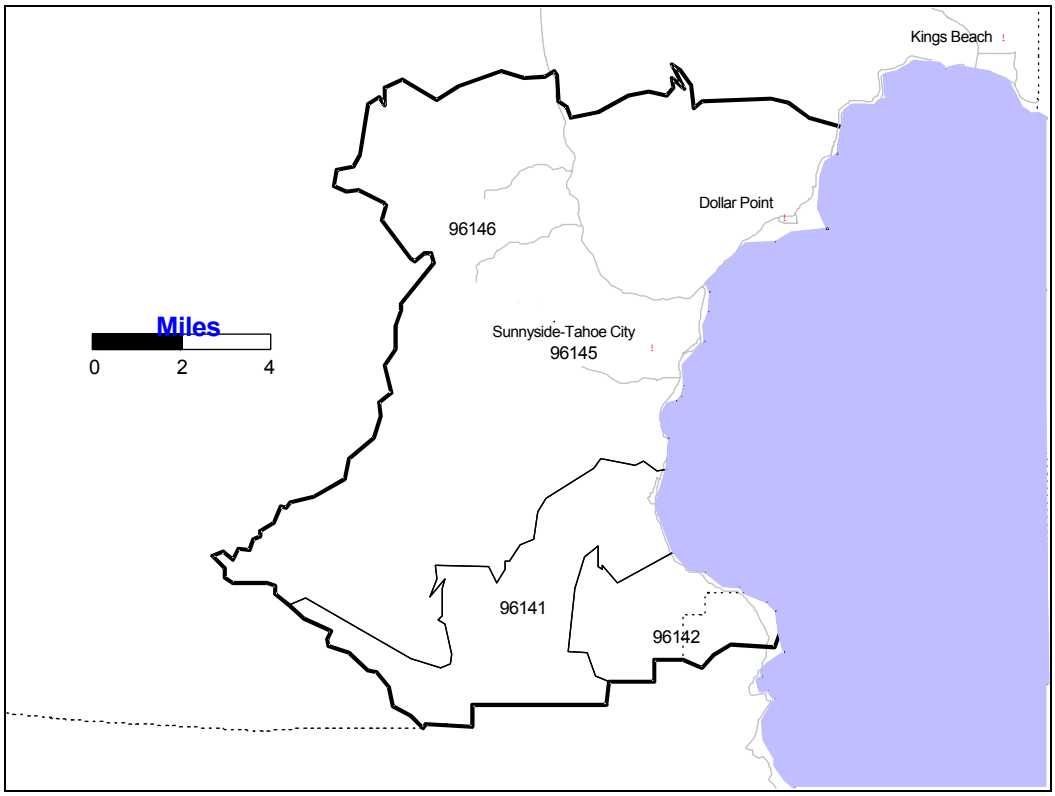


Figure 6-3—Tahoe City community region.

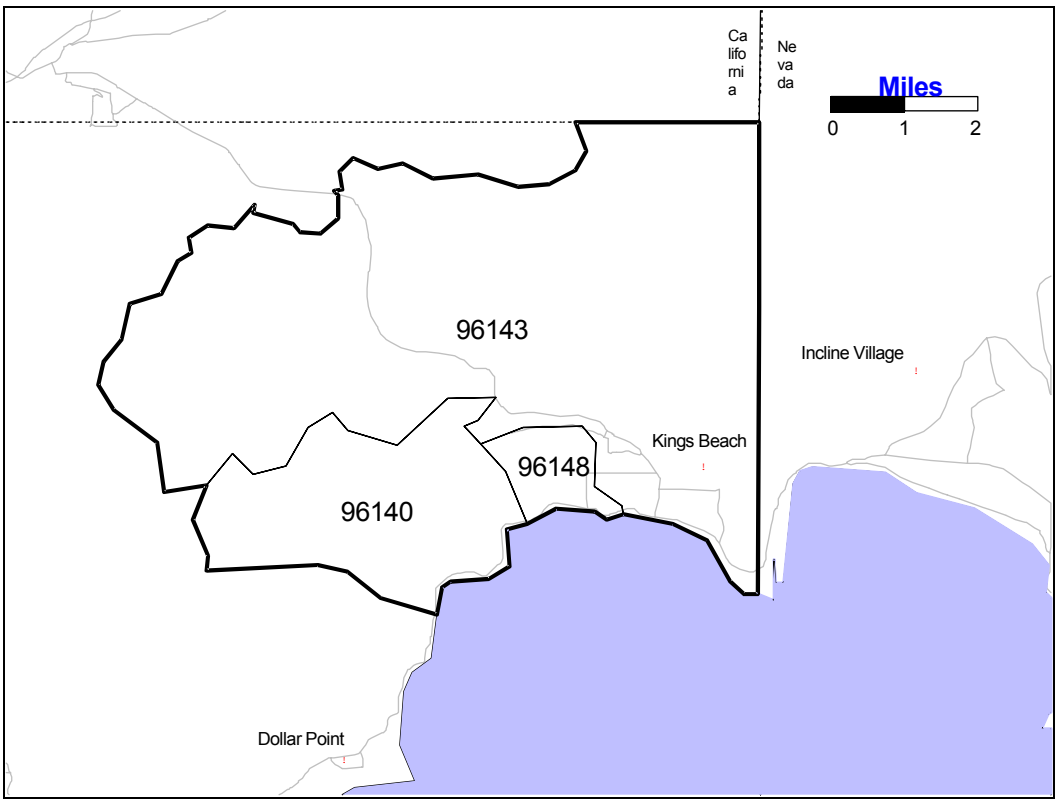


Figure 6-4—Kings Beach community region.

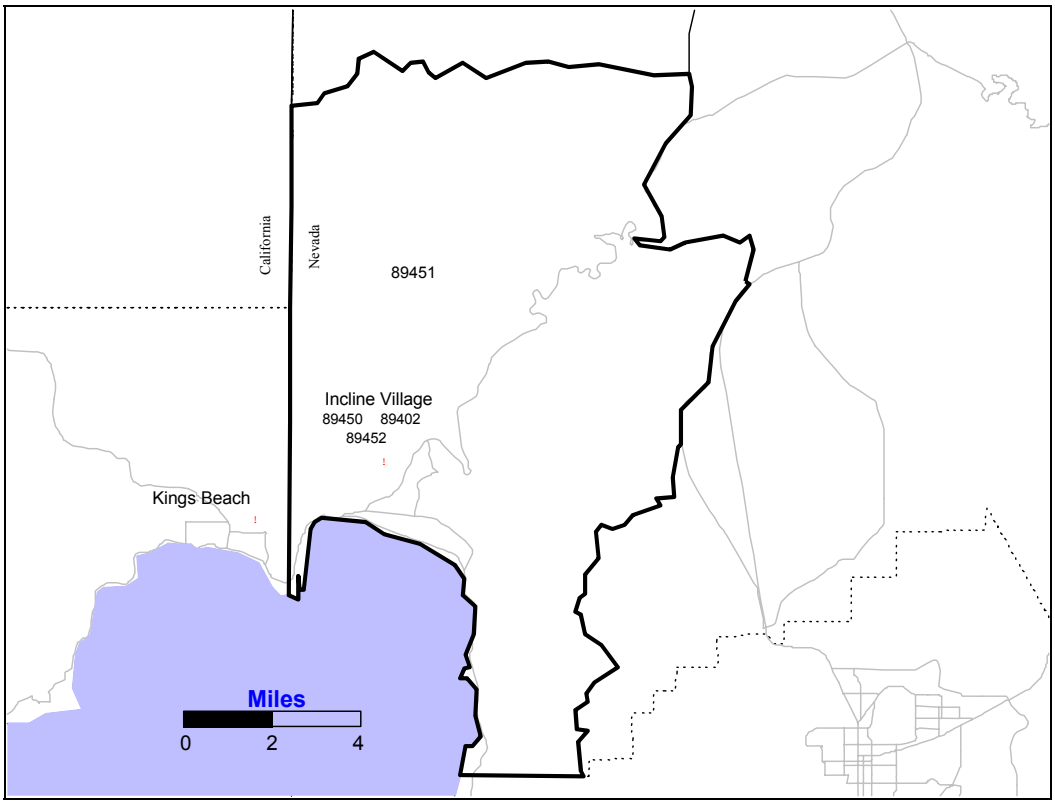


Figure 6-5—Incline Village community region.

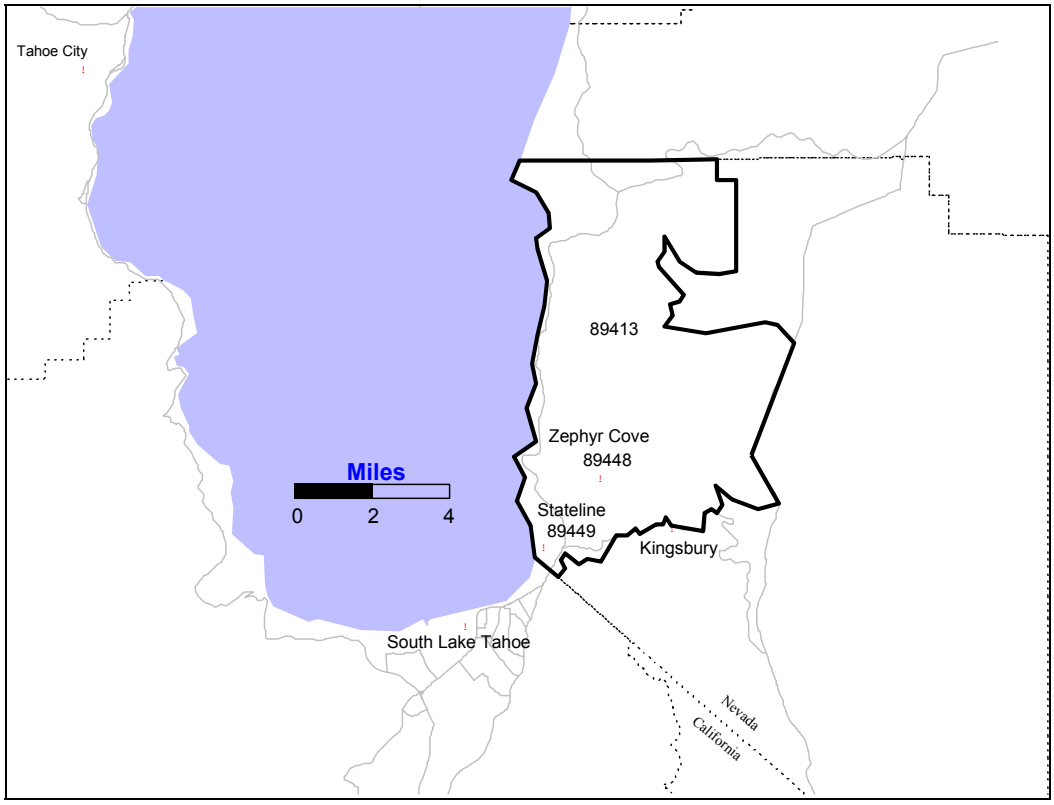


Figure 6-6—Stateline community region.

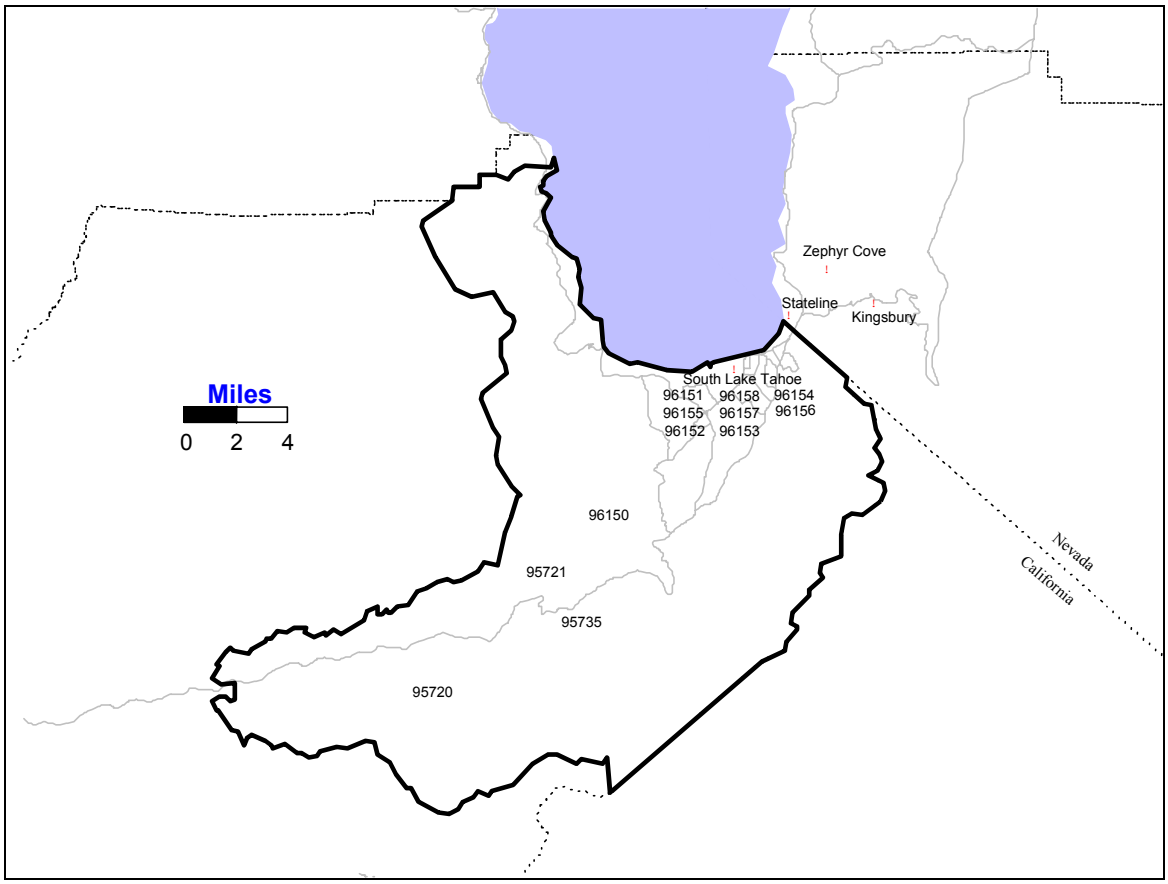


Figure 6-7—South Lake Tahoe community region.

to understand the flow of capital and resources in the entire basin. Most of those links are accommodated in the model. Effectively implementing the models requires extensive local knowledge and expert opinion. Allocating the relative portions of internal and external share of both capture and impacts is a critical phase of the model implementation. This is usually done by presenting the data from such sources as County Business Patterns (compiled by the US Census) to local knowledgeable experts and, through interviews and other interactions, adjusting the relative weight among values, known as the "ground truthing" phase (Robison, forthcoming).

The data presented here have a high confidence level but are necessarily in flux. The modeling effort was developed to continue beyond the completion of the watershed assessment, and the ground truthing phase has not been implemented. However, the assessment team is confident that the data are useful in their current form to describe current (as of 1998) patterns of employment and income in the five community-regions.

The following definitions are important for a clear understanding of the community-region profile data presented in tables 6-13 through 6-17:

- *Residents' Income*—The total before tax income of persons living within the boundaries of the community. It can be thought of as income generated in the community, less the claims of in-commuters and absentee owners (defined as *Residents' Inside Income*), plus the income of out-commuters, income from ownership of property located outside the community, and transfer payments (defined as *Residents' Inside Income*). *Residents' Income = Residents' Inside Income + Residents' Outside Income.*

Table 6-13—Tahoe City community region economic profile.

Tahoe City	**(x $1,000)**			
Labor Income by Place of Work	$113,628			
Less Incommuting Income	-$43,407			
Labor Income by Place of Residence	$70,221	83.1%		
Property Income	$14,300	16.9%		
Total Inside Income	**$84,520**	**100%**	**47.0%**	
Property Income	$21,334	22.4%		
Transfer Payments	$19,645	20.6%		
Outcommuters Income	$35,380	37.1%		
Income of non-working Part-time Residents	$18,904	19.8%		
Total Outside Income	**$95,264**	**100%**	**53.0%**	
Total Residents' Income	**$179,784**		**100.0%**	

Labor Income and Jobs by Industry	**Jobs**	**%**	**Earnings**	**%**
Agriculture & agricultural services	123	2.2%	$ 1,904	1.7%
Mining, sand and gravel	1	0.0%	$ 14	0.0%
Construction	637	11.4%	$ 21,588	19.0%
Food processing	-	0.0%	-	0.0%
Wood products	49	0.9%	$ 2,380	2.1%
Misc. manufacturing	121	2.2%	$ 2,479	2.2%
Transportation	158	2.8%	$ 4,801	4.2%
Publishing and communications	29	0.5%	$ 1,407	1.2%
Public utilities	5	0.1%	$ 197	0.2%
Trade	609	10.9%	$ 13,396	11.8%
Motels, eating and drinking	1,069	19.2%	$ 14,043	12.4%
Finance, insurance, and real estate	426	7.7%	$ 7,259	6.4%
Amusement and recreation	1,224	22.0%	$ 15,095	13.3%
Consumer services	232	4.2%	$ 4,485	3.9%
Business services	294	5.3%	$ 8,460	7.4%
Medical, educational and social services	195	3.5%	$ 4,950	4.4%
Federal government	30	0.5%	$ 822	0.7%
State and local government	361	6.5%	$ 10,348	9.1%
TOTAL	**5,563**	**100.0%**	**$113,628**	**100.0%**

Source: Economic Modeling Specialists, Inc.

Table 6-14—Kings Beach community region economic profile.

Kings Beach	**(x $1,000)**			
Labor Income by Place of Work	$51,401			
Less Incommuting Income	-$18,382			
Labor Income by Place of Residence	$33,019	86.3%		
Property Income	$5,263	13.7%		
Total Inside Income	**$38,282**	**100%**	**32.2%**	
Property Income	$6,941	8.6%		
Transfer Payments	$13,011	16.1%		
Outcommuters Income	$57,223	70.9%		
Income of non-working Part-Time Residents	$3,570	4.4%		
Total Outside Income	**$80,745**	**100%**	**67.8%**	
Total Residents' Income	**$119,027**		**100.0%**	

Labor Income and Jobs by Industry	**Jobs**	**%**	**Earnings**	**%**
Agriculture & agricultural services	45	1.8%	$ 506	1.0%
Mining, sand and gravel	-	0.0%	-	0.0%
Construction	267	10.5%	$ 9,042	17.6%
Food processing	-	0.0%	-	0.0%
Wood products	-	0.0%	-	0.0%
Misc. manufacturing	19	0.7%	$ 886	1.7%
Transportation	112	4.4%	$ 2,951	5.7%
Publishing and communications	22	0.9%	$ 704	1.4%
Public utilities	1	0.0%	$ 31	0.1%
Trade	211	8.3%	$ 4,495	8.7%
Motels, eating and drinking	838	32.8%	$ 12,366	24.1%
Finance, insurance, and real estate	145	5.7%	$ 2,436	4.7%
Amusement and recreation	428	16.8%	$ 5,325	10.4%
Consumer services	20	0.8%	$ 439	0.9%
Business services	63	2.5%	$ 1,988	3.9%
Medical, educational and social services	145	5.7%	$ 3,562	6.9%
Federal government	21	0.8%	$ 575	1.1%
State and local government	213	8.4%	$ 6,094	11.9%
TOTAL	**2,550**	**100.0%**	**$51,401**	**100.0%**

Source: Economic Modeling Specialists, Inc.

Table 6-15—Incline Village community region economic profile.

Incline Village	**(x $1,000)**			
Labor Income by Place of Work	$258,166			
Less Incommuting Income	-$91,882			
Labor Income by Place of Residence	$166,284	90.5%		
Property Income	$17,388	9.5%		
Total Inside Income	**$183,672**	**100%**	**43.4%**	
Property Income	$109,654	45.8%		
Transfer Payments	$25,654	10.7%		
Outcommuters Income	$89,818	37.5%		
Income of non-working Part-Time Residents	$14,083	5.9%		
Total Outside Income	**$239,209**	**100%**	**56.6%**	
Total Residents' Income	**$422,881**		**100.0%**	

Labor Income and Jobs by Industry	**Jobs**	**%**	**Earnings**	**%**
Agriculture & agricultural services	115	1.2%	$ 1,828	0.7%
Mining, sand and gravel	-	0.0%	-	0.0%
Construction	783	8.3%	$ 26,552	10.3%
Food processing	3	0.0%	$ 147	0.1%
Wood products	7	0.1%	$ 176	0.1%
Misc. manufacturing	56	0.6%	$ 1,983	0.8%
Transportation	161	1.7%	$ 4,687	1.8%
Publishing and communications	60	0.6%	$ 2,276	0.9%
Public utilities	16	0.2%	$ 1,149	0.4%
Trade	732	7.8%	$ 18,758	7.3%
Motels, eating and drinking	3,431	36.6%	$ 77,768	30.1%
Finance, insurance, and real estate	1,233	13.1%	$ 29,040	11.2%
Amusement and recreation	563	6.0%	$ 13,857	5.4%
Consumer services	414	4.4%	$ 15,944	6.2%
Business services	859	9.2%	$ 35,343	13.7%
Medical, educational and social services	462	4.9%	$ 11,452	4.4%
Federal government	44	0.5%	$ 1,907	0.7%
State and local government	444	4.7%	$ 15,299	5.9%
TOTAL	**9,382**	**100.0%**	**$258,166**	**100.0%**

Source: Economic Modeling Specialists, Inc.

Table 6-16—Stateline community region economic profile.

Stateline	**(x $1,000)**			
Labor Income by Place of Work	$394,895			
Less Incommuting Income	-$285,489			
Labor Income by Place of Residence	$109,406	88.6%		
Property Income	$14,101	11.4%		
Total Inside Income	**$123,507**	**100%**	**43.3%**	
Property Income	$92,490	57.1%		
Transfer Payments	$24,707	15.3%		
Outcommuters Income	$33,282	20.6%		
Income of non-working Part-Time Residents	$11,473	7.1%		
Total Outside Income	**$161,952**	**100%**	**56.7%**	
Total Residents' Income	**$285,459**		**100.0%**	

Labor Income and Jobs by Industry	**Jobs**	**%**	**Earnings**	**%**
Agriculture & agricultural services	149	1.0%	$ 1,728	0.4%
Mining, sand and gravel	-	0.0%	-	0.0%
Construction	610	4.2%	$ 20,677	5.2%
Food processing	-	0.0%	-	0.0%
Wood products	-	0.0%	-	0.0%
Misc. manufacturing	115	0.8%	$ 3,545	0.9%
Transportation	86	0.6%	$ 2,191	0.6%
Publishing and communications	24	0.2%	$ 1,199	0.3%
Public utilities	14	0.1%	$ 1,107	0.3%
Trade	451	3.1%	$ 9,791	2.5%
Motels, eating and drinking	10,721	73.6%	$ 284,720	72.1%
Finance, insurance, and real estate	941	6.5%	$ 23,047	5.8%
Amusement and recreation	429	2.9%	$ 11,514	2.9%
Consumer services	272	1.9%	$ 7,846	2.0%
Business services	252	1.7%	$ 13,254	3.4%
Medical, educational and social services	274	1.9%	$ 7,438	1.9%
Federal government	27	0.2%	$ 734	0.2%
State and local government	195	1.3%	$ 6,103	1.5%
TOTAL	**14,558**	**100.0%**	**$394,895**	**100.0%**

Source: Economic Modeling Specialists, Inc.

Table 6-17—South Lake Tahoe community region economic profile.

South Lake Tahoe	**(x $1,000)**			
Labor Income by Place of Work	$329,522			
Less Incommuting Income	-$39,953			
Labor Income by Place of Residence	$289,569	91.3%		
Property Income	$27,477	8.7%		
Total Inside Income	**$317,046**	**100%**	**39.5%**	
Property Income	$76,692	15.8%		
Transfer Payments	$114,833	23.7%		
Outcommuters Income	$244,907	50.5%		
Income of non-working Part-Time Residents	$48,949	10.1%		
Total Outside Income	**$485,381**	**100%**	**60.5%**	
Total Residents' Income	**$802,427**		**100.0%**	

Labor Income and Jobs by Industry	**Jobs**	**%**	**Earnings**	**%**
Agriculture & agricultural services	216	1.4%	$ 2,651	0.8%
Mining, sand and gravel	-	0.0%	-	0.0%
Construction	901	5.7%	$ 30,553	9.3%
Food processing	5	0.0%	$ 103	0.0%
Wood products	13	0.1%	$ 317	0.1%
Misc. manufacturing	73	0.5%	$ 1,452	0.4%
Transportation	272	1.7%	$ 6,312	1.9%
Publishing and communications	217	1.4%	$ 6,386	1.9%
Public utilities	192	1.2%	$ 14,091	4.3%
Trade	2,407	15.2%	$ 49,843	15.1%
Motels, eating and drinking	2,988	18.8%	$ 44,166	13.4%
Finance, insurance, and real estate	1,199	7.6%	$ 19,033	5.8%
Amusement and recreation	3,040	19.2%	$ 30,779	9.3%
Consumer services	502	3.2%	$ 11,243	3.4%
Business services	662	4.2%	$ 16,905	5.1%
Medical, educational and social services	1,668	10.5%	$ 50,200	15.2%
Federal government	192	1.2%	$ 5,868	1.8%
State and local government	1,321	8.3%	$ 39,618	12.0%
TOTAL	**15,869**	**100.0%**	**$329,522**	**100.0%**

Source: Economic Modeling Specialists, Inc.

- *Labor Income*—Sometimes called "*earnings*," includes wages, salaries, and proprietors' income.
- *Jobs*—As reported in the tables, jobs are both full-time and part-time and refer to the annual average of monthly employment. Thus, a person who holds two part-time jobs for the full year will appear as two jobs, while two persons employed for six months each will appear in the table as one job.
- *Property Income*—Income from the ownership of privately held equities and real estate. Includes claims on the profit of corporations and any other payments classed as dividends, interest, and rent. Includes private pension income.

  Inside property income is generated on property located within the boundaries of the community. In rural communities this normally includes rental income on real estate and the income of incorporated businesses located in the community. Inside property income excludes claims by nonresident (or absentee) owners. Thus, the property income of a locally owned grocery store or restaurant will be included, while that of a national chain will be excluded.

  Outside property income is generated outside the community but claimed by community residents. It includes claims on outside corporate income, normally paid as dividends, capital gains, and interest payments on corporate stocks and bonds, mutual fund income, and so on. It also includes money market and other bank interest and rental income on real estate located outside the community. Private pension income is included in outside property income.
- *Transfer Payments*—Payments to community residents (normally by the government) that do not result from current production and for which no services are rendered. Examples include Social Security and veteran's payments, public assistance, and unemployment compensation.

Model Validation and Application

The validity of the community region economic models was tested based on an analysis of visitor spending impacts, as projected by the models. Visitor spending accounts for large, although variable and unknown, shares of the economic activity in several highly important sectors of each community region, including hotels and lodging places, amusement and recreation services, and eating and drinking places. The models were validated by estimating the amount of visitor spending in these sectors, as well as in food stores, automotive dealers, and service stations and in miscellaneous retail sectors, which are also relatively dependent on visitor spending. Model validity is indicated by results showing that visitor spending in fact accounts for most of these sectors' sales; conversely, results indicating that visitor spending accounts for either a relatively small portion of these sectors' sales or more than 100 percent of their sales would suggest significant errors in the models.

The validation test required generating independent estimates of numbers of basin visitor days and average daily spending levels by sector. Annual visitation to the south shore area was estimated at 1.8 million visitor days, based on reported rentals of lodging room-nights and estimates of the average number of persons per room and the proportion of visitor days accounted for by day users (Strategic Marketing Group 1999). Annual visitation in the north shore area was estimated at 46 percent of the south shore visitation total (0.8 million visitor days), based on reported room-night rentals in the north shore area relative to that in the south shore area. Within the north and south shore areas, visitor days were allocated among community regions in proportion to the combined number of jobs in the motels and lodging places and amusement and recreation services sectors (as shown in tables 6-13 through 6-17). The resulting allocation of visitation to the community regions is shown in Table 6-18.

Table 6-18—Estimated allocation of visitation to the Lake Tahoe basin community regions.

Community Region	Visitor Days	Percent of Total Visitation
California Region		(%)
Kings Beach	36,400	1
South Lake Tahoe	621,400	24
Tahoe City	382,200	15
Nevada Region		
Incline Village	410,800	16
Stateline	1,149,200	44
Total	**2,600,000**	**100**

Source: Jones and Stokes Associates, Inc.

Spending profiles reflecting average daily spending levels by spending category in the north and south shore areas (Table 6-28) were obtained from recent visitor surveys (RRC Associates 1992; Strategic Marketing Group 1998). These spending categories were modified to conform to the economic sectors contained in the models (Table 6-19). As indicated in Table 6-19, the validation test was based on the assumption that all gaming expenditures in the north and south shore areas are made by visitors to Incline Village and Stateline, respectively. Daily spending levels for visitors to the Nevada regions thus were increased from the area-wide average to absorb all of the area's gaming expenditures, while daily spending levels for California region visitors were correspondingly decreased.

Table 6-20 shows the estimated total annual visitor-related spending in each of six key visitor-serving sectors, based on the annual visitation levels and daily spending levels shown in tables 6-18 and 6-19, respectively. Tables 6-21 through 6-25 show the estimated direct employment impacts that would result from the loss of all basin visitation, using the lower more conservative figure discussed above, of 2.6 million annual visitor days. These tables reveal some of the inaccuracies and questionable assumptions contained in the community region economic models developed for this assessment.

The most obvious and economically important model error revealed in tables 6-21 through 6-25 is the relatively small shares of the community region economies (e.g., as measured by employment effects) accounted for by visitation. A 100 percent loss of the estimated 2.6 million annual visitor days throughout the basin is estimated to reduce overall employment in the community regions from a minimum of six percent in Kings Beach to a maximum of 32 percent in Tahoe City. That these shares are low is readily apparent from results for Stateline, for example, where 69 percent of all jobs are classified within the hotels and lodging places sector, whereas only 25 percent of the jobs would be lost if Stateline visitation (estimated at 1,149,200 annual visitor days) were entirely displaced (Table 6-24).

Two main potential sources of this underestimation of the economic impacts of visitation are that estimates of visitation are too low or that average daily spending is inaccurately measured. However, the estimated average per capita daily spending level of $204 for Stateline would not intuitively appear to be a substantial underestimate; at this rate, for example, a typical family of four would spend $5,712 during a one-week stay. If the spending estimate is not too low, the main source of error would likely be a low estimate of annual visitation. Considering that alternative estimates of basinwide visitation range as high as 23 million visitor days (almost nine times larger than the level assumed for this validation test), underestimating visitation is a plausible source of model error.

One hypothesis explaining the underestimation of basin visitation is that day use exceeds the estimated 12 percent of total

Table 6-19—Estimated allocation of visitor spending to economic sectors.

Region / Spending Category	Average Daily per capita Spending (in $)	Economic Sector Allocation[1]	Retail Margin (in %)	Amount (in $)
California South Shore (without gaming)				
Food & Drink	$32.00	Food Stores (450) - 50%	25%	4.00
		Eating & Drinking (454) - 50%	100%	16.00
Lodging	31.00	Hotels & Lodging (463) - 100%	100%	31.00
Transportation	6.00	Food Stores (450) - 80%	25%	1.20
		Service Stations (451) - 20%	25%	.30
Entertainment	22.00	Amusement & Recreation (488) - 100%	100%	22.00
Other[2]	44.00	Miscellaneous Retail (455) - 25%	25%	2.75
		Amusement & Recreation (488) - 75%	100%	33.00
Total				**110.25**
Nevada South Shore (with gaming)				
Food & Drink	32.00	Food Stores (450) - 50%	25%	4.00
		Eating & Drinking (454) - 50%	100%	16.00
Lodging	31.00	Hotels & Lodging (463) - 100%	100%	31.00
Transportation	6.00	Food Stores (450) - 80%	25%	1.20
		Service Stations (451) - 20%	25%	.30
Entertainment	22.00	Amusement & Recreation (488) - 100%	100%	22.00
Gaming	69.00	Hotels & Lodging (463) - 85%	100%	58.65
		Amusement & Recreation (488) - 15%	100%	10.35
Other[2]	44.00	Miscellaneous Retail (455) - 25%	25%	2.75
		Amusement & Recreation (488) - 75%	100%	33.00
Total				**179.25**
California North Shore (without gaming)				
Food & Drink	43.00	Food Stores (450) - 50%	25%	5.38
		Eating & Drinking (454) - 50%	100%	21.50
Lodging	42.00	Hotels & Lodging (463) - 100%	100%	42.00
Transportation	8.00	Food Stores (450) - 80%	25%	1.60
		Service Stations (451) - 20%	25%	.40
Entertainment	12.00	Amusement & Recreation (488) - 100%	100%	12
Other[2]	66.00	Miscellaneous Retail (455) - 25%	25%	4.12
		Amusement & Recreation (488) - 75%	100%	49.50
Total				**136.50**
Nevada North Shore (with gaming)				
Food & Drink	43.00	Food Stores (450) - 50%	25%	5.38
		Eating & Drinking (454) - 50%	100%	21.50
Lodging	42.00	Hotels & Lodging (463) - 100%	100%	42.00
Transportation	8.00	Food Stores (450) - 80%	25%	1.60
		Service Stations (451) - 20%	25%	.40
Entertainment	12.00	Amusement & Recreation (488) - 100%	100%	12.00
Gaming	38.00	Hotels & Lodging (463) - 85%	100%	32.30
		Amusement & Recreation (488) - 15%	100%	5.70
Other[2]	66.00	Miscellaneous Retail (455) - 25%	25%	4.12
		Amusement & Recreation (488) - 75%	100%	49.50
Total				**174.50**

Source: Jones and Stokes Associates, Inc.

Notes:
[1] 3-digit numbers in parentheses refer to Standard Industry Classification (SIC) codes
[2] The "Other" category includes spending at local retail establishments (e.g., sundries, souvenirs, etc.)

Table 6-20—Estimated visitor spending by economic sector and community region.

Community Region	Economic Sector	$/Visitor Day	Total Annual Spending ($1,000)
Kings Beach	Food Stores (450)	6.98	254
	Service Stations (451)	.40	14
	Eating & Drinking (454)	21.50	782
	Miscellaneous Retail (455)	4.12	149
	Hotels & Lodging Places (463)	42.00	1,528
	Amusement and Recreation (488)	61.50	2,238
Total		**136.50**	**4,965**
South Lake Tahoe	Food Stores (450)	5.20	3,231
	Service Stations (451)	.30	186
	Eating & Drinking (454)	16.00	9,942
	Miscellaneous Retail (455)	2.75	1,708
	Hotels & Lodging Places (463)	31.00	19,263
	Amusement and Recreation (488)	55.00	34,177
Total		**110.25**	**68,507**
Tahoe City	Food Stores (450)	6.98	2,667
	Service Stations (451)	.40	152
	Eating & Drinking (454)	21.50	8,217
	Miscellaneous Retail (455)	4.12	1,574
	Hotels & Lodging Places (463)	42.00	16,052
	Amusement and Recreation (488)	61.50	23,505
Total		**136.50**	**52,167**
Incline Village	Food Stores (450)	6.98	2,867
	Service Stations (451)	.40	164
	Eating & Drinking (454)	21.50	8,832
	Miscellaneous Retail (455)	4.12	1,692
	Hotels & Lodging Places (463)	74.30	30,522
	Amusement and Recreation (488)	67.20	27,605
Total		**174.50**	**71,682**
Stateline	Food Stores (450)	5.20	5,975
	Service Stations (451)	.30	344
	Eating & Drinking (454)	16.00	18,387
	Miscellaneous Retail (455)	2.75	3,160
	Hotels & Lodging Places (463)	89.65	103,025
	Amusement and Recreation (488)	65.35	75,100
Total		**179.25**	**205,991**

Source: Jones and Stokes Associates, Inc.

Table 6-21—Direct employment impacts related to loss of visitation at Kings Beach, California.

Economic Sector	Sales ($1,000)	Employment (# of Jobs)	Employment Change (# of Jobs)	Change (%)
Food Stores (450)	1,255	27	(6)	-22
Service Stations (451)	1,265	16	0	0
Eating & Drinking (454)	19,111	570	(31)	-5
Miscellaneous Retail (455)	3,182	114	(7)	-6
Hotels & Lodging Places (463)	14,403	267	(28)	-11
Amusement and Recreation (488)	13,085	411	(70)	- 17
Subtotal (all visitor serving sectors)	52,301	1,405	(142)	-10
All Other Sectors	324,546	1,145	(17)	-2
Total	376,847	2,550	(159)	-6

Source: Jones and Stokes Associates, Inc.

Table 6-22—Direct employment impacts related to loss of visitation at South Lake Tahoe, California.

Economic Sector	Sales ($1,000)	Employment (# of Jobs)	Employment Change (# of Jobs)	Change (%)
Food Stores (450)	27,564	600	(89)	-15
Service Stations (451)	13,760	234	(11)	-5
Eating & Drinking (454)	44,799	1,361	(348)	-26
Miscellaneous Retail (455)	18,068	624	(73)	-12
Hotels & Lodging Places (463)	74,202	1,627	(422)	-26
Amusement and Recreation (488)	74,396	2,897	(1,331)	- 46
Subtotal (all visitor serving sectors)	252,789	7,343	(2,274)	-31

Source: Jones and Stokes Associates, Inc.

Table 6-23—Direct employment impacts related to loss of visitation at Tahoe City, California.

Economic Sector	Sales ($1,000)	Employment (# of Jobs)	Employment Change (# of Jobs)	Change (%)
Food Stores (450)	5,503	117	(65)	-56
Service Stations (451)	2,847	35	(4)	-11
Eating & Drinking (454)	31,619	944	(331)	-35
Miscellaneous Retail (455)	5,366	192	(70)	-36
Hotels & Lodging Places (463)	6,735	125	(298)	-238
Amusement and Recreation (488)	38,101	1,196	(738)	- 62
Subtotal (all visitor serving sectors)	90,171	2,609	(1,506)	-58
All Other Sectors	702,947	2,954	(257)	-9
Total	793,118	5,563	(1,763)	-32

Source: Jones and Stokes Associates, Inc.

Table 6-24—Direct employment impacts related to loss of visitation at Incline Village, Nevada.

Economic Sector	Sales ($1,000)	Employment (# of Jobs)	Employment Change (# of Jobs)	Change (%)
Food Stores (450)	10,132	233	(70)	-30
Service Stations (451)	3,111	42	(3)	-7
Eating & Drinking (454)	18,030	495	(253)	-51
Miscellaneous Retail (455)	5,137	160	(58)	-36
Hotels & Lodging Places (463)	189,697	2,936	(472)	-16
Amusement and Recreation (488)	25,943	399	(425)	- 107
Subtotal (all visitor serving sectors)	252,050	4,265	(1,281)	-30
All Other Sectors:	1,228,220	5,117	(275)	-5
Total	1,480,270	9,382	(1,556)	-17

Source: Jones and Stokes Associates, Inc.

Table 6-25—Direct employment impacts related to loss of visitation at Stateline, Nevada.

Economic Sector	Sales ($1,000)	Employment (# of Jobs)	Employment Change (# of Jobs)	Change (%)
Food Stores (450)	1,850	42	(134)	-319
Service Stations (451)	1,829	36	(7)	-19
Eating & Drinking (454)	23,131	674	(535)	-79
Miscellaneous Retail (455)	6,606	217	(104)	-48
Hotels & Lodging Places (463)	736,117	10,047	(1,406)	-14
Amusement and Recreation (488)	26,666	385	(1,085)	- 282
Subtotal (all visitor serving sectors)	796,199	11,401	(3,271)	-29
All Other Sectors:	901,829	3,157	(320)	-10
Total	1,698,028	14,558	(3,591)	-25

Source: Jones and Stokes Associates, Inc.

visitation (see recreation section below). In comparison to overnight visitation, for which relatively reliable data are reported by lodging places, day use is difficult to estimate reliably (Ribaudo 1999b). Although the average daily spending level for day users is probably much lower than for overnight visitors, substantial underestimation of day use would account for at least a portion of the models' underestimation of visitor impacts on the economy.

Another type of model error apparent in tables 6-21 through 6-25 is that the assumed apportioning of spending among visitor-serving sectors (Table 6-19) is inconsistent with the models' classification of employment by sector. This error is indicated by the fact that eliminating visitation is shown as having an unreasonably small employment effect on some sectors (e.g., -14 percent in Stateline hotels and lodging places) and an unreasonably large effect on other sectors (e.g., -323 percent in Stateline food stores). This error is probably attributable primarily to the standard industrial classification (i.e., SIC coding) of major visitor-serving facilities in US Census Bureau employment data. It appears, for

example, that all or nearly all employment in Stateline casino facilities is classified within the hotels and lodging places sector. This classification is inconsistent with the assumed apportioning of spending (Table 6-19), where no food and drink, entertainment, or other spending is allocated to hotels and lodging places, and results in underestimating the effects of visitation on this sector. Conversely, apportioning 50 percent of food and drink spending and 80 percent of transportation spending to food stores probably overstates the effects of visitation on this sector.

A discussion of these errors is included here in order to point out the need for better estimates of basin visitation and related spending, primarily for day users, and also to improve understanding of the classification of major visitor-serving facilities in relation to the allocation of visitor spending among sectors. Improved information on these economic variables must be incorporated into the models before the models can be applied reliably for policy analysis.

A second validation test was conducted by comparing the estimated distribution of visitation based on room-night rentals, as described above, and the distribution based on employment levels in the hospitality sectors—motels and lodging places and amusement and recreation services. As discussed above, based on room-night rentals, the north shore area is estimated to account for 46 percent more visitor days than the south shore area. Based on the hospitality sector employment estimates reported in tables 6-13 through 6-17, the north shore area also accounts for 46 percent more visitor days than the south shore area. The convergence of these independent estimates supports the validity of the estimated distribution of visitation between the north and south shore areas.

Social and Economic Indicators to Measure Links between Socioeconomic Well-being and Environmental Quality

Especially in light of the fiscal implications of the EIP, many interests in the Tahoe basin's community have expressed a need to monitor the social and economic impacts of actions required to move the basin toward threshold attainment (Wallace 1998; Ribaudo 1999; Hasty 1999; TCORP 1999). TRPA's 1996 threshold evaluation report notes that while there are no specific social or economic thresholds, there is a need to "study, on an ongoing basis, the cause and effect relationships related to the Region's economy" (TRPA 1996: 9-1). Under its goals and policies, the regional plan mandates a monitoring program to "allow analysis of possible socioeconomic impacts of the Regional Plan" (TRPA 1986: VII-26). The purpose of monitoring social and economic indicators is to "assist in economic development and diversification within the constraints of the thresholds" (TRPA 1986). Indeed, under Goal #3 of the implementation element, the plan establishes a socioeconomic advisory panel "to help develop a socioeconomic monitoring program, to periodically review and report on the state of the basin's economy and make recommendations to the governing board" (TRPA 1986).

The 1996 threshold evaluation document makes several recommendations to account for the impacts of the regulatory environment on the economy, including the following:

- Allocations of additional residential development should be continued to allow for some residential development opportunities, which would have positive economic benefits in terms of stability, assessed valuation, and—to a limited degree—housing supply and availability.
- TRPA should initiate a study of the local economy to determine key business relationships and the impacts of development guidelines, including environmental mitigation programs, on new business development.
- TRPA should monitor the rate of absorption of commercial allocations by business type and location to establish the need for additional commercial allocations in the future.
- TRPA should develop a model of the local economy to determine significant contributors to local economic growth. This model should estimate total economic activity, economic multiplier rates, and

assess the impact and extent of economic leakage.

- TRPA should study the recreational nature of the local economy to determine how this relates to the commercial needs of the Region (TRPA 1996: 9-17).

Finally, the 1996 evaluation includes an implementation plan and a schedule for each of the elements in the plan. In that schedule, there is a commitment to work with the Tahoe Truckee Economic Coalition (TTREC) to provide data on economic trends in preparation for the 2001 evaluation. One element of the plan is to complete an "[i]ntegrated model of the Tahoe Region economy," to be completed by June 30, 2000 (TRPA 1996).

TRPA and many representatives of the larger community have long recognized the importance of tracking indicators of social and economic impacts beyond the immediately obvious impacts of regulation. However, it appears that neither institutional mechanisms nor social or political demand have been strong enough for TRPA (or any other public agency with regional influence in the basin) to monitor a full suite of socioeconomic indicators and trends.

TTREC was formed in the early 1990s to monitor economic trends and to plan regionally for economic change. While the primary impetus to initiate TTREC came from TRPA, the idea had broad community support (Teshara 1998; Hasty 1999; SEI Working Group 1999b). TTREC articulated the need for regional perspectives on economic trends and development in the basin; however, TTREC has been less successful in fostering a social and economic monitoring and modeling program at a basin-wide scale. Between 1993 and 1996 TTREC sponsored efforts to develop a suite of quality of life indicators for the basin, holding workshops and public meetings to capture the range of perspectives and needs in the community (TTREC 1996).

TTREC's economic indicators project held several workshops and meetings and stimulated public discussion about quality of life in the Tahoe basin's communities. However, a monitoring effort based on the quality of life indicators developed by TTREC and others was not carried forward or institutionalized (Farrell 1998; Hasty 1999; Ross 1999).

As is noted in the institutional assessment, the separation of regulatory authority and political representation creates a structural separation between the articulation of social preferences at the local community level and the expression of social preferences at regional, state, and national scales (R/UDAT 1989: 5, 21 & 25 ; NLTRA 1995: 3). TRPA is designed to compensate for this structural disconnection through a tiered approach to representation of interests. At the local scale, the TRPA-supported community planning process, in which 23 "natural communities" formed citizen advisory committees to develop community plans and plan area statements (PAS), continues in some of the communities. Ideas and recommendations that emerge from the advisory committees are integrated into TRPA's policy process through its Advisory Planning Commission (APC) (Lacey 1998). In general, the community plans reflect a desire to preserve the area's historic characteristics while improving known scenic, parking, transportation, and public facility deficiencies.

The APC is on the second tier, with basin-wide representation. This level of governance is designed to provide a regional focus to planning issues and to allow a greater degree of public involvement in developing regulation and policy. Finally, there is a board of governors, whose membership represents interests at the bi-state and national level. Through this three-tiered approach, TRPA is institutionally positioned to negotiate the "nested hierarchies" of social preferences.

There has been a decades-long evolution in the collective understanding of the purposes of public assets and public resources in the basin. One of the clearest statements of that collective understanding is found in the Goals and Policies of the Tahoe Regional Plan:

> The primary function of the region shall be as a mountain recreation area with outstanding scenic and natural values . . . . The economic health of the Region depends on a viable tourist and recreation-oriented environment. It is

> not the intent of this Regional Plan to encourage other economic development, such as industry or non-service commercial facilities, at the expense of outdoor recreation in the Tahoe Region (TRPA 1986: II-2).

As is pointed out in the SNEP case study of the Lake Tahoe basin (Elliott-Fisk et al. 1996), the relatively rapid acquisition of public lands in the basin over 30 years is a significant indicator of a public vision for Lake Tahoe. Various early efforts to designate the basin as a national park or to give the basin similarly protected status were not successful (TRPA 1976; Schmidt 1979; Fink 1991). However, Lake Tahoe's value as a scenic resource and tourist destination became the primary asset around which public and private investment was to be made (Jackson and Pisani 1973; Strong 1984, 1998). The recreation, tourism and service economy that grew up around that vision is still determined by the basin's fundamental organizing principal, clearly stated in the 1996 threshold evaluation document: the export of a high quality recreational experience (see introduction to TRPA 1996).

The mandate of the regional plan is to achieve a relative balance of costs and benefits in all sectors—social, economic, and environmental—without compromising the unique natural assets of the basin. The TTREC community indicators process identified a mutual dependency: a healthy community in the basin depends on a healthy environment, and the health of the environment depends on the health of the community. The challenge TTREC and others face is how to measure what is meant by "health." Many of the indicators identified in the TTREC process between 1993 and 1996 went beyond economic measurements to social concerns, acknowledging that measurement of a community's health through predominantly econometric means is unsatisfactory.

The creative tension among economic development, community well-being, and environmental quality has been heightened as the suite of EIP projects has been more clearly defined following the Presidential Summit in July 1997. There is substantial concern that the local private and public contribution, totaling about $254 million,[8] will create unfair burdens on certain economic and social sectors. Those social and economic questions are yet to be understood and resolved by future research and policy development efforts.

There are differing perspectives on the relative weight that community well-being should have in the development of public policy in the basin. General agreement exists that purely economic measures of community well-being contribute to a misconstruction of the social and economic questions raised by TTREC and others. At the core of the issue is a two-step argument: investments in community well-being (i.e., investments in sources of social and human capital) result in higher levels of social and economic resiliency (i.e., community capacity) (Doak and Kusel 1996; Kusel 1996; Sierra Business Council 1997). Higher community capacity and socioeconomic scores (Doak and Kusel 1996), measured across the entire community, are likely to indicate a greater willingness to participate in seeking sources of investment for environmental quality (Miller 1998b; Hasty 1999; Ross 1999). This logic has been articulated in other community indicators projects occurring throughout the United States (Tyler, Norris Associates 1997; Redefining Progress 1998; National Association of Regional Councils 1999). Daniel Kemmis and Neal Pierce, both regional writers of national and international stature, have monitored the trend toward what Pierce has called the "new citistate" (Peirce 1993; Kemmis 1995). This trend is characterized by cities, metropolitan regions, and groups of towns that have collectively identified the economic, cultural, and social logic of their regions. The revitalization of regions as coherent political, social, and economic units has accompanied the movement toward environmental justice and livable communities. What these efforts have in common, and what is particularly relevant to the basin, is a commitment to broad-based participatory review of the measurable indicators by which the region or "citistate" will monitor its livability, sustainability, and relative collective health. "Community indicators" is an increasingly common term used to capture both the processes and outcomes of these collective efforts to renegotiate the terms of health, livability, and sustainability. As one national clearinghouse on these processes defines them,

[8] The EIP's cost analysis projects a total of $908 million, including $152.7 million from the private sector and $101 million from local government sources (TRPA 1998).

> "Community Indicators" are a measuring system, designed, developed and researched by the community members themselves. They are like instrument panels, that provide citizens with clear and honest information about past trends and current realities, and assist them in steering their communities on their desired course. They help civic leaders clarify key issues and challenges, or prioritize spending when budgets are tight. (Tyler, Norris Associates 1997: 1).

According to the database maintained by the San Francisco-based nonprofit, Redefining Progress, there are presently nearly 250 community indicator processes underway in cities across the country (Redefining Progress 1999). The database criteria require that entries have an ongoing multi-stakeholder process, actual projects, and an active effort to define appropriate indicators (Frank 1999). An analysis of the database shows approximately ten percent of those projects are currently under development in California alone. A common thread among all of these processes is the development of quantifiable social and economic indicators that more closely match each community's or city's sense of how to measure quality of life, community well-being, and sustainability. Moreover, the process itself often turns out to be as important as the ultimate content and focus of the resulting suite of indicators (Tyler, Norris Associates 1997: 1).

The Tahoe basin's regulatory environment, as expressed in the regional plan, already mandates an approach to economic and social sustainability balanced with conservation of its unique environmental assets (Ross 1999; Hasty 1999). However, the need to quantify and analyze the social and economic impacts of the EIP and the evolving demand to include some understanding of community well-being in the basin's planning and investment strategies are likely to stimulate demand for a regionally focused effort to identify shared indicators of quality of life. There is demand from the private sector to develop an economic model of the basin, echoing the recommendations of both TRPA threshold evaluations (1991 and 1996). The modeling development effort also may trigger support for quality of life indicators that enable the policy community to better monitor social and community well-being.

The assessment's socioeconomic working group reviewed a list of 57 indicators that might be used to monitor social well-being and economic health. Some of the indicators identified have relatively little data to support their measurement in the basin at this time. While the complete list is reproduced in Appendix T (SEI Working Group 1999a, 1999c), the selected indicators can be grouped into the following general categories:

- Recreation, tourism, and visitor-profile information;
- Demographics and social characteristics of part-time and full-time residents;
- Social indicators, including educational achievement, crime, and public assistance;
- Political and social participation and volunteerism;
- New and emerging economic activities;
- Labor and employment;
- Housing;
- Transportation; and
- Redevelopment and community reinvestment.

No formal mandate or process is in place at this time to pursue a suite of social and economic indicators in the basin. However, developing and monitoring social and economic indicators in the basin has challenged planners and policy-makers for some time. The difficulty of the task is closely related to the following issues:

- Indicators themselves are difficult to identify in ways that are both useful to policy-makers and scientifically and methodologically credible. A recent informal survey of community indicator project sponsors found that many indicators initially proposed by a collaborative process

eventually are rejected because their measurement is often infeasible or cost prohibitive (Nechodom 1999; Bonnenfant 1999).

- The identification of indicators requires sufficient public process in order to establish the purpose of the indicators and to explore fully the potential consequences of measuring one particular suite of indicators as opposed to another.
- Community indicator processes are resource-intensive and time-consuming. Many attempts to initiate community indicators processes fail because of lack of sufficient coordination, capacity, and funding. Others find that, despite large investments of volunteer and in-kind labor and resources, the process often outruns any single organization's ability to sustain it to completion (Redefining Progress 1998; Nechodom 1999).
- The process of establishing an appropriate suite of indicators is itself a political process and is likely to be controversial.

Issue 2: Understanding Patterns of Recreation and Tourism as They Affect Environmental Quality, Social Well-being, and Economic Health

Emerging Trends in Tourism and Recreation

In the first third of the twentieth century, the Tahoe basin provided recreation opportunities to an elite group of summer residents and resort guests drawn to the area's natural amenities. In the 1930s, an increasing number of middle class and working people began to enjoy camping in the basin (Strong 1986). Following World War II, tourism expanded rapidly, as motorists from northern California and around the country took advantage of improved highway access to and around the lake. While games of chance attracted primarily summer visitors to the Nevada side of the basin, rapid development of downhill ski resorts following the 1960 Winter Olympics at Squaw Valley established the basis for a year-round tourist destination. A seasonally bimodal pattern of visitation, with peaks in summer and winter, developed and has persisted through today. Hotels, marinas, trails, and campgrounds were developed to accommodate the recreation needs of a growing and increasingly mobile, wealthy, and suburban population of visitors.

Quantitative Trend Analysis—Emerging trends in tourism can be identified by analyzing various types of quantitative and qualitative data. Users of the information often prefer quantitative data on recreation use levels and patterns and on demographics over qualitative data, primarily because of the relative objectivity of quantitative data. Visitor and user censuses and surveys have been conducted in the basin to establish baseline levels and trends for basin tourism and recreation. (Censuses involve collecting information on an entire population of interest; surveys usually involve collecting information on a sample of the population.) Not all quantitative data on recreation are census- or survey-based, however. The USDA Forest Service, for example, estimates annual participation in selected recreation activities based on various methods, including occasional counts of people and vehicles. As a result of using these diverse methods, the reliability of the estimates is variable. The total number of visitor days spent in the basin is a highly contentious recreation datum (Lacey 1999). An estimate of 23 million annual visitor days was reported in a recent case study (Elliott-Fisk et al. 1997). This estimate is based on a broadly inclusive definition of visitation and undoubtedly overstates actual visitation, as usually defined. For example, it includes seasonal residents among visitors and assumes that each seasonal resident accounts for 90 visitor days each year. It also includes people who make incidental stops while traveling through the basin, predominantly on the south shore via Highway 50 (Lacey 1999).

A much more conservative recent estimate of the basin's annual visitation level is 2.6 million visitor days (Strategic Marketing Group 1999), which includes 1.8 million visitor days in the south shore area and 0.8 million in the north shore area. This estimate for the south shore area was based on the reported number of room-nights rented annually over a three-year period, multiplied by the average number of persons per room, which had been

estimated in a previous study. Based on another study, day users were estimated to account for approximately 12 percent of total visitation on the south shore, which is in addition to the number resulting from the room-night analysis. The north shore visitation estimate was based on the relative number of rented room-nights reported for the north shore area. The 2.6 million total visitor-day estimate probably understates the true total, as usually defined, because it excludes, among other things, campground use. As indicated by the large discrepancy between these two estimates, however, the annual level of visitation actually occurring in the basin is a highly imprecise statistic.

Qualitative data on tourism trends usually take the form of professional judgment and expert opinion. Local professional recreation managers and experienced local providers of tourism and recreation services are usually the most authoritative sources of professional judgment and expert opinion on tourism trends.

Quantitative trend analysis requires compiling time-series data; that is, measurements or estimates of variables of interest consistently made over time. The best time-series data on tourism in the basin have been on skier days, gaming revenues, Tahoe-bound airport arrivals, and lodging nights purchased, all of which have been compiled for recreation and tourism industry associations. Consistent data on these variables cover at least the past eight years. As shown in Table 6-26, total alpine skier days at resorts in and adjacent to the basin generally have increased during the 1990s, although skier days have declined in a few recent years. Gaming revenues (expressed in constant 1998 dollars) generally have declined during this decade. The number of Reno-Tahoe International Airport arrivals bound for the basin has increased dramatically since 1991, as has the proportion of arrivals who are visitors. These air-passenger trends indicate the growth of the basin as a tourist destination for long-distance visitors.

Total hotel lodging nights purchased in the South Lake Tahoe area have fluctuated in the 1.0 million to 1.1 million range since 1990, achieving their maximum in 1994 (Table 6-27). The average room occupancy rate at South Shore casinos declined in 1991, but since then the rate has been relatively stable. During the 1990s, the average hotel room occupancy rate in the Incline Village/Crystal Bay area fluctuated in the 60 percent to 69 percent range, achieving a maximum in 1995, while the average occupancy rate for condominiums and vacation homes in this area fluctuated in the 23 percent to 32 percent range, peaking in 1993.

The most comprehensive statistically reliable sources of data on tourism in the basin are the quarterly visitor surveys conducted for the Lake Tahoe Visitors Authority (for the South Lake Tahoe area) and the North Lake Tahoe Resort Association (for the northern portion of the basin). Although these surveys do not provide estimates of total visitation, they provide substantial information on group type (e.g., family or other) and size, regions of origin, length and frequency of stay, activities, choice of lodging type, and spending patterns. Some of the problems that limit the identification and interpretation of tourism trends based on these survey results, however, include the small number of years in which surveys have been conducted, changes over time in the wording of survey questions leading to the incomparability of data on selected variables for various years, and declining reliability of results due to reduced survey sample sizes (Ribaudo 1999b).

In some cases, year-to-year variations in the data for several variables, combined with the above data limitations, suggest that what might appear to be a trend may merely represent aberrations or normal fluctuations. Examples of such questionable patterns include the proportion of South Lake Tahoe visitors who are day users, who stay in hotels or casinos, who participate in gaming or alpine skiing, and who live in California or the San Francisco Bay Area (Strategic Marketing Group 1997 and 1998; RRC Associates 1992; Rosall, Remmen, and Cares, Inc. 1990). The data source that provides estimates of total recreation use in the largest portion of the

Table 6-26—Skier days, gaming revenues, and air passenger arrivals and visitors for the Lake Tahoe basin.

Year	Skier Days[a]	Gaming Revenues[b]	Tahoe Basin-bound Air Passenger Arrivals[c]	Percent of Airport Arrivals Who Are Visitors
1990		489	--	--
1991		455	66,054	64.4
1992		438	104,969	77.1
1993		433	89,287	82.2
1994	2,500	436	127,148	81.6
1995	2,900	402	132,138	84.8
1996	2,700	375	115,985	89.0
1997	2,600	338	188,667	89.2
1998	3,200	348	--	--

Sources: California Ski Industry Association 1990-1998, Nevada State Gaming Control Board 1990-1998, Airport Authority for Washoe County 1991-1997.

Notes:
[a] In thousands. Each ski year includes the November-December period from the previous year.
[b] In millions of 1998 dollars.
[c] For Reno-Tahoe International Airport.

Table 6-27—Lodging room nights and occupancy rates for the Lake Tahoe basin.

Year	South Shore Hotel Nights	South Shore Casino Room Occupancy (%)	Incline Village/Crystal Bay Hotel Room Occupancy (%)	Incline Village/Crystal Bay Condo-Vacation Home Occupancy (%)
1990	975,250	81.5	--	--
1991	896,307	75.3	60.0	25.9
1992	907,794	75.1	62.8	28.8
1993	1,019,007	77.4	66.2	31.7
1994	1,028,469	74.2	68.8	27.8
1995	1,028,140	76.6	69.0	24.9
1996	949,936	76.7	66.7	22.9
1997	934,834	76.0	64.5	25.1
1998	--	75.3	66.4	30.3

Sources: City of South Lake Tahoe 1990-1998, Incline Village/Crystal Bay Visitors and Convention Bureau 1990-1998.

basin is the USDA Forest Service's Recreation Inventory Management (RIM) system as applied to the Lake Tahoe Basin Management Unit (LTBMU), which accounts for 77 percent of the basin's land base. The RIM system provides estimates of total annual visitation to the LTBMU and of total levels of participation in more than 60 activities. The estimates are based on various methods, including campground registrations, records of wilderness permits issued, automatic traffic counters (e.g., at building entrances), and occasional counts of people or vehicles at selected locations. Although all of these methods measure the same variable (recreation visitor days, or total number of visitor-hours divided by 12), they vary greatly with regard to the statistical reliability of the results. Consequently, time-series data on aggregated use (e.g., total annual use of the LTBMU) are a more reliable indicator of trend than time-series data on participation in most activities or activity groups. Between 1972, when the LTBMU was established, and 1993, estimated total annual use of the LTBMU increased from approximately 2.3 million RVDs to approximately 3.0 million RVDs.

Since then, total use has been relatively constant (Lane 1999). However, a comparison of LTBMU figures with the other estimates of the total number of visitor days spent in the basin each year (23 million) (Elliott-Fisk et al. 1997) suggests that differing measurements of visitation used in the basin make it difficult to establish accurately the actual level of facility use and visitation. Given the critical nature of this kind of information for planning and policy, the lack of consistent measurements or data on visitation is highly problematic. Several other public recreation providers systematically collect data on recreation use. For example, the California Department of Parks and Recreation and the Nevada Division of State Parks both prepare monthly summaries of use of state park facilities in the basin. These summaries are based on paid attendance records and on occasional counts conducted by rangers. The California Department of Parks and Recreation also manages the state's SnowPark program, which involves sales of parking permits for use at trailheads and other snowplay areas in the northern and central Sierra Nevada, including four locations in or near the basin. SnowPark permit sales records are the best source of data on levels of cross-country skiing and similar snowplay in the basin (Finster 1999).

The recreation agencies of the city of South Lake Tahoe, Douglas County, and the utility districts serving the Incline Village, North Tahoe, Tahoe City, and Tahoe-Paradise communities also collect data on the use of community parks and related facilities that they manage; however, their systematic data collection efforts typically are focused on just a few aspects of facility use.

Special studies occasionally are conducted on various aspects of basin recreation and tourism, including recent surveys of watercraft use (Hagler Bailly, Inc. 1998), bike trail use (Tahoe Coalition of Recreation Providers 1997), and visitors' attitudes (JD Franz Research 1998). Assessments of the adequacy of and need for community recreation facilities also are periodically conducted (The Dangermond Group 1999; Parsons Harland Bartholomew & Associates, Inc. 1998).

Qualitative Trend Analysis—In addition to quantitatively documented trends in basin tourism and recreation discussed above, several emerging trends have been observed by local recreation managers and tourist service providers, as described below.

- The most important trends driving changes in the recreation patterns in the Tahoe basin are the increased ethnic diversity of visitors and residents and the increased emphasis on family-based recreation. The average size of families visiting the basin has increased, with more generations (including grandparents) participating. More family visitation has resulted in increased demand for affordable snowplay facilities and for larger campsites and picnicking sites. While demand for tent-camping facilities is declining, demand for campsites that accommodate large recreation vehicles is increasing. Demand is increasing for recreation experiences that include an education component, such as visits to museums, historic sites, and Washoe cultural sites. The need is increasing for bilingual signage and interpretive displays (Lane 1999; Michaely 1999; Gustafson 1999b; Teshara 1999).
- Demand is increasing rapidly for recreation trails, including both high-standard urban-suburban trails and backcountry trails, for bicycling, hiking, inline skating, equestrian use, and wheelchair use. Growing trail use is correlated with an increased societal emphasis on fitness and health. Substantial trail use is indirectly associated with alpine skiing in that family members who elect not to ski on certain days or parts of days often recreate on trails instead (Gustafson 1999b; Michaely 1999; Lane 1999).
- Large groups of cyclists frequently use the basin's roads for organized rides. In addition to bicycling for recreation, bicycles are increasingly used as an alternative to motor vehicles for commuting and shopping. The basin is becoming an

important destination for mountain bikers of all skill levels. Old logging roads are being converted to bike trails to accommodate this demand (Tahoe Coalition of Recreation Providers 1997; Lane 1999; Michaely 1999).

- Increasing recreation demand, particularly for access to the Lake Tahoe shoreline, is not being met because of inadequate facility capacity, limited public access, and congestion. Public parking lots and shoreline resorts (e.g., Camp Richardson and Zephyr Cove) are frequently full during the recreation season. Fees are being charged for access to more areas and facilities. Charging fees tends to displace potential users to free-use areas, increasing congestion at these areas, and resulting in more driving, both to find available facilities and as an alternative to using fee-use areas (Lane 1999).
- Demand is rapidly increasing for youth soccer facilities and programs to serve residents. There is unmet demand for indoor facilities for swimming, basketball, exercising, and other activities. Demand for such adult team-sport programs as softball is decreasing. Although community park facilities historically were intended to serve primary resident populations, they are an increasingly important attraction for visitors (Weiss 1999; Gustafson 1999b; Michaely 1999; Lane 1999).
- Participation is increasing in individual-participant activities that require skill and specialized equipment. These activities include golf, mountain biking, cross-country skiing, snowshoeing, snowmobiling, equestrian activities, river rafting, windsurfing, kayaking, and flyfishing (Michaely 1999; Gustafson 1999b).
- Visitors are more interested in pursuing outdoor activities and using such facilities as campgrounds and trails in the traditional off-seasons of spring, fall, and winter (Michaely 1999; Gustafson 1999b).
- Fueled by the proliferation of sport utility vehicles, driving on backcountry roads and off-road is increasing (Lane 1999).
- As indicated by increasing deplanements at the Reno-Tahoe International Airport, the basin is attracting more visitors from distant locations seeking a destination resort experience (Teshara 1999).
- Fewer visitors are participating exclusively in high-stakes gaming; visitors tend to participate in gaming for shorter periods, on a relatively recreational level (Teshara 1999).

Key Data Gaps—The basin's economic health and social well-being depend heavily on the quality, availability, and sustainability of local recreation opportunities. Better information on recreation and tourism trends would be useful not only to recreation planners and tourist business proprietors but also to community and regional planners and decision-makers and all residents concerned with the area's future. Some of the key gaps in data on recreation and tourism that could be filled to help improve and sustain the basin's economic health and social well-being are listed below.

- *Better information on the demographic profiles of visitors and resident-recreationists, including age, ethnicity, household size, income, and recreation preferences*—The demographics of the populations of California and Nevada (the sources of more than half of the basin's annual visitation) are changing rapidly, increasing the diversity of the visitor populations to the basin.
- *More reliable estimates of basinwide visitation levels, disaggregated by community, by day use and overnight use, and by tourists and seasonal residents*—More reliable information on the total number of people who visit the basin each season and how those numbers change over time would improve general understanding of basin's popularity as a tourist destination, of the dependence of the basin's economy on recreation and tourism, and of the health of this economic sector.

- *More comprehensive seasonal estimates of the activities in which visitors participate and better assessment of the reasons they choose not to participate in other activities*—A key to recreation destination success is providing the varieties and qualities of recreation opportunities that satisfy the desires of all types of visitors. The basin provides an extraordinary variety of recreation opportunities, but much is unknown about how these opportunities interact to define the Lake Tahoe recreation experience.
- *More reliable estimates of seasonal basinwide use of shore and lake areas, disaggregated by community and recreation activity*—The Lake Tahoe shoreline is the single most important focus of basin recreation. The ability to obtain access to desirable beaches contributes greatly to the quality of recreation experiences for a large proportion of visitors, especially during summer. Most communities (Incline Village being an exception) compile relatively little information on beach use.
- *More comprehensive and reliable estimates of use of high-standard (urban-suburban) trails, desegregated by type of use (for example, pedestrian and bicycle) and community*—High-standard trails are a growing focus of recreation activity in the basin for both visitors and residents. Some communities, such as Tahoe City, already have effective programs in place to assess trail use, and a good baseline estimate exists for basinwide bike trail use (Tahoe Coalition of Recreation Providers 1997). Enhancing the comprehensiveness and reliability of trail-use assessments would require implementing relatively small expansions to existing assessment efforts. Urban-suburban trail use also can displace a substantial amount of vehicle use.
- *More reliable estimates of basinwide seasonal use of backcountry roads and trails, desegregated by recreation activity and community*—An increasing share of the basin's total recreation use occurs in backcountry areas, often by people willing to spend relatively large sums to enjoy their recreation experiences. The basin provides excellent opportunities for backcountry recreation, but increasing pressure on the facilities and resources required for such recreation could lead to decreased levels of satisfaction, user conflicts, or increased environmental impacts. Better information on backcountry use would enhance recreation managers' ability to meet users' expectations and to maintain and protect backcountry facilities and resources.
- *More comprehensive assessment of the use of community parks and related facilities by visitors and residents, including current levels of satisfaction with available facilities and sources of dissatisfaction*—Community parks are a critical recreation resource for large shares of both the resident and visitor populations. They are important places for residents to take their visitors to share in the Lake Tahoe recreation experience. Better information on park users' desires and the factors that contribute to their satisfaction would help recreation managers meet their clients' expectations.

Economic Impacts of Visitor Activities

Visitors to the Tahoe basin affect the regional economy in several ways. Most notably, visitors purchasing goods and services from local businesses directly infuse money into the regional economy by supporting local businesses, the workers they employ, and the workers' households. To accommodate tourists, local businesses purchase goods and services from their suppliers, many of which are also in the basin, and these purchases also generate income and employment. On the cost side, tourism increases the need for a wide range of public services beyond the levels needed by basin residents. Finally, because the amount that most tourists would be willing to pay to enjoy the Lake Tahoe recreation

experience exceeds the amount they actually pay for the experience, tourists incur what economists call a "consumer's surplus" when they visit the basin. This surplus represents a net economic value to the tourists and to society.

Visitor Spending—Each quarter, the Lake Tahoe Visitors Authority and the North Lake Tahoe Resort Association commission surveys visitors to the south and north Lake Tahoe areas, respectively, to assess (among other things) visitor demographics, length of stay, activities, preferences, and spending patterns. The reported spending levels by category of expenditures are averaged to develop spending profiles for summer and winter visitors. The results for 1997 expressed in terms of per capita daily spending are shown in Table 6-28. [illegible] total annual visitor days in the basin estimated a[illegible] to 23 million (Elliott-Fisk et al. 1996), annual visitor spending probably amounts to several billion dollars.

Employment and Income Effects—Economists refer to the effects of purchases of the products of an economic sector on jobs and income within that sector as direct economic effects. Jobs and income generated when those revenues are spent on the inputs needed by that sector are called indirect effects. Finally, the jobs and income that result from the spending of wages and salaries by people employed in the directly affected sector are referred to as induced effects. The direct, indirect, and induced income and employment effects generated by visitor spending vary by category of spending. Labor-intensive economic sectors (i.e., sectors that allocate a large share of their total purchases to labor) tend to have relatively large direct employment effects per dollar of sales. Sectors characterized by relatively high wages, salaries, and proprietors' income (profits) also tend to have relatively large direct income effects. Sectors with high value-added levels (i.e., that buy relatively few cents worth of inputs from other sectors per dollar of sales) usually have relatively large direct employment and income effects. Sectors that purchase large amounts of inputs from other businesses in the region tend to have relatively large indirect economic effects. High value-added sectors convert a large share of sales to personal income and thus have relatively large induced effects.

Most visitor-serving businesses are retail outlets that typically have moderate labor intensity, relatively low average wages and salaries, and moderate or high value-added levels. Some visitor-serving businesses, such as restaurants, purchase many of their inputs locally or regionally, while others, such as service stations, import most of their inputs. Based on these characteristics, visitor-serving businesses tend to have moderate direct effects, relatively small indirect effects, and moderate induced economic effects per dollar of sales. Although these general results are likely to hold for most visitor-serving businesses in the basin, many exceptions also could apply. For example, specialized recreation services, such as outdoor guides, probably have relatively high levels of labor intensity and value added and relatively high average salaries.

Table 6-29 summarizes data on average earnings, labor intensity, value added, and the relative magnitude of direct, indirect, and induced effects on employment and income for main industrial sectors that serve visitors. These results were obtained from IMPLAN, a county-based input-output model designed to project the interindustry effects of changes in the production of a specified industry (Minnesota IMPLAN Group, Inc. 1994). For the purposes of this assessment, IMPLAN was used to construct a region that included the four counties (Placer, Washoe, Douglas, and Eldorado) that encompass the Tahoe basin. Carson City was excluded from the region because there is virtually no business activity in the basin portion of Carson City. Although a large share of these sectors' sales are made to visitors, the sectors (except for hotels and lodging places) also depend heavily on sales to residents. These results therefore, should not be interpreted as describing the visitor-serving portion of the regional economy exclusively; these sectors serve varying combinations of visitors and residents.

As shown in Table 6-29, of the principal visitor-serving sectors, only automotive dealers and service stations have average annual earnings in in excess of $25,000 per job; average earnings in the miscellaneous retail, amusement and recreation services, and eating and drinking places sectors is

Table 6-28—Average daily per capita spending (in dollars) by summer and winter visitors to the North and South Lake Tahoe areas, 1997.

	North Lake Tahoe		South Lake Tahoe	
	Summer	**Winter**	**Summer**	**Winter**
Food and drinks	41	45	23	40
Lodging	40	44	38	24
Transportation	9	6	6	6
Entertainment	13	12	25	19
Gaming	18	20	56	34
Other	74	62	44	43
Total	**195**	**189**	**192**	**166**

Sources: RRC Associates 1992; Strategic Marketing Group 1998.

Table 6-29—Employment and income multipliers and related characteristics for tourism-related industrial sectors in the four-county region.

Sector	Average Earnings ($)	Labor Intensity[a]	Value Added[b]	Type I Multiplier[c]		Type III Multiplier[d]	
				Income	Employment	Income	Employment
Food stores	22,213	0.774	0.856	1.07	1.07	1.78	1.76
Auto dealers and service stations	32,172	0.649	0.761	1.13	1.18	1.66	1.93
Eating and drinking P1	14,583	0.401	0.504	1.23	1.11	2.64	1.82
Miscellaneous retail	10,420	0.563	0.732	1.19	1.08	2.71	1.78
Hotels and lodging P1	24,144	0.491	0.590	1.27	1.28	2.04	2.10
Amusement and recreation services	11,340	0.418	0.630	1.33	1.16	2.83	1.92

Source: Minnesota IMPLAN Group 1994.

Notes:
[a] Employee compensation as a fraction of total production.
[b] Sum of employee compensation, indirect business taxes, proprietary income, and other property income as a fraction of total production.
[c] Type I multiplier is the sum of the direct and indirect effects on employment or income divided by the direct effect.
[d] Type III multiplier is the total effect (i.e., sum of direct, indirect, and induced effects) on employment or income divided by the direct effect.

less than $15,000. In comparison, the average earnings per job in all sectors in the four-county region is $27,389 (US Department of Commerce 1998). Food stores and automotive dealers and service stations are the most labor intensive of the major tourist-serving sectors, which suggests that they have relatively large direct effects per dollar of sales. These sectors also have the largest relative value added, another indicator of comparatively large direct economic effects.

Table 6-29 also shows type I and III multipliers for the visitor-serving sectors. Type I multipliers are defined as the sum of the direct and indirect effect, divided by the direct effect; they indicate the relative importance of the indirect effect. Type III multipliers are defined as the sum of the direct, indirect, and induced effect, divided by the direct effect; they indicate the combined importance of indirect and induced effects. None of the sectors has a Type I multiplier (for either employment for income) that exceeds 1.33, which indicates that the tourist-serving sectors of the region generate relatively little income and employment through their purchases from other businesses in the region. However, four of the sectors have Type III income multipliers that exceed 2, which means that

employees who respend their earnings generate substantial amounts of income.

A major limitation of the results shown in Table 6-29 is that the basin makes up such a small portion (in terms of area, population, and economic activity) of the four-county region. The unique economic characteristics of the basin are likely to be masked by the economic dominance of the region's larger population centers, such as Reno and Roseville. The reliability of economic impact assessments for the basin is expected to be substantially improved, however, by the further development of the input-output models specifically designed for each community region in the basin. Once completed, the community-region models will be publicly available to assess the income and job impacts of a wide range of policy options (e.g., implementing the EIP) and to refine and expand a basin-wide socioeconomic impact model.

Fiscal Effects—Besides the employment and income effects of visitor spending, the presence of large numbers of visitors (who easily outnumber basin residents during peak tourism periods) creates a need for public services beyond the levels needed by residents. Public services potentially affected by visitors include park and recreation services, law enforcement, emergency medical services, search and rescue services, water and wastewater services, solid waste disposal, and fire suppression. Visitors' demands for public services have been taken into account in planning and developing the basin's existing infrastructure and programs.

If the fiscal impacts of visitation are assumed to include only the incremental operations and maintenance costs to meet visitors' needs, as opposed to also including a share of the capital costs of infrastructure development, the cost of providing public services to visitors can be relatively small. For example, on the one hand, a recent study of recreational demands on utility capacities estimated that the total rate of water consumption associated with summer recreation in the basin at approximately 4.0 million gallons per day (mgd) (3.6 million of which is attributable to golf course watering, which serves residents as well as visitors), compared to a total estimated rate of water supplied by local agencies of 10.3 mgd. Similarly, the average summer wastewater flow attributable to recreation in the basin was estimated at 0.75 mgd, compared to the estimated wastewater flow of 14.2 mgd. (RRC Associates and Vasey Engineering 1996). On the other hand, by affecting the peak demand for some public services, visitors can be an important impetus for capacity expansions. This is particularly true in such areas as ski resort villages, where visitors greatly outnumber residents during the peak season of use.

Consumer's Surplus—In addition to the economic effects of visitor spending, recreational visits to the basin result in consumer's surplus, representing the amount visitors would be willing to spend on their visits in excess of the amount they actually spend. Use value (i.e., the net economic value that accrues to users of a recreation resource) is only one component of society's total willingness to pay to protect valuable natural resources, such as Lake Tahoe. Economic research has shown that outstanding natural resources also have existence value (peoples' willingness to pay to know that the resource exists, even if they have no plans to visit it), option value (willingness to pay to know that they will have the option to use the resource in the future, if they choose to), and bequest value (willingness to pay to know that future generations will be able to enjoy the resource) (Sanders et al. 1990). Of these four types of net economic value, use value is the only one that qualifies as consumer's surplus because none of the others actually involve consumption of a good or service (for example, use of a recreation resource). Unlike the effects of recreation spending, consumer's surplus does not involve monetary transactions nor does it generate jobs or personal income. Nonetheless, as a reflection of the quality of

a recreation experience, consumer's surplus affects visitors' well-being and sometimes influences public investment and other political decisions. Also, as a reflection of the value people place on an experience or participation in an activity, the surplus of consumers accounts for a portion of each individual's participation level and, in this sense, explains a portion of the associated monetary transactions.

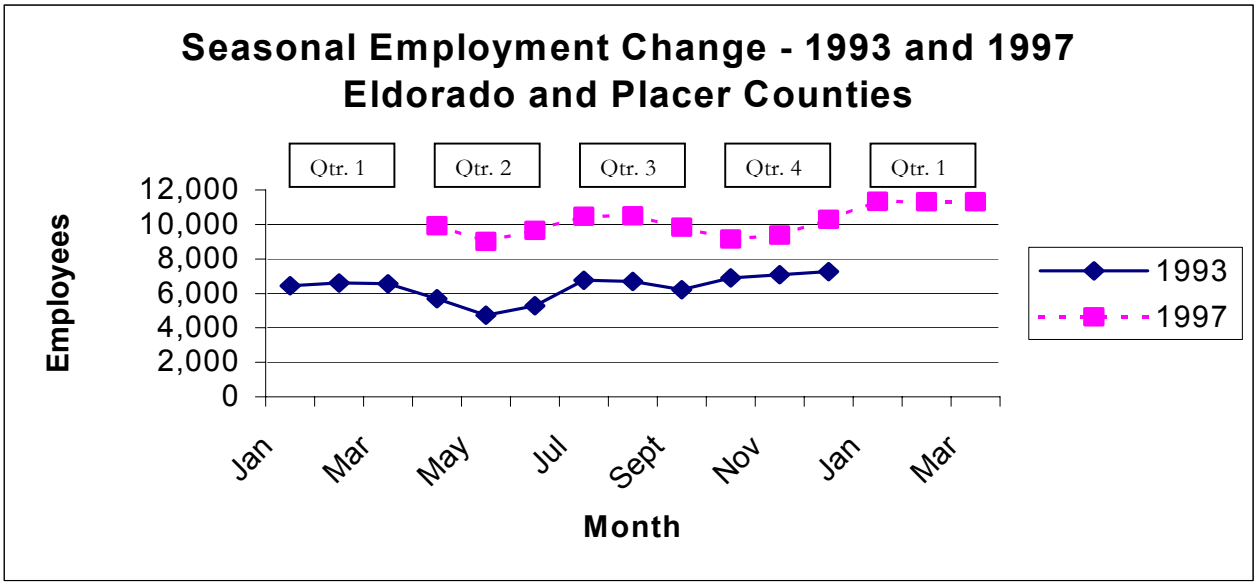
Consumer's surplus is usually measured by conducting visitor surveys, often through experiments where visitors are asked how much they would be willing to pay to continue to use a resource in its current condition, as opposed to using it in some alternative condition. This approach, the contingent valuation method (CVM), is one of two methods recommended by the US Water Resources Council for valuing outdoor recreation in federal benefit-cost studies. No CVM studies have been conducted or consumer's surplus estimates been made for Lake Tahoe or other resources in the basin. However, a CVM study of nearby Mono Lake found that each visitor to the lake would be willing to pay an average of $76 per year (in 1998 dollars) if the lake's water level were increased by seventeen feet from 6,375 feet above sea level to 6,392 feet, the elevation to which the California State Water Resources Control Board ultimately stipulated that the lake be raised (Jones & Stokes Associates, Inc. 1993).

Translator Models for Economic Impact Analysis—In addition to affecting visitors' willingness to pay, changes in the quality of recreation resources can affect peoples' decisions of whether to visit and their frequency of visiting. For example, if the clarity of Lake Tahoe continues to decline to a level typical of other Sierra Nevada lakes, this change in lake clarity could adversely affect the number of visitor days spent in the basin. Reduced visitation would result in lower tourist-based personal income and employment. Assuming that reductions in lake clarity beyond a specified threshold would affect visitation, and, assuming that the relationship between lake clarity and visitation is known, lake clarity could be specified as a "translator" for use in conjunction with the visitor spending patterns (Table 6-28). Community-region input-output models (described above) could be used to assess the local economic effects of alternative future levels of lake clarity. Similarly, other translators could be developed to project changes in visitation in relation to changes in recreation facility capacity, highway congestion, or other basin conditions likely to affect visitation.

The Effect of Seasonal Variation in Tourism and Recreation on the Socioeconomic Dynamics of the Basin

As with most recreation economies, the Tahoe basin experiences pronounced cycles of economic activity. From the seasonal recreation visitation patterns, which drive the local economy, to larger business cycles, which affect the regional economy at large, Tahoe's financial system has been characterized in the past as one of booms and busts. Seasonality in Tahoe generally describes the bimodal seasonal influx of visitors, and commensurate increase in employment, that occurs with the onset of the winter and summer tourism seasons. However, while many ski communities outside the basin are striving to establish summer markets to mitigate the seasonal visitation fluctuations associated with the ski industry, Tahoe has firmly defined a market niche for both winter and summer visitors. Using California employment data as a proxy for visitation, total employment during the third-quarter summer season surpassed first-quarter winter season employment in both 1993 and 1997. The data suggest that summer visitation exceeds winter visitation (Figure 6-8).

While these cyclic trends in visitation and employment may have existed in the past, net seasonal employment fluctuations decreased from 1993 to 1997. For example, 1993 third-quarter employment was 25 percent higher than second-quarter employment. In 1997, the difference between the spring employment and summer employment displayed only an eight percent increase. Annual average employment increased from 6,353 in 1993 to 10,187 in the first three quarters of 1997 and the first quarter of 1998. This increase represents a 60 percent rise in employment between 1993 and 1997 (EDD 1999).



Sources: California Employment Development Department; Authors' calculations

Figure 6-8—California basin-wide employment, 1993 and 1997.

With changes in employment come changes in demographics. Census data, taken every ten years, does not display the temporal resolution necessary to convey this type of information. Potential sources of information available with the necessary temporal resolution might include rental listings in the local newspapers. Many Tahoe locals have observed that during the fall, the availability of rental homes increases dramatically. This might suggest that the cyclic flux of employees into and out of the basin could be estimated through short-term rental housing figures.

As basin-wide visitation increases, traffic congestion, scenic quality, air quality, and most quality of recreation measures show a notable decrease (NLTRA 1995). One might hypothesize that seasonal changes in population densities and the resulting patterns of short-term residence affect community well-being. However, until indicators of community well-being are established through a broader process it will be difficult to evaluate the impacts of seasonal economic fluctuations. In the absence of a richer suite of community indicators, TRPA's thresholds of environmental carrying capacity remain the best available indicators by which a rough correlation to community well-being might be established. Certain thresholds, such as scenic quality, noise, air quality (connected to vehicle miles traveled, or VMT), and recreation, play a role in socioeconomic dynamics and are directly affected by the seasonal nature of the Tahoe economy. These TRPA thresholds however, are not sufficiently specific to be used as quality of life indicators to facilitate a broad evaluation of community well-being. In addition, the five-year evaluation cycle of the thresholds is not frequent enough to address socioeconomic impacts of seasonal variability.

Issue 3: Understanding How Land Use Trends Affect the Basin's Environment and Socioeconomic Dynamics

The total land area of the basin is 207,561 acres, and, although most land use discussions often do not include bodies of water, clearly any discussion of land use in the basin must include "jurisdiction" of water bodies. While state and federal authorities govern use of navigable waters, the total area that must be considered part of the basin is 328,671 acres, including the lake itself (Table 6-30). The basin has seen dramatic changes in the distribution of ownerships over the past several decades. During the 1930s, only about 15 percent of the total land area was in public ownership, and most of that was

in bequests to the California State Parks system. By the 1950s, the public ownership portion had risen to only about 20 percent. Since that time, acquisition strategies for environmental protection have altered patterns of ownership substantially. As of 1999, 87 percent of the land area in the basin is in public total ownership (Table 6-31). While only 13 percent of the land area in the basin is in private ownership, 56 percent of the shoreline around the lake is in private hands (TRPA 1999a).

Table 6-30—Land areas by county in the Lake Tahoe basin.

County	Land Area	Lake Area	Total
Alpine	4,182	0	4,182
Eldorado	105,057	35,240	140,297
Placer	46,383	50,435	96,818
Washoe	20,092	13,499	33,591
Carson City	6,328	7,708	14,036
Douglas	25,519	14,228	39,747
Total	**207,561**	**121,110**	**328,671**

Source: TRPA 1999

Table 6-31—Lake Tahoe basin ownerships.

Federal	161,898	78%
State	16,605	8%
Local	2,076	1%
Private	26,983	13%
Total	**207,562**	**100%**

Source: TRPA 1999

Land use, as used in this section, includes three levels of human impacts on the land and in the water:

1. High-intensity uses that visibly and permanently modify the biophysical attributes of the land or water, such as changes in soil profiles and vegetation structure from housing and roads, dams and diversions, piers and marinas;
2. Land uses that are less visible and transient, such as mountain biking, hiking, fishing, and motor boating, that may have less visible effects but that are cumulative and may be as significant as permanent modifications; and
3. Land uses that have the least impact on the biophysical attributes, e.g., viewing, educational, informational and uses that may change future behavior toward elements of the ecosystem (and, as a result, will change ecosystem structure and function) at all three levels of intensity.

The boundaries among the three levels are not discrete and are used here mainly for organization and presentation purposes.

This section focuses on the impacts the three classes of land use have on the environment. To clarify the use of terminology in this section, "ecosystem" is meant to include social, cultural, economic, and institutional elements. The term "biophysical system" is used to denote the nonhuman components of the ecosystem. Occasionally, "the environment" is used synonymously with biophysical system. The approach taken in this issue section reflects observations by the assessment team, and some of these observations are not referenced to published literature. The statements in this section are based on a synthesis of disparate sources, such as newspaper articles, speeches, informal conversations, interviews, and publicly available flyers and meeting materials.

The Effect of Permanent Land Use Changes on the Environment

This level of land use change is limited to the effects of existing built and modified surfaces, construction on previously unbuilt land, redevelopment of built land, and acquisition of parcels to be retained in their natural state.

Environmental Impacts of Existing Development—Since the end of the intensive Comstock Era logging, the basin's biophysical system has had to adjust to over 100 years of increasing numbers of buildings, roads, and ski areas. There is no geography of settlement over time that can be used to isolate the effects of building on the biophysical system. This could be accomplished by constructing a series of maps that describe the geography of built and modified surfaces (modified surfaces refer primarily to permanent ski areas) as they have accumulated over time. This historical geography can be quantified so that it would become an independent variable in the equation linking building to changes in the biophysical system,

especially water flow, erosion, sediment transport, and lake clarity. A historical geography of building-induced sediment and nutrient production can inform interpretations of lake sediment cores and historical nutrient fluxes.

The accumulation of permanent land use changes is referred to as the process of urbanization and contains two general patterns. The first pattern manifests a high aggregation of impervious surfaces, as is found today around Stateline; the second pattern is more dispersed, with important quantities of vegetation growing in the interstices of the impervious surfaces. The basin has both patterns with gradations in between, and it is useful to include in any future analysis of land use impacts a picture of these changing spatial gradations. These can be displayed, simply, as ratios of pervious/impervious area. In areas of aggregated impervious surfaces, there are significant and well-known increases in runoff velocity, peak flows, downstream erosion potential, and deterioration of water quality from both eroded material and exotic chemicals and particulates from roofs, roads, and parking lots. As impervious areas are reduced in size or dispersed, these impacts diminish. The spatial distribution of pervious and impervious areas, with amounts and kinds of interstitial vegetation, governs precipitation interception, water flow and quality, some forms of air pollutant flux, fire behavior, and the distribution, health and recreational availability of wildlife and biota.

Because built surfaces in the basin were placed within a vigorous presettlement forest, the role of vegetation—especially trees—is significant in modifying the negative environmental effects of settlement and urbanization. The trees, shrubs, herbs, and grasses in the interstices of impervious surfaces mature, die, and are modified by people; their effects are not static over time, and their environmental role has not been quantified (McDonnell and Pickett 1991; Rowntree 1998). This matrix of vegetation is a functional link between the built environment and the biophysical system. This functional link operates as an interactive, two-way relationship; for example, tree crowns over parking lots remove pollutants from the air, but these pollutants also affect tree health.

The management of interstitial, or "urban," vegetation appears to be governed by an effective set of guidelines and regulations at TRPA (TRPA 1998a). These are designed to ensure that careful consideration is given to removing trees from private land and that the resulting stand of trees on any parcel optimizes benefits and minimizes costs. The Tahoe Regreen Project is a cooperative effort of 32 government and private organizations, devoted to reducing fuel loads and restructuring urban interstitial vegetation in a fire-safe configuration. The guidelines in the basin for managing urban vegetation appear to be effective for mitigating a small portion of the negative effects of existing development.

In summary, it has been common knowledge for some time that the effects of settlement and urbanization in the basin have increased the flow of nutrients, sediments, and pollutants to the receiving waters (Goldman 1994; Reuter et al., Chapter 4, this document). Thus, the period of urbanization has had a significant, permanent, and continuing impact on the rivers and lake in spite of erosion control and restoration efforts.

Environmental Impacts of Construction—Each year, TRPA allocates 300 residential development parcels among the counties in the basin, and this total will remain constant until all parcels are allocated. Of the 300 parcels, approximately 250 to 280 a year are converted to building permits (Baetge 1999). Most of the remaining parcels are in Eldorado County (Pepi 1999). The number of parcels left to develop in the basin depends on where the line is drawn between buildable and nonbuildable parcels. This line is a numerical score, aggregated from ratings of several environmental factors, called the Individual Parcel Evaluation System (IPES). From 1985 to 1987, TRPA worked with a large number of interest groups and government agencies to develop a consensus resolution of the issues affecting final approval of the 1987 Regional Plan. A TRPA ordinance was developed from this process, which replaced the older Bailey land capability system, using a more objective classification system. The IPES system and procedures for scoring and appeal are described in Chapter 37 of the TRPA Code of

Ordinances. A timeline of early acquisitions, based on the Bailey and IPES systems, shows the influence of those systems on development (see Figure 6-10 and Twiss 1997).

The IPES assigns a numerical score to vacant parcels and ranks the parcels within each local jurisdiction according to their relative suitability for development. Any owner of a parcel with a score above the minimum score established by the TRPA Governing Board may obtain a development allocation from the jurisdiction in which it is located, after which TRPA may issue a building permit.

Over a period of several years, the IPES line is expected to be lowered in order to allow more parcels to be developed. This process will depend on a suite of environmental protection goals being met and on such requirements as expanded water quality monitoring programs and purchase of a number of low-scoring parcels through one of the public acquisition programs.

The IPES score does not apply to residential parcels that are already developed. Scores are established by teams that include at least a soils scientist, a hydrologist, and a planner/engineer and are based on an actual on-site analysis, which includes a small pit dug for analyzing the soil profile. Eight criteria are used to develop the IPES score, as follows:

1. Relative erosion hazard, based on the soil sample, slope data, and precipitation data (450 points maximum);
2. Runoff potential, referring to the potential for overland runoff, based on vegetative cover and the ease with which soil absorbs precipitation (200 points maximum);
3. Access, based on the amount of excavation and vegetation removal necessary to construct driveways and parking (170 points maximum);
4. Stream environment zones (SEZ), based on the extent to which utilities, excavation, and grading will encroach on SEZs (70 points maximum);
5. Condition of watershed, which considers the overall status of the watershed in which the parcel is located (70 points maximum);
6. Ability to revegetate, evaluated on the inherent ability of the site to be revegetated, considering soil and site properties (50 points maximum);
7. Need for water quality improvements in the vicinity, a broad evaluation factor that examines the lot's relationship to surrounding areas with stable cut and fill slopes, adequate and stable drainage, and paved roads (50 points maximum); and
8. Distance from lake, which receives a higher score depending on distance from the shore of Lake Tahoe (50 points maximum).

Appeal procedures are established through which the appellant's parcel is reviewed by an alternate IPES team. After the second score is issued, property owners may appeal their score directly to the TRPA Governing Board.

As of 1999, approximately 4,000 parcels remained to be allocated for development or mitigation purposes in the basin, some portion of which are not buildable because they lie in sensitive areas. Under current IPES ratings, there will be no parcels left for allocation after approximately 2010 (Baetge 1999).

All construction requires the application of designated best management practices for reducing sediment and nutrient flux from the site. While these techniques may be effective for reducing sediment flux, many technical experts agree that they cannot prevent nutrients from leaving the site with lateral movement of ground water (Pepi 1999). Even when sediments are trapped on-site, for example, in a dry well, the water from many sites is thought to flow below the surface and emerge downslope to produce erosion and transport nutrients. Lateral subsurface flow is also a problem with established buildings that are using on-site settling basins or dry wells. The runoff from roofs, walks, and driveways may appear to have been trapped on-site, but in fact the water infiltrates and is concentrated in the lateral ground water stream, emerging at the surface and inducing erosion downslope. Additional environmental impacts of construction come from having utility connections that must cross SEZs.

The current trend in construction has three key factors that contribute to greater or lesser environmental impacts over time (Pepi 1999). First, it is assumed that negative environmental impacts accumulate with each increment of construction. Second, the *per unit* negative impact is increasing (more on the Nevada side of the basin) because of the increased need for crossings through stream environment zones and the likelihood of increased building on more sensitive lots. Third, the process negotiating the line between buildable and non-buildable parcels lacks sufficiently detailed data on a parcel-wide and basin-wide scale. TRPA has identified a need to analyze all remaining parcels in terms of the environmental costs and impacts of development (Baetge 1999).

Environmental Effects of Commercial Redevelopment—Commercial redevelopment in the basin seeks to lessen the environmental impacts of urbanization by enhancing environmental infrastructure (e.g., water treatment of selected commercial nodes), by consolidating impervious surfaces to make pervious surfaces available, and by improving the visual quality of the urbanized portions of the basin to enhance the basin experience for visitors and residents. As examples, the Ski Run Boulevard redevelopment created just less than 10 acres of permeable surface (i.e., surfaces through which runoff and precipitation can infiltrate into the soil), and the planned Heavenly Valley redevelopment at Stateline will create several acres of permeable surface while building a more pedestrian-friendly and aesthetic setting. While commercial redevelopment may the reduce impervious area in small amounts, continued residential construction under current permitting schemes is likely to offset these reductions by increasing dispersed impervious surfaces.

Environmental Effects of Land Acquisition: Selected Considerations—Many portions of the basin's urbanized area display a unique ownership pattern rarely seen outside of the basin. Public land acquisition programs, initiated in California by voters in 1982 through the passage of the Lake Tahoe Acquisition Bond Act, by Nevada voters in 1986 through the passage of a $31 million bond issue, and through federal legislation in the 1980 Santini-Burton Act (PL 96-586), have created a mosaic of publicly owned lots within privately developed subdivisions. Both Santini-Burton and the Nevada bond act provide funding to purchase environmentally sensitive lands in the basin. On the California side, the Lake Tahoe Acquisition Bond Act, administered through the California Tahoe Conservancy (CTC), provides funds that may be used to acquire property for protecting the region's natural environment, for providing public recreation areas, for providing public lake access, for preserving wildlife and habitat areas, and for making miscellaneous purchases needed to ensure access to or management of other public lands.

Table 6-32 shows total investments, acres, and numbers of parcels acquired through the three programs from 1982 to 1999. Of the nearly $187 million dollars spent on acquisition during this period, Santini-Burton funds accounted for almost half (47 percent) and the California bond act contributed more than a third (38.2 percent) of the total investment (Table 6-33). Twice as much Santini-Burton money was spent acquiring Nevada parcels as was spent on California parcels, reflecting

Table 6-32—Public lands acquired 1982 to 1999.

Year	Acres	Parcels	Direct Costs
1982	12	55	12,363
1983	1,847	219	8,229,000
1984	679	280	7,309,100
1985	756	309	8,304,163
1986	335	1093	14,013,910
1987	953	1272	21,663,993
1988	454	1101	30,370,050
1989	359	969	25,993,550
1990	202	827	19,122,814
1991	113	417	15,386,970
1992	110	286	13,836,419
1993	36	163	4,210,575
1994	64	200	8,053,400
1995	16	124	3,747,600
1996	6	104	1,839,365
1997	28	80	2,306,275
1998	8	60	1,116,403
1999	6	2	1,325,000
Total	**5,986**	**7,561**	**186,840,950**

Sources: California Tahoe Conservancy; Nevada State Lands Division; USFS Lake Tahoe Basin Management Unit

Table 6-33—Public acquisition costs 1982 to 1999.

	Santini-Burton (California)	Santini-Burton (Nevada)	Santini-Burton via CTC	California Bond Act (CTC)	Nevada Tahoe Bond Act	Total
1982	$363	$12,000				$12,363
1983	$6,029,500	$2,199,500				$8,229,000
1984	$4,519,100	$2,790,000				$7,309,100
1985	$4,164,200	$4,139,963				$8,304,163
1986	$3,625,525	$1,033,000		$9,355,385		$14,013,910
1987	$334,500	$8,395,680		$12,933,813		$21,663,993
1988	$95,700	$14,586,460		$15,687,890		$30,370,050
1989	$74,925	$6,386,800	$2,514,800	$9,594,025	$7,423,000	$25,993,550
1990	$56,300	$3,805,800	$1,813,200	$4,969,514	$8,478,000	$19,122,814
1991	$58,000	$5,380,250	$720,500	$3,188,720	$6,039,500	$15,386,970
1992	$836,898	$5,635,300	$927,250	$4,638,411	$1,798,560	$13,836,419
1993	$264,000	$611,250	$435,200	$2,330,625	$569,500	$4,210,575
1994	$893,000	$1,026,000	$209,500	$4,758,900	$1,166,000	$8,053,400
1995	$62,800	$2,375,900	$118,500	$1,086,400	$104,000	$3,747,600
1996	$20,400	$0	$828,400	$945,565	$45,000	$1,839,365
1997	$0	$868,500	$180,100	$1,257,675	$0	$2,306,275
1998				$746,403	$370,000	$1,116,403
1999					$1,325,000	$1,325,000
	$21,035,211	$59,246,403	$7,747,450	$71,493,326	$27,318,560	$186,840,950

Sources: California Tahoe Conservancy; Nevada State Lands Division; USFS Lake Tahoe Basin Management Unit

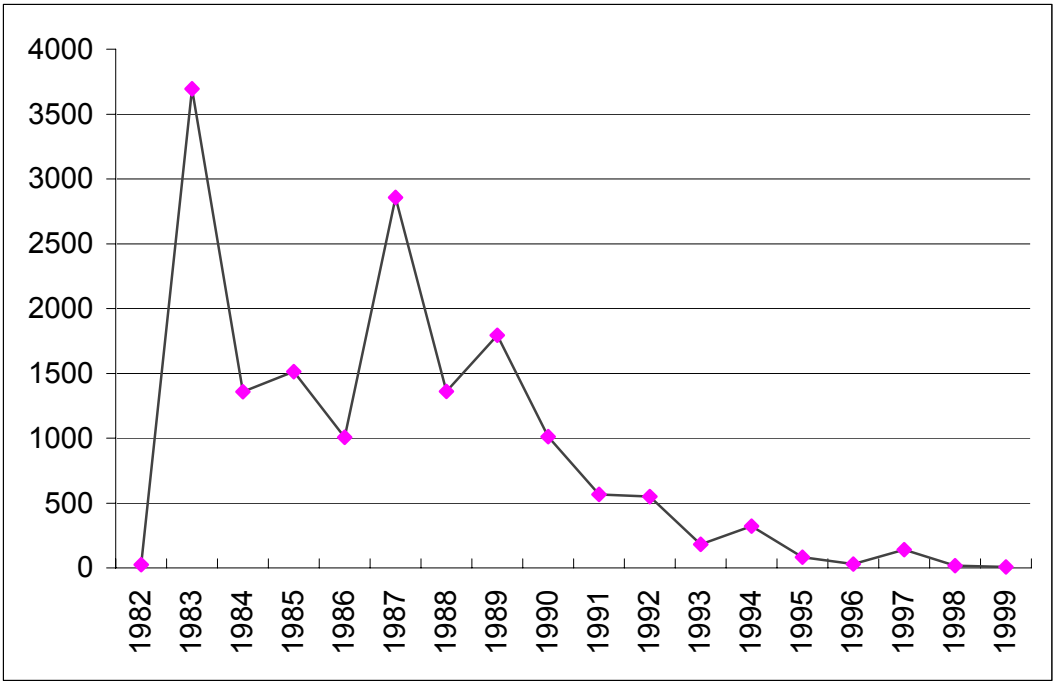
much higher purchase prices in California. However, so far, the total acquisition investment of $187 million has been divided about equally between the two states.

Most of the 16,513 acres acquired were purchased during the first decade of the various programs, with sharp declines in funding and purchases beginning in 1990 (Figure 6-9). The vast majority of total acquisition program acreage has been purchased on the California side of the basin (California, 12,232 acres; Nevada, 4,281 acres) (Table 6-33).

The three programs' funds have acquired a total of 7,561 parcels, many of which are large and are scattered throughout the urbanized areas of the Lake Tahoe basin. The large parcels are most often located on the periphery of the urbanized area and expand the ecological and socioeconomic benefits of the existing large public holdings. This section of the report notes some of the potential environmental effects of the array of small lots distributed throughout the residential land uses of the basin's urbanized area. The hydrologic and water quality benefits are obvious, though very difficult to quantify. Preserved lots mitigate peak flows, high runoff velocities, and erosion from the surrounding developed areas. Precisely how the array of preserved lots affects fire behavior is not well understood at this time. When the lots contain an understory of light, easily ignited fuels, they are sources of ignition, particularly when they are play areas for children who can start fires or when they contain refuse and green waste that adds to ignition potential.

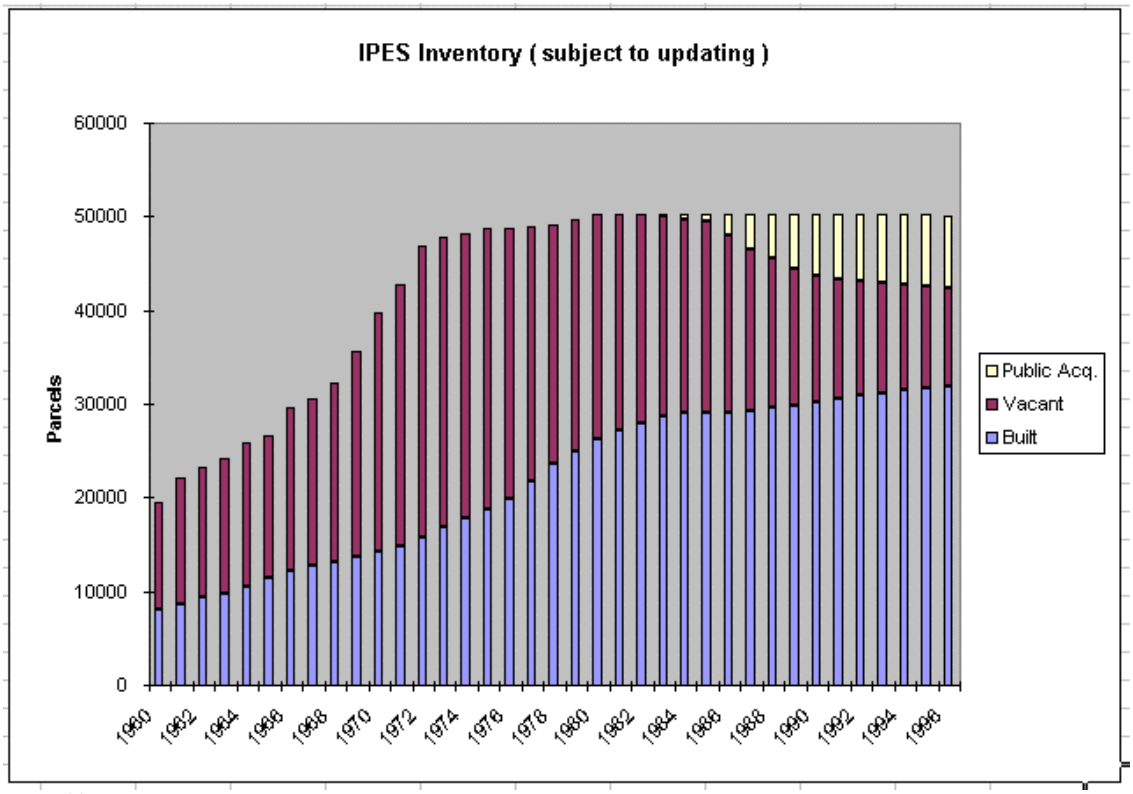
Interviews with agency managers showed that the CTC and USFS take different approaches to managing their lots and that both agencies are seeking the means for knowing how individual lots and the total combined array of lots can be managed to optimize environmental and socioeconomic benefits. The CTC maintains a comprehensive spatialdata base of its lots, and USFS is advancing its data acquisition and management programs to make its lot data spatially explicit for use in GIS analyses.

Because of the large investment in acquiring and managing the lots and because of the critical role they may play in mitigating the negative environmental effects of the urbanized portion of



Sources: USFS Lake Tahoe Basin Management Unit; Nevada State Lands Division; California Tahoe Conservancy

Figure 6-9—Historical public parcel acquisition, 1982 to 1999.



Source: Twiss 1997

Figure 6-10—Integrated parcel evaluation system timeline.

the basin ecosystem, a better understanding of their ecological role would support more effective management. Two key areas of research, according to program managers, concern the influence of publicly owned lots on fire behavior in residential areas and the role of publicly owned lots in supporting biodiversity. Groups of lots can be viewed as "archipelagos" made up of a set of biotic "islands." When an archipelago of lots provides a high degree of connectivity between the inner urban zones and the extensive unfragmented forest adjacent to the edge of the urbanized area, movement of organisms back and forth may be facilitated that would not occur if the distances between the lots were greater or if the number of lots were fewer. One current study finds that the larger the lot and the farther it is from the undisturbed forest, the higher the plant diversity and the lower the fuel loading (McBride and Boniello 1999). The increase in diversity with distance from the undisturbed forest into the urbanized area is purportedly correlated to the addition of exotic species from disturbed sites and gardens in the urban area.

Another preliminary study under way is seeking to understand the role of undeveloped lots in filtering pollutants that would otherwise transport through streams to the lake (Johnson et al. 1999). Many of the lots have dense upper tree canopies and are islands of very high leaf surface areas that remove particulates from the atmosphere. However, it is unknown what the subsequent disposition of these quantities of particulates might be. Follow-up studies would need to track needle washoff during precipitation and snow melts.

Land Acquisition and Increased Property Values—The following section suggests an experimental method to test the hypothesis that public acquisition of parcels enhances the property values of surrounding residences. Real estate professionals have generally acknowledged that publicly owned lots affect the desirability of certain neighborhoods and individual parcels and in some cases can influence property values by as much at $25,000 to $35,000 (Hedley 1999). The exercise below is a preliminary test of this hypothesis using a method of spatial analysis of housing locations and values on the California side of the basin. A secondary purpose of the exercise is to determine some of the capabilities of the lot data placed within a geographic information system (GIS). Available data layers from several agencies include parcel boundaries, roads, streams, watersheds, and several other types of data. Public ownership information was obtained directly from each of the land-owning agencies. Assessed property values and other information were assembled from the Eldorado and Placer county assessors' offices, as reported monthly (TRW 1998). Data relating to ownership and assessed value were linked to the digital parcel maps and were analyzed in the CTC's GIS.

Displayed below is a timeline of subdivided lot availability and public land acquisitions. This trend may be compared to the neighborhood assessed values to give a longer term history of the impacts of public land acquisition on land values in the basin.

While increasing socioeconomic well-being is not an objective of the public acquisition programs, it is a general belief that the more than 7,700 publicly held lots on the California side of the Tahoe basin enhance the lives of people who live near them (Willmett 1999). Enhancements vary from improved access to larger forested tracts of USFS property, to greater assurance that existing views will not be obscured by future development, and to more available open space and wildlife viewing. This preliminary study tests the hypothesis that the most tangible socioeconomic indicator of these benefits would be variations in property value. However, accurate regional measures of property values are expensive to generate and therefore are rare. Conversely, assessed property values are readily available from the county assessor's office.

Assessed property values often are not used as indicators of property worth for two reasons. First, an individual parcel is reassessed only upon transfer of title or through major renovation. Consequently, if a parcel does not change hands, frequently assessed values can lag behind market values. Second, in 1978 California voters approved Proposition 13, a constitutional amendment that effectively lowered property taxes and restricted their rate of increase. The effect of these two factors

causes the assessed value of comparable lots to vary widely.

The format for this analysis is a neighborhood-based approach comparing average assessed property values for 19 neighborhoods. Neighborhoods were selected according to the following criteria:

- Each neighborhood was subdivided at roughly the same historical moment (i.e., the time when it was put on a map and certified by the county);
- Each neighborhood contained at least 350 parcels;
- Most of the parcels are less than an acre; and
- Each neighborhood must have active public land acquisition programs acquiring property in the subdivision (i.e., Santini-Burton, California Tahoe Conservancy, and/or Nevada State Lands).

The size of the neighborhoods was designed to overcome some of the limitations in assessed property values discussed above. The smallest of the neighborhoods had 350 lots, the largest 3,500, with an average of 1,168. Average neighborhood values were used comparatively to analyze the effect of open space. Therefore, differences between assessed value and true market value, while potentially substantial, generally will be unimportant at the neighborhood scale; that is, while average homes in Cedar Flat and Kings Beach may not sell for $153,065 and $103,007, respectively, as a measure of the value of homes in Cedar Flat versus Kings Beach, the ratio $153,065/$103,007 may be appropriate. In other words, comparing the average assessed values of individual neighborhoods is appropriate. Other potential sources of error include geo-referencing in the GIS parcel maps, property value variation resulting from the age and quality of the development, and other significant factors affecting property value, such as mountain or lake views.

First, the California side of the basin was divided into 19 separate neighborhoods using an "expert knowledge" technique (Figure 6-11). Each neighborhood represents a tract of housing units, which generally share such characteristics as age, quality of construction, and desirability of vicinity. Second, the total count of public lots and private lots for each neighborhood was computed. Included below are smaller scale maps of the neighborhoods used in this analysis, separated by Eldorado and Placer counties (figures 6-12 and 6-13, respectively). Notably excluded is the Tahoe Keys neighborhood in South Lake Tahoe and the Dollar Point subdivision in North Lake Tahoe. Neither the CTC nor the USFS acquisition programs are currently active within Tahoe Keys or Dollar Point because of strictly enforced property assessments within the boundaries of each subdivision; consequently, they were not included in this analysis of the impacts of the public acquisition programs. Third, a metric was computed for each neighborhood, the ratio of total public acreage in the neighborhood divided by the total acreage in the neighborhood. Finally, these three computations—average assessed value for vacant lots, average assessed value for developed lots, and the ratio of private property to public property within each neighborhood—were compared (Table 6-34).

In order to verify the usefulness of the data presented, the model must establish the strength of the correlation between two continuous data sets. A Pearson correlation was computed only for the neighborhoods listed on Table 6-35 of this analysis. Correlation coefficients were calculated to detect the sensitivity to outlying data points. For example, had Tahoe Keys and Dollar Point been included in the analysis, the results would have differed significantly because both are high density developments without significant public holdings. Analysis suggests that there is a statistical relationship among average neighborhood, assessed developed property value, and neighborhood density of public ownership. As shown in Table 6-36, there is a less than five percent chance that the observed correlation is the result of random variations. The **P** value describing the relationship between assessed vacant property value and the density of public ownership indicates a 20 percent chance that the observed correlation is the result of random variation. Consequently, while these data suggest that as the density of public

Table 6-34—GIS analysis of land values and acquisitions.

Neighborhood	Ratio of Public Acreage to Total Acreage	Average Value Developed	Average Value Vacant
Al Tahoe	8.73%	$107,182	$25,303
Bijou	9.13%	$104,895	$17,441
Gardner Mountain	8.15%	$93,776	$18,370
Meyers	22.67%	$98,985	$17,277
Montgomery Estates	21.23%	$166,430	$26,742
N. Upper Truckee	41.52%	$123,077	$19,389
Rubicon	26.32%	$199,413	$69,516
Sierra Tract	9.08%	$79,161	$15,548
South State Line	8.38%	$89,070	$17,433
South "Y"	8.48%	$81,306	$15,294
Tahoe Island	6.30%	$91,172	$16,055
Tahoe Paradise	32.77%	$116,729	$19,350
Tahoma	7.09%	$75,991	$10,871
Agate Bay	6.67%	$147,056	$29,860
Cedar Flat	5.28%	$153,065	$34,973
King's Beach	12.69%	$103,007	$19,307
Kingswood West	32.24%	$198,980	$34,527
McKinney, Chambers and Tahoma Vista	21.74%	$142,417	$29,526
Talmont	23.77%	$185,428	$38,404

Sources: TRPA GIS Database; California Tahoe Conservancy GIS Database

Table 6-35—Pearson correlation coefficients.

	Ratio of Public Acreage to Total Acreage
Average Value Developed	0.52
Average Value Vacant	0.32

Source: Authors' calculations

Table 6-36—P values for determining chance of error.

	Pearson Correlation Coefficient	P Value	Chance of Type I Error
Developed property versus ratio of public ownership	0.52	2.498	< 5%
Vacant property versus ratio of public ownership	0.32	1.393	~20%

Sources: Authors' calculations

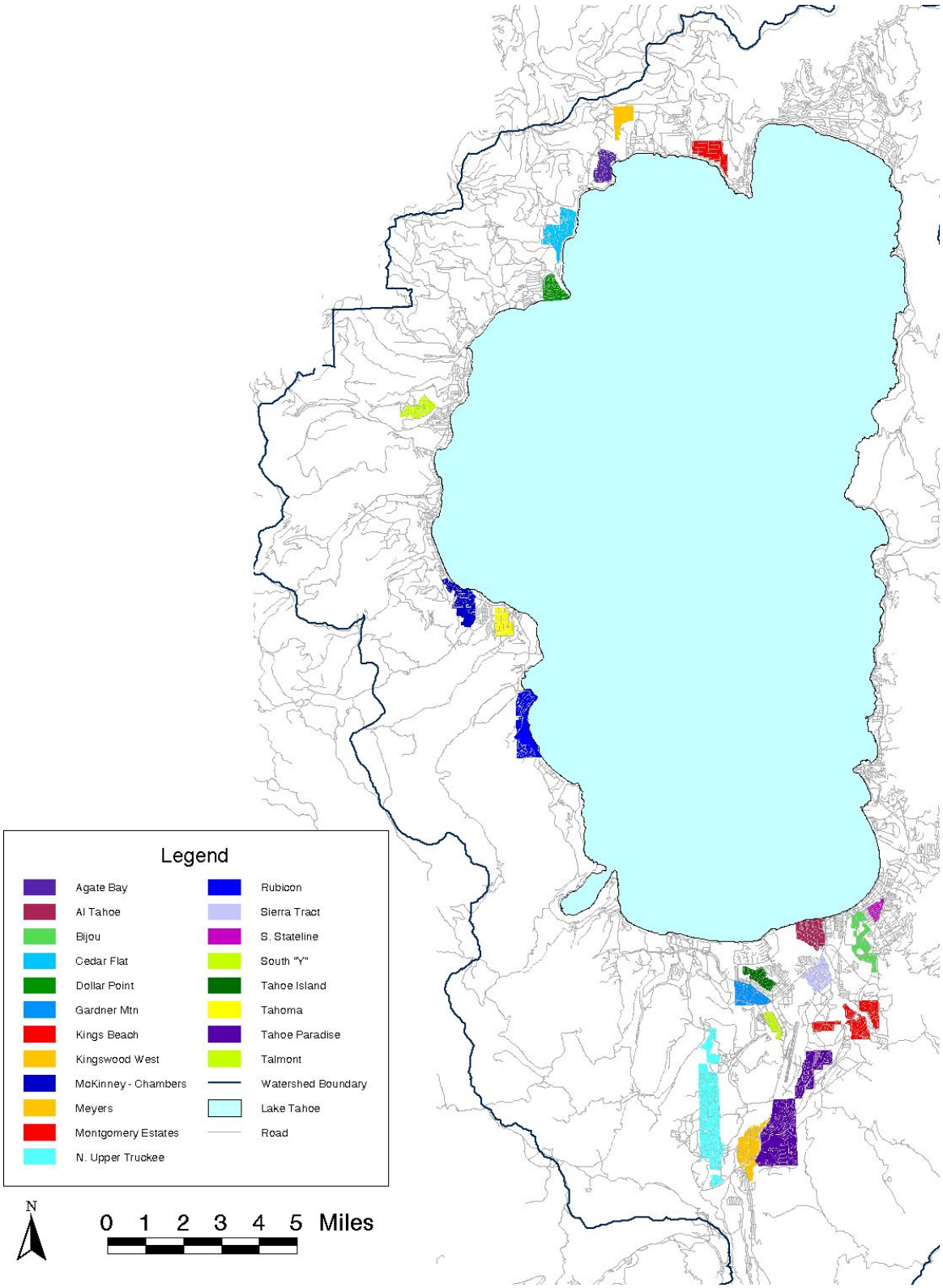


Figure 6-11—Neighborhood locations, Placer and El Dorado counties.

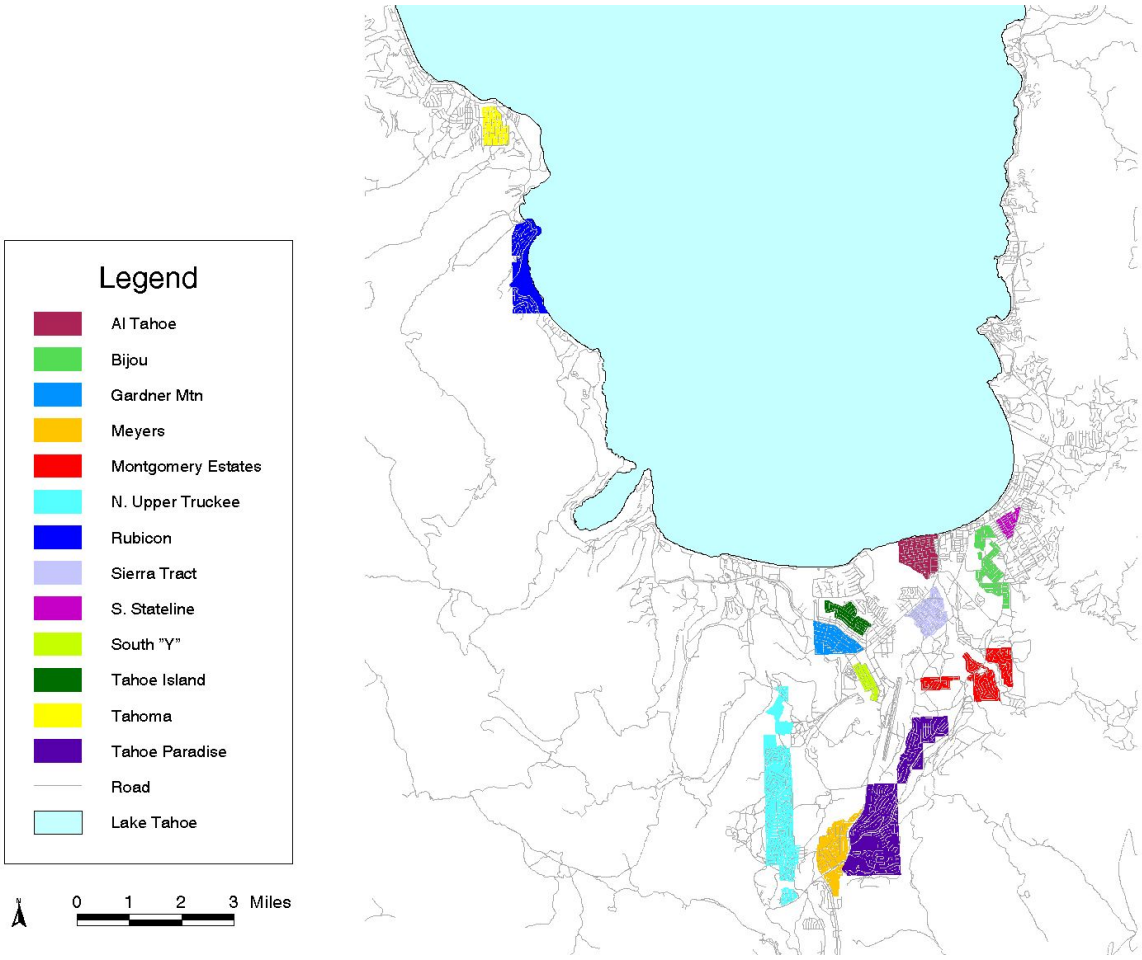


Figure 6-12—Neighborhood locations, El Dorado County.

property increases in a neighborhood, property values might be expected to rise, this exercise does not conclusively prove this. One reason is that the frequency of reassessment is higher for developed lots than public lots. Consequently, assessed values more closely reflect the developed properties' market value.

A more exact model would be required before the full economic impacts of the basin's parcel acquisition programs can be accurately quantified. Factors that would need to be evaluated in such a model include temporal variations in property prices that are not accurately reflected in the county assessor's data, proximity to other attractive or unattractive features (such as the lake, roads, parks, views, and schools), connectivity to lake, forest, or other amenities, an evaluation of how the form of all public ownership within an area affects the amenities available to property owners in that area, and TRPA-identified development potential.

This section on effects of permanent land use changes does not include an evaluation of the environmental effects of the many erosion control, habitat restoration, public access, and facility improvement programs, all of which have many benefits. Nor does this section attempt to describe socioeconomic effects of land use change beyond the preliminary analysis of acquisition parcels and property values. The environmental effects considered were either those reasonably well understood and examined in other chapters of this assessment—such as the hydrologic effects

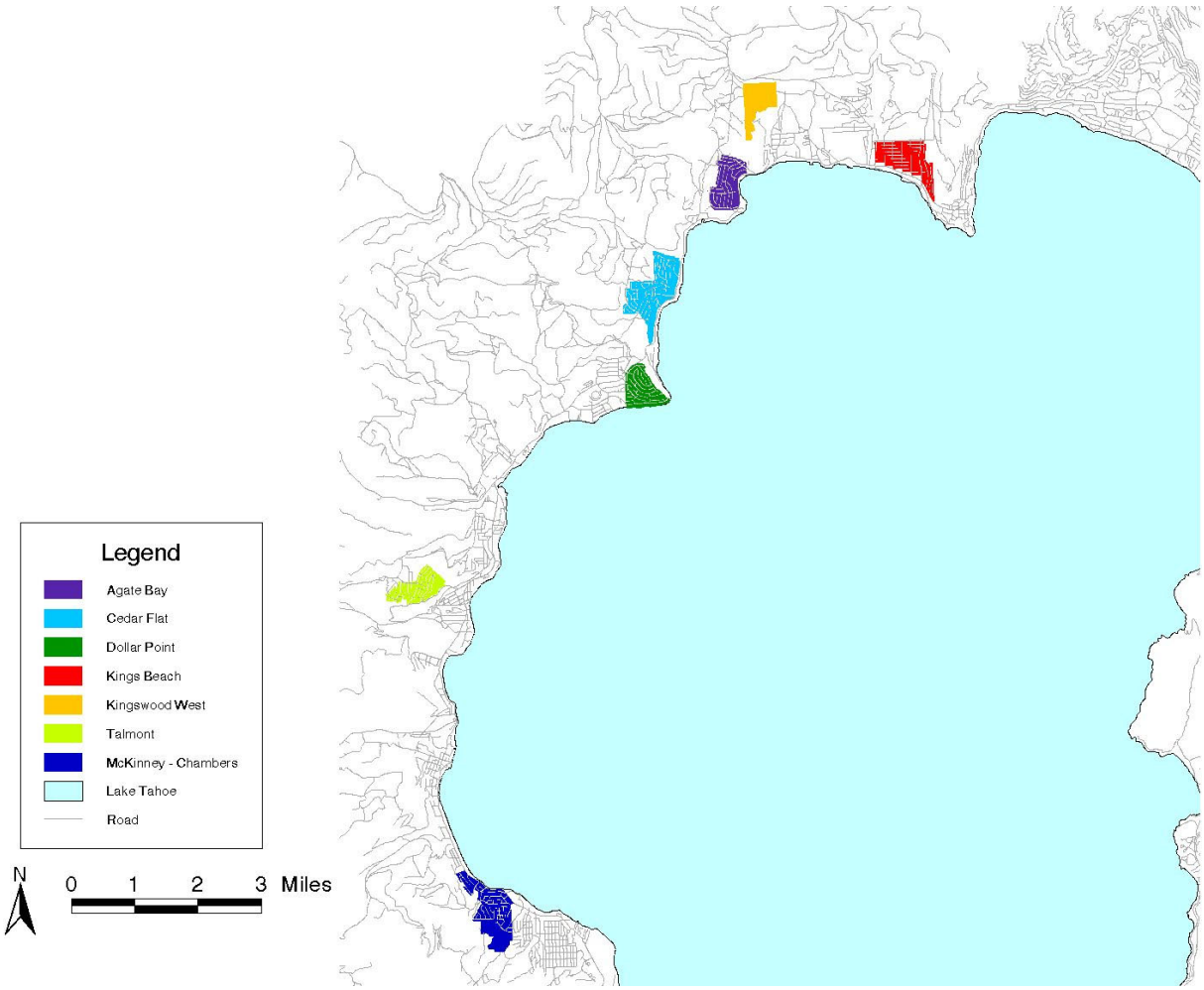


Figure 6-13—Neighborhood locations, Placer County.

of urbanization—or examples of those effects that require further in-depth study, such as the biotic effects of public lot locations and conditions.

It is clear from this section and from discussions elsewhere in the watershed assessment that residential and commercial development have increased the flow of nutrients and sediments to the lake above what would otherwise be a "natural" background level. However, there are insufficient data about the combined and cumulative effects of many land uses to give a clear answer to the often-asked question, "How much more and what kinds of land use change should be allowed if we are to halt degradation of lake clarity and preserve the integrity of the biophysical system?" While the answer to this question has key economic and social consequences, evidence suggests that much more information and research is required before a reliable quantification of impacts can fully inform policy- and decision-making.

How Transient Land and Water Use Affect the Environment

Transient use, in this section, focuses on selected environmental effects of tourism and recreation that have not been highlighted in other sections of this report.

Land-based Use—Land-based use includes a spectrum of activities, from camping in the backcountry to driving around the lake. This section

is limited to several uses that seem to require special attention. In most parts of the West, mountain biking is increasing rapidly (Chavez 1999). The basin is a site where rates of increase, while inadequately measured (Tahoe Coalition of Recreation Providers 1997, 1999), appear to be among the highest in the country. Mountain biking can be divided into on-trail and off-trail use for purposes of discerning environmental impacts. On-trail use, where trails are paved or stabilized, tends to result in minimal impact. On-trail use of unpaved trails on slopes contributes importantly to erosion and sediment/nutrient transport. Off-trail use within 50 meters of a stream, where sediment and nutrients can be easily transported into the stream network, is an issue that has not been adequately assessed (Miller 1999). As off-trail mountain biking increases in popularity, near-stream erosion will increase, assuming current trends in education and mitigation programs.

Off-highway vehicle (OHV) use in the basin is highly regulated because of the need to minimize soil and vegetation disturbance. However, when vehicles use unpaved trails or roads, sediment and nutrient movement either by water or air is highly likely (Miller 1999). Airborne dust is under consideration as a source of sediments and nutrients (especially phosphorous) moving to the lake. OHV use in the basin is a candidate for further study in terms of its cumulative environmental impact.

The environmental impacts of backcountry hiking and camping were evaluated in this assessment through interviews with USFS recreation staff. As population growth continues within the 1.5-hour radius from Desolation Valley, significant increases in day-use demand and use during the shoulder seasons can be anticipated. Because Desolation Valley is one of the most intensely used wilderness areas in the US, this trend of increasing day and shoulder season demand suggests a need for monitoring recreation trends and environmental impacts more closely.

Driving around the lake is a popular form of recreation in the basin. As population growth on the nearby west and east Sierran slopes continues, this form of recreation is expected to increase environmental and social impacts. Increases in day use and shoulder season traffic will add to existing congestion. Gasoline evaporating from parked vehicles in unshaded parking lots around the basin has not been studied, but evidence suggests that this source of airborne volatiles could add a measurable increment to other pollutants. McPherson and Simpson (1998) have quantified this problem at sites outside the basin and are experimenting with tree shade to reduce vehicle temperatures and evaporation.

Water-based Use: Impacts of Motorized Watercraft—Trends in motorized watercraft use affect most residents and tourists using the lake, the shoreline, the near-shore zone, and—in the case of noise pollution—much of the uplands in the basin. Primary considerations are noise, water pollution, safety, and the degree to which motorized watercraft use enhances or detracts from the recreational experience of both visitors and residents. Also important is the effect motorized watercraft have on wildlife near the lake, especially nesting birds. This section on motorized watercraft is based primarily on recent investigations by Morrison (1999).

Because two-stroke engines discharge as much as 30 percent of their fuel/oil mixture into the air and water unburned, a new regulation against these engines went into effect June 1, 1999. This law bans two-stroke engines with five exceptions:

1. Two-stroke engines with direct fuel injection (DFI), such as the four-person, 65 horsepower "Polaris" personal watercraft (PWC), which came on the market during the 1999 boating season, are permitted because these are much cleaner than other two-stroke engines. The following two-stroke engines will be permitted until October 1, 2001:
2. Outboard motors under 10 horsepower;
3. Auxiliary outboard motors on sailboats;
4. PWCs with electronic fuel injection (one model of Bombardier Seadoo purchased by concessionaires in good faith before the regulation was finalized);
5. PWCs that meet the EPA 2001 emissions standards. As of 1999, one model of Yamaha with a catalytic converter falls into this class.

There are three other TRPA boating rules that have been in effect for the last two years that affect PWCs:

1. All motorized watercraft are restricted to five mph within 600 feet of the entire Lake Tahoe shoreline;
2. Motorized watercraft are not permitted in the tributaries to Lake Tahoe; and
3. Discharge of any waste into Lake Tahoe is prohibited.

Until the summer of 1999, enforcement of TRPA boating rules has been minimal and, many believe, ineffectual. Beginning in the 1999 boating season and using two law enforcement boats, TRPA enforced the two-stroke ban at launch ramps and marinas in Nevada and California. In addition, new legislation in Nevada requires local, county, and state marine law enforcement patrols to assist TRPA with its education and enforcement programs. As of June 1999, no formal action had been initiated in the California legislature regarding enforcement. TRPA's current proposal is to educate first-time offenders, who will be logged into a database, and to cite repeat offenders.

TRPA has begun a publicity campaign in Nevada and California that includes mailing brochures to boat owners. The objective is to prevent large numbers of violations and to discourage boaters who may travel long distances with noncompliant boats only to be turned away upon arriving at Lake Tahoe. There is already great concern that Donner Lake (near Truckee and outside the jurisdiction of TRPA) will have a higher number of noncompliant boats because of restrictions in the basin. No data are available yet from the 1999 Donner Lake boating season.

The recently completed TRPA report on watercraft use states that approximately 20 percent of motorized watercraft use on Lake Tahoe, prior to the new regulations, was with PWCs. The new regulations will reduce PWC use on the lake to a relatively small number of exempted and compliant PWCs for a few years. As compliant PWCs are marketed, one can infer from both national EPA estimates and the TRPA data that soon PWC use on Lake Tahoe again will reach 20 percent of all motorized watercraft use (EPA 1996; TRPA 1999b).

Newspaper and magazine articles and interviews conducted by the SEI assessment team revealed serious concerns among boaters and shore users about continued PWC use, aside from the problem of water pollution. These concerns appear to focus on a combination of noise, safety, and erosion of the Tahoe recreational experience. One common concern focused on the character of the noise, rather than on the actual decibel levels produced by PWCs. Because much of the PWC experience is based on near-shore wave and wake jumping, the noise is relatively high-pitched and variable, therefore annoying to those within hearing range. TRPA's 1997 Motorized Watercraft Environmental Assessment found that noise from PWCs produced "impacts to fisheries and wildlife from watercraft usage in general, which include[s] noise impacts, and disturbance of fish breeding grounds and bird nesting areas" (TRPA 1999b). One manufacturer of a compliant model advertises that its new PWC will have a 60 percent noise reduction compared to the older models. This, together with enforcement of the 600-foot reduced speed zone, is expected to diminish the noise problem.

Safety is a second key concern. As the number of PWCs increase and as they become capable of higher speeds with more people aboard, the risk of accidents increases. Motor boaters observe that many PWC users come from behind and begin wake jumping in the motor boater's blind spot. According to interviews, this is quite distracting to the boater (Morrison 1999). The use pattern of PWCs is often one where two or more PWC operators play together in close proximity to one another and to other boats. This, together with the high speeds and erratic course changes of PWCs, creates an accident environment and an experience of significant anxiety for boaters.

An important part of Tahoe cultural history is the antique wooden speedboat, known as a "woody." The Sierra Boat Company on the north shore stores and maintains approximately 360 wooden boats through the year. Anecdotal estimates indicate that there are an additional 350 boats at other locations around the lake. An additional 100 wooden boats are brought into the basin during the summer. The combined number of 800 antique

wooden boats have a total value in excess of $200 million. Sierra Boat Company employs and provides benefits to 28 year-round skilled workers. Based on interviews and employment data, there are an estimated 10 to 15 additional skilled wooden boat workers elsewhere on the lake. The Tahoe Yacht Club sponsors an August showing of antique wooden boats, and this invitational event brings in about 130 high quality restored wooden boats from various parts of the US. About 5,000 visitors attend the two-day event. The sponsor donates the annual proceeds of about $20,000 from the event to local charities. Wooden boat engines (if they are original) pollute more than contemporary four-stroke machines, but they comply with state and federal regulations. Average use is on the order of 12 to 15 hours a year for each of the 800 boats on the lake, and fuel consumption is about five gallons per hour. This is 61,500 gallons per year, or about 3.5 percent of the total fuel consumption on Lake Tahoe. Thus, the antique wooden speedboat is a small percentage of total motorized watercraft use, but they are seen as part of the "Tahoe experience" by many who use or see them.

Many more recent models of speedboats do not use the kinds of underwater exhaust systems that reduce exhaust noise. Inboard and inboard-outboard speedboats having above-water or water-muffled (cooling water mixed with the exhaust) systems are more likely to exceed the TRPA noise threshold. If they do not, they still provide a threat to the recreational experience of many using the lake, the shore, and the upland hiking and camping areas. Estimates by TRPA find that approximately 20 percent of the boats on Lake Tahoe have exhaust systems producing noise in excess of Nevada, California, and TRPA regulations. There seem to be two causes for this. Noise regulations are poorly enforced and manufacturers make high-noise systems available. For example, the popular "captain's call" system allows the operator to route exhaust either above or below water (TRPA 1999b).

Projections of future motorized watercraft use can be found in Hagler Bailly (1999), TRPA (1999b), and EPA (1996). Use is governed in part by supporting facilities. In TRPA's 1999 shorezone study, the preferred buildout alternative projects significant increases in the numbers of piers, slips, buoys, ramps, and floating docks. TRPA's surveys and projections strongly suggest that PWC use nationwide and on Lake Tahoe will continue to increase (TRPA 1998b, 1999b).

Examples of Ecosystem Elements and Processes that can Contribute to the Knowledge Component of the Tahoe Experience—The basin ecosystem has numerous processes, structures, and functions that can provide visitors and residents with ecological knowledge. As the basin comes to be seen more and more as an ecosystem, the opportunities for learning and for augmenting the current Tahoe experience with ecosystem-level knowledge is considered potentially valuable. No research has been performed to assess whether there is an increasing demand for a knowledge-augmented experience.

Prescribed fire may provide a useful example for future investigation. The Presidential Forum of 1997 resulted in a mandate to increase prescribed burning by approximately ten-fold in the basin. This dramatic proposal focused the public mind on some of the concerns about prescribed burning at a time when this management practice enjoys a high degree of popularity in both technical and lay circles. Expert testimony to the Forest Health Consensus Group and recent technical reports to the USFS show that low-to-moderate intensity fires were fairly common in presettlement times. These fires may have been set by Native Americans, by lightning, or, around the middle of the 19th century, by sheep herders. As the demand increases for more and better information about the structure, function, and management of the basin ecosystem, one may anticipate questions about the appropriateness and practicality of reintroducing fire to an ecosystem that has developed into an entirely different state than when presettlement fires were a part of the forest.

There has been little formal study of the reactions of residents and visitors to prescribed burning while it is happening or to the visual attributes of the forest after the prescribed burn (Litton 1999; McBride 1999). A limited number of interviews with basin residents and visitors found that—with the exception of complaints about smoke—a prescribed burn in progress is an

evocative sight that stimulates curiosity. Prescribed burning, no matter how it is perceived afterward, may be one of the most powerful attributes of the basin's future ecosystem as a repository of knowledge and as a visible form of ecological management.

Summary: Environmental Effects of Land Use Changes

An integrated understanding of the relationships between land use processes and ecosystem processes is incomplete. A systematic evaluation of how accurately environmental impact statements (for all basin projects) predicted the impacts that have occurred would add to a better understanding of the extent to which it is possible to predict the effects of a given land use change.

Issue 4: Determining Appropriate Institutional and Organizational Aspects of Adaptive Management in the Lake Tahoe Basin Context

The Effect of Institutional Capacities and Arrangements on Collaborative Processes and the Use of Information in Adaptive Decision-making and Management in the Basin

The basin has a complex history of institutional evolution, and collaborative and cooperative efforts among those institutions. The most complete documentation of this history to date is contained in the Lake Tahoe case study produced for the Sierra Nevada Ecosystem Project (SNEP) report (Elliott-Fisk et al. 1996). The SNEP case study paints a backdrop against which the current constellation of institutional relationships can be viewed. It also summarizes several lessons that can be drawn from the Lake Tahoe case, the first of which is that it "takes time and effort to create a unified vision." The degree to which the basin community is able to work cooperatively or collaboratively toward environmentally and socially sound solutions is a function of its own history. As the SNEP case study observed,

> "the institutional framework in the Lake Tahoe basin is a cumulative response to evolving public values and the strong link between the environmental and economic health of the region. It follows many decades of controversy, litigation, the establishment of new regulations and a major shift in the ratio of public private land ownership in the Basin" (Elliott-Fisk et al. 1996: 243).

One year after the publication of the SNEP report, the Presidential Summit of 1997 came to two similar conclusions. First, the larger regional community has recognized close links between economic and environmental health. Second, the complex web of interagency efforts, collaborations, and coalitions is essential to achieving sustainable economic and ecological outcomes in the basin. As one of several outcomes of the 1997 Presidential Summit, the authors of the watershed assessment were charged with assessing the status of ecological and social knowledge in the basin. Perhaps their greatest challenge is to present that knowledge so that it complements and enhances efforts that have already taken place within the complex web of institutional relationships in the basin.

While the SNEP case study offered a valuable story of the evolution of institutions in the basin, it did not fully account for the structures of governance and decision-making that are likely to affect adaptive management solutions in the near future. The purpose of this institutional assessment is twofold. First, it is to identify key stakeholders, institutions, and relationships in the basin. Second, it seeks to highlight some of the existing pathways of communication and decision-making that will require more precise understanding in order to build adaptive management and collaborative relationships among public agencies, public interest groups, non-governmental organizations (NGOs), and the public at large.

The information gathered for this portion of the assessment comes primarily from more than 30 in-depth interviews conducted with experts and leaders in the community between April and July 1998, and from discussions held in the Socioeconomic and Institutional Working Group in early 1999.[9] And a caveat is due: this institutional assessment was developed in the context of this

[9] Cited as Adair 1999; Ames 1998; Broughton 1998; Chilton 1998; Coambs 1998; Farrell 1998; Ferrari 1998; Greenwood 1998; Hansen 1998; Hasty 1998; Hill 1998a, 1998b; Lacey 1998a, 1998b; Machida 1998; Manley 1998; McGowan 1998; McIntyre 1998; Nason 1998; O'Daly 1998; Palma 1998; Shannon 1998; Teshara 1998a; Wallace 1998a; Wilcox 1998.

larger watershed assessment, one of several of the presidential commitments in the basin. One of its underlying goals is to integrate biophysical and socioeconomic assessments. The institutional assessment is presented to help anticipate structural opportunities for and barriers to developing a more comprehensive and integrated array of relationships among science, policy, and management. While it was clear from the outset that the political community in the basin already operates at a level of sophistication that exceeds that of many regions, evidence gathered for this report shows critical gaps in the sharing of information and resources among public agencies and between public agencies and key private sector coalitions and interests. The task here is in part to note some of these gaps and to identify opportunities for building bridges across them.

Governance, Institutions, and Stakeholders: The Geography of Power and Influence in the Basin—Political representation in the basin is more fragmented and complex than in many other regions. For example, the California portion of the basin alone has nearly 30 state-authorized special districts (Milbrodt 1988), and there are over 25 state and local jurisdictions on the Nevada side of the basin. At the level of citizen expectations for the delivery of services, the fragmentation means a dispersed range of governmental and non-governmental authorities to which one may appeal for assistance or redress. Several studies in the basin already have noted that permitting processes are more complex and the rules more constrained than in most other political jurisdictions (Milbrodt 1988; R/UDAT 1989; Sabatier and Pelkey 1990; NLTRA 1995).

This complexity is due in part to the predominance of state and federal public lands and the admixture of public land management and private land development. Also, political representation is made more complex because services, decisions, and oversight typically handled by local government jurisdictions are divided between a bi-state regional regulatory agency (TRPA), various special districts, and a plethora of boards and commissions that lack either general or comprehensive authority. While one might expect such a fragmented structure to produce incoherent outcomes, there has been robust institutional adaptation and innovation in bringing coherence to basin-wide issues.

There are several dozen jurisdictions that have impacts on land and resource management in the basin. Listing all the basin's federal, state, and local jurisdictions is less useful than describing key agencies and informal institutions that implement most of the regulations and carry out the bulk of management responsibilities in the basin. This central group of institutions can be called "core institutions," although no objective hierarchy is applied. They are identified because of their relationship to the three key biophysical issues that focus the watershed assessment: air quality, water clarity, and watershed integrity and biotic health. These substantive areas are in large part affected by decisions generated within the core group of institutions. The following agencies, associations, and coalitions are considered "core institutions" for the purposes of this assessment:

- TRPA;
- USFS;
- CTC;
- Lahontan Regional Water Quality Control Board;
- California Department of Parks and Recreation;
- Nevada Department of Conservation with nine divisions, including, among others the Division of State Lands, the Division of Parks and Division of Forestry (NDF), and the Division of Environmental Protection;
- Public utility and other special districts, including the Tahoe City Public Utility District (TCPUD), the North Tahoe Public Utility District, the South Tahoe Public Utility District (STPUD), the Incline Village General Improvement District (IVGID),

and General Improvement Districts (GIDs) in Douglas County;

- City of South Lake Tahoe (CSLT);
- The chambers of commerce and visitors and convention bureaus;
- NGOs and coalitions, including League to Save Lake Tahoe, the Tahoe Center for a Sustainable Future, the Lake Tahoe Transportation and Water Quality Coalition (TWQC), the Tahoe Truckee Regional Economic Coalition (TTREC), the Tahoe Coalition of Recreation Providers (TCORP), and the Forest Health Consensus Group (FHCG);
- Nevada Department of Transportation and California Department of Transportation;
- Research institutions, including University of California, Davis, particularly the Tahoe Research Group, the University of Nevada, Reno, the Desert Research Institute, The University of California, Berkeley, the USGS, the USFS Pacific Southwest Research and Experiment Station, and Stanford University;
- Counties and equivalent jurisdictions in the basin, including Eldorado and Placer counties in California, Douglas and Washoe counties in Nevada, and Carson City rural area.

Note that the coalitions and groups listed above are not formally empowered to make decisions or to formulate policy agendas, nor do they explicitly or implicitly claim that power. However, the management of environmental issues in the basin inevitably must take into account the involvement, investment, historical knowledge, and perspectives of these institutions and quasi-institutions. Moreover, there are key individuals who frequently are consulted, but who do not necessarily express or exercise their interests through these institutions or associations. Collectively, these institutions, quasi-institutions, and key players form a broader geography of power and influence in the basin.

Interagency Coordination and Cooperation—Although a greater focus at the policy level on interagency cooperation among the core institutions has developed since the 1997 Presidential Forum, the capacities for collaboration and cooperation among the core institutions has only partially penetrated to the line and operational strata of core public institutions. The institutional analysis literature would suggest that the behavior of key institutional players is perhaps better explained by the exercise of prerogative and authority in the service of agency goals and missions (Ostrom 1992; Singleton and Taylor 1992; Keohane and Ostrom 1994; Thomas 1997b). A more thorough analysis is required in the basin. However, many feel that cooperation and collaboration in the public sector lags behind the extra-governmental sector and, in some cases, impedes progress on issues that require broad-based, multisector cooperation.

TRPA stands squarely at the center of land use regulation and management in the basin. TRPA is responsible for making land use decisions down to the parcel level, which in most other locations are made by municipal and county planning entities. The most critical elements in the regulatory framework of TRPA are the regional plan and the "environmental threshold carrying capacities," or more simply the thresholds.[10] Both form the legal and political framework for basin-wide collaboration and cooperation.

[10] An "environmental threshold carrying capacity" is defined under TRPA Resolution 82-11 as "an environmental standard necessary to maintain a significant scenic, recreational, educational, scientific or natural value of the region or to maintain public health and safety within the region" (Tahoe Regional Planning Agency 1996: 1). The thresholds were adopted as a result of the recommendations of the Western Federal Regional Council's Task Force report. Based on the ecological concept of "carrying capacity," developed in the 1960s, most of the thresholds were developed from analyses of the ability of the environment to sustain activities in each of the threshold areas. While carrying capacity has been criticized as an ecological concept (Rees 1996; Lindberg and McCool 1998), it remains the basis of the thresholds today.

Since the establishment of the nine threshold categories in 1982, the basin political community has gone through cycles of legal challenge and political compromise that have both clarified the management implications of the thresholds and helped to consolidate working relationships among TRPA, other key management agencies, important political constituencies, and the general public. The recently adopted EIP was compiled in 1996 in part as a means to shift emphasis from regulation to restoration and mitigation projects in order to move the basin toward attainment of the thresholds. As a political strategy, the EIP was important in order to offer some incentives to an increasingly burdened public. Through the presidential forum, the EIP became the document around which the basin community has rallied, even though its scientific basis is not yet generally accepted. The EIP functioned, in any case, as a positive focal point that has demonstrated unity among disparate interests.

TRPA does not have exclusive land use decision-making authority in the basin. However, TRPA does have the authority to approve plans, to regulate disturbances in sensitive environmental areas, and to require mitigation of the impacts of development projects. These powers have been the source of conflict, particularly with regard to private property rights. Several legal tests have occurred that clarify TRPA's regulatory authority on private land. However, it appears to be a commonly held opinion that, despite controversy over the criteria for achieving the thresholds, TRPA is the only existing institutional framework in the basin with the political authority and the political legitimacy to convene diverse perspectives and interests at a basin-wide scale. Significant differences of opinion still exist about which issues are truly regional in nature, but there appears to be little serious contest of TRPA's authority to regulate development, to scope issues, and to focus institutional resources at the regional scale.

The USFS is another critical player among the core institutions. Technically the USFS is responsible for managing approximately 77 percent of the land area in the basin.[11] Approximately 20 percent of USFS land ownership is classified as "urban interface lands" or "urban or subdivision lots."[12] The USFS lands in the basin technically lie within the jurisdictions of three separate national forests: the Tahoe, the Eldorado and the Toiyabe. In the 1970s, during the early years of the TRPA, it became clear that managing the basin national forest lands required a single management authority. In response, the LTBMU was formed in 1973 and given independent management and fiscal authority. The LTBMU is functionally equivalent to a national forest; however, its challenges to manage a large urban interface area in a predominantly recreation-focused region has given the USFS unique budgetary constraints and staffing characteristics when compared to other national forests in Nevada and

[11] LTBMU shows figures for its total acreage at about 158,500; the regional office in San Francisco figures show about 157,500. Variations occur because of differences in where the boundary of the basin is supposed to lie.

[12] Discussions with the LTBMU lands officer revealed that accurate measurement of the interface with urban lands is difficult at best. A 1995 environmental assessment of urban lots showed approximately 100 miles of interface between USFS and private lands in the immediate area of the lake. Depending on the management prescription, the "depth" of treatment or management will vary substantially. In the case of current fire management strategies, the Defensible Fuel Profile Zone (DFPZ) normally works within the first ¼ mile of USFS land. Applied roughly, the USFS manages anywhere from 16,000 to 20,000 acres as "urban interface." The Santini-Burton acquisitions database, maintained by the USFS LTBMU, does not support a precise analysis of total acreage under "urban interface" classification. Many of the approximately 3,500 Santini-Burton parcels (~11,000 acres) have been acquired within the "general forest" areas because of ecological significance and do not fall within the urban interface. Additionally, some urban interface lands cannot be managed because they are designated wilderness (e.g., Mount Rose Wilderness Area, which abuts several private holdings in Incline Village). However, a rough estimate for the purposes of this report would put USFS land influenced by urban or developed lands at approximately 30,000 acres, or about 20 percent of the total land managed by the LTBMU.

California (within regions four and five of the USFS).

The predominant human activity on LTBMU lands is recreation in various forms. This reality places the USFS in a key relationship with the basin's recreation economy, which accounts for more than $1 billion per year, or half of all recreation generated revenues in the entire Sierra Nevada annually (Stewart 1996). Notwithstanding the importance of recreation in the basin, the LTBMU's recreation funding has remained fairly constant (approximately $1 million per year), despite the increasing demands on resources and the general declines in national budgets. The USFS's experimental "fee demonstration program," initiated nationwide by Congress in 1997, provides some opportunities for the LTBMU to increase and capture 80 percent of program revenues for local national forest reinvestment in facilities and services. However, the program is not without controversy in some areas, and its full impacts are still to be analyzed (San Jose Mercury News 1999). At this time, the so-called "Fee Demo" program is used only on a limited basis in the basin.

There appears to be some divergence in both the missions and styles of operation between TRPA and USFS in the basin. Several interviewees expressed concern that the overall orientation of the USFS appears to be excessively focused on "desired conditions." The desired-condition orientation of the USFS derives largely from the National Forest Management Act of 1976 and signifies a major transition in agency thinking over the last several years. However, it is seen by some in the basin as divergent from TRPA's Regional Plan, the thresholds, and the intent of the EIP.

This apparent divergence can be understood by examining the historical orientation of each agency. Until the passage of the Santini-Burton Act (PL 96-586, 1980), USFS land acquisition and management programs were focused on wildland in the basin (Fink 1991). TRPA's regulatory authorities, on the other hand, were focused on already developed lands and mitigation for parcels proposed for development. Through the joint development of the "Land-Capability Classification System," under the leadership of Robert Bailey, a geomorphologist with the USFS, TRPA and the USFS began to use the same criteria in evaluating sensitive lands for acquisition and management (Bailey 1974). However, while the USFS was increasingly focused on acquiring sensitive lands, TRPA continued to focus on offsetting the impacts of development. As the relationships between land acquisition and environmental protection have become more quantifiable, the missions of the two agencies have moved closer together, in practice.

Further, TRPA and the USFS have different means for developing management focus. The TRPA thresholds encompass clear and measurable regulatory limits while expressing a desired condition for developed lands throughout the basin. Progress toward threshold attainment is documented every five years, and threshold standards are evaluated regularly for their consistency with the best available science. The USFS on the other hand regulates its management activities through its Land and Resource Management Plan (LRMP), which is updated every ten years. The LRMP divides the basin into 24 management areas, each with distinct resource goals or "desired future conditions." According to the legal requirements guiding USFS management and planning (set by TRPA), standards and guidelines are then developed to steer management activities toward desired conditions. While the standards and guidelines for each management area may differ, all management areas incorporate TRPA thresholds.

A key difference lies in the two agencies' public processes. Both agencies engage in extensive consultation and public involvement, normally going well beyond the strict requirements of the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA). Through exhaustive public review processes, management standards usually end up looking nearly identical for the two agencies. However, changes in TRPA's management guidelines are evaluated through both the Advisory Planning Commission, which has strong local representation, and the Governing Board, with representatives from all

levels of government from local to both states to federal. TRPA's public process may appear to slow down changes in management and planning, but it ensures a thorough public airing of issues and increases the likelihood of broader consensus on controversial issues.

The USFS has put extraordinary effort into making its management strategies more transparent and public involvement accessible. As a practical matter, the desired future condition approach itself is an example of how the agency has attempted to engage disparate public interests within a common framework. But formal access to USFS decision-making processes is limited to public comment, which is interpreted by USFS staff, or appeal, which formalizes objections to proposed decisions. Without a formally designated and appointed federal advisory committee, there is no institutional mechanism to ensure robust public debate in USFS decision-making processes.

The FHCG created an innovative governance opportunity for both agencies. The FHCG was initiated by the TRPA Governing Board to engage a broad public dialogue in the search for solutions to a severe forest health problem following years of drought and beetle infestation. When the FHCG began its work in 1992, a broad range of stakeholders relatively quickly developed consensus on a statement of desired future conditions for the basin's forests (Forest Health Consensus Group 1992). The FHCG's next step was to identify ecosystem management strategies and techniques, including indicators to complement the thresholds, that would help to steer forest structure toward the pre-Comstock Era conditions identified in the group's desired future condition statement. That process has taken several years and continues to meet with institutional resistance when the group approaches agency prerogatives and interagency review protocols too closely (Nechodom and Kusel, forthcoming).

Technically, the USFS's desired-condition approach and TRPA's thresholds are nearly identical. Historically the USFS has been one of the most active contributors to the development of both the science and management frameworks that underpin the biotic thresholds, yet political perceptions in the basin indicate that the USFS often distances itself from the thresholds. Speculations about the causes of this apparent contradiction tend to point to the LTBMU's reluctance to cede management authority to a local or regional jurisdiction, whether it is a county in the basin, the Lahontan Regional Water Quality Control Board, or TRPA. This appears to be the source of a great deal of frustration in the management community in the basin. Observations at this time would suggest that the institutional divisions visible in the tensions between desired condition and the thresholds have more to do with agency prerogative and allegiance to disparate institutional clienteles than they have to do with the technical feasibility or scientific credibility of either approach (Sabatier 1986; Wondolleck and Yaffee 1994; Sabatier, Loomis, and McCarthy 1995; Nechodom 1996; Thomas 1997a).

From the perspective of those interviewed in the political community, the difficulties of sharing information and the uneven record of cooperation between the USFS and TRPA appear to be among the more salient institutional disconnections in the basin. However, this lack of cooperation and communication is intelligible from an institutional and political perspective. Until the Presidential Forum, and presidential commitments that followed the forum, little specific mandate has existed for cooperative action at the larger institutional scale. While the two institutions consult regularly with one another at the program and project scales, neither the structure of the bi-state compact (as revised in 1980) nor explicit congressional directives suggest a superstructure within which TRPA, the bi-state regulatory agency, and the USFS, the predominant federal land management agency, can share authority and power without losing autonomy. The absence of such a mandate reduces the ability of administrative leadership to sustain interagency cooperation or collaboration. While historically USDA Forest Service forest supervisors and TRPA executive directors occasionally have taken significant risks to

overcome interagency barriers, experience suggests that administrative risk without sufficient mandate or adequate constituency demand often fails (Berry et al. 1984; Berry et al. 1993).

Some of those interviewed speculate that excessive focus on the institutional disconnections between TRPA and USFS has been a red herring. Continuing to emphasize that particular problems obscure other perhaps more critical systemic disconnections between and among other important institutions. Institutional gaps are not uncommon in the basin, particularly at the periphery of the "core institutions." These gaps can be identified in several substantive areas, including transportation planning, water quality monitoring, recreation facility planning, tourism infrastructure development, and links between air quality and prescribed burning. Efforts are underway to close some of those gaps, and a number of interviewees expressed hope that funding from the presidential commitments, as well as eventual funding for the EIP, would help to facilitate better data coordination and interagency communication.

An overriding theme in many of the in-depth interviews was a perceived procedural mismatch among decision-making, implementation, and monitoring. Implementing the right kind of process or making sufficient investment in the processes themselves appeared to be the areas of greatest deficiency. One of the reasons the CTC is highly regarded in the basin is because of its position as an interagency and community facilitator. Its deliberate strategy is to invest heavily in public process, including very aggressive consultation with key interest groups in venues that are compatible with the communication styles of those groups. It is not at all unusual for CTC representatives to attend meetings of local interest groups (including homeowners' associations, business associations, and community planning roundtables) in order to provide general programmatic information and to give advance information on proposed projects prior to a formal public process. This often requires a substantial expenditure of agency overhead, as well as a direct budgetary commitment to developing constituencies for projects and helping specific sectors increase their knowledge in order to make informed contributions to the planning process.

In this context, the CTC has important advantages over other Tahoe basin public agencies. It has no regulatory responsibility or police powers; and, more importantly, it has a substantial budget for land acquisition, project implementation, and management. Moreover, the CTC has played an important historical role that has contributed to its position as a facilitating and implementing agency. In 1987, after the new bi-state compact was negotiated, the legal challenges were cleared, and the thresholds were approved, the fiscal burdens of the new regulatory framework in the basin were nearly insuperable for local governments and special districts. Environmental mitigation measures were needed to make progress toward threshold attainment, but few local entities could afford them. The CTC played a critical role in moving fiscal resources into place and providing relief to local jurisdictions.

Contributing the means to meet new environmental standards carried two additional advantages. First, because the requirements for CTC funding include projects that improve basin-wide environmental quality or provide "visitor-serving recreation amenities," partnerships between the CTC and local agencies serve to increase the likelihood that the local jurisdiction is able to link its needs and actions to a regional context. Second, without the CTC's substantial infusions of capital, progress toward threshold attainment would have been far more difficult and would have undermined the legitimacy of the thresholds. Many interviewees reflected on the fact that cultural and political attitudes toward the fairly strict regulatory environment in the basin have progressed from outright hostility, to acquiescence, to—at least in some sectors—solid support over the past two decades. Preparedness in the Tahoe basin for collaborative approaches to collective regional solutions is importantly rooted in the kinds of institutional relationships that have evolved between local jurisdictions and regional agencies.

Several local jurisdictions have realized great advantage in developing strategic partnerships with the CTC. Beyond increasing the flow of resources to those jurisdictions, these partnerships take advantage of combined educational and project implementation resources to advance mutually compatible agendas.

A key example of this partnership is the TCPUD, which is in the unusual position of providing multiple services to local constituents beyond its strict public utility service delivery mission. In order to deliver a broad range of services, it has developed strategic alliances with several institutions, including the CTC, the North Lake Tahoe Resort Association (NLTRA), and others, in order to leverage resources and to serve multiple constituencies.

Experience from the CTC's strategic relationships is suggestive for institutional evolution in the basin. Many have observed that the basin, as a regional community, is far more advanced politically and institutionally than many other regions. This was also one of the SNEP case study's conclusions in 1996 (Elliott-Fisk et al. 1996). Particularly over the last decade, the region has developed exceptionally high levels of social and human capital. Having high levels of social capital means that "networks of reciprocity and exchange" (Putnam et al. 1993: 169; Doak and Kusel 1996) are particularly well developed. The sense of interdependence and mutual obligation, reaching beyond barriers of personal preference, has been apparent through in-depth interviews and observations in public meetings. Further, human capital refers to the levels of skill, competency, and education an individual brings to his or her participation in the public domain (Kusel 1996).

These two forms of capital combine relatively easily with an unusually well-developed foundation of scientific information and collective social history in the basin to bring the political community to the point where process and communication are high priorities. Many key players understand the necessity of scientific verification of the assumptions behind the regulatory and restoration strategies in the basin. However, they tend to put the emphasis more on the way that scientific information flows through the community and contributes to advancing the collective needs in the basin. This is entirely consistent with observations from elsewhere regarding the readiness of communities to integrate scientific information into decision-making and dispute resolution processes (Lee 1993; Weeks and Packard 1997).

The Role of Coalitions—The basin's increasing focus on the exchange of information and the communication of ideas helps us make sense of the inordinate importance of coalitions within the political community. Many noted in interviews that there are sufficient formal venues through which one may obtain information or seek redress of grievances. However, most are aware of the essential importance of informal venues for generating and developing new ideas and innovations. In many other contexts, particularly in land and resource management in the American West, these informal venues are the causes of wariness and cynicism because they preclude open access to critical decision-making processes and enable local capture of state or national resources (McConnell 1967). It is for this reason that "sunshine laws" have been developed to interrupt the more typical patterns of power consolidation at the local level. In contrast, the robust and complex avenues of communication apparent in the basin reflect a great deal of transparency, as well as frequently articulated demands for access. Therefore, the fear of local capture and the unfair advantages gained by local power elites is minimized in the basin by a relative symmetry of power among several very disparate interests.

For several reasons, a clear sense of interdependence exists among diverse and often fractious interests in the Tahoe basin. Increasing economic diversity, the competition for scarce resources (such as transferable development rights, "coverage," or commercial floor space) and the shared sentiment that the environmental health of the basin is directly tied to economic and social well-being in the basin all create an environment ripe for cooperation and collaboration.

Thus, the Lake Tahoe Transportation and Water Quality Coalition (TWQC) is logically a very powerful quasi-institution through which information circulates and innovative ideas are generated. The group initially formed in 1989 as the Tahoe Transportation Coalition (TTC) and soon brought $2.5 million to the basin to help coordinate disconnected transportation systems on the south shore. The TTC evolved into the TWQC prior to the Presidential Forum, signaling a need to broaden

its focus to include water quality and lake clarity. The coalition's membership waxed and waned in the months prior to the Presidential Forum. However, it became increasingly clear to representatives of the various sectors who attended the coalition's meetings that a coherent voice was needed to show commonality and solidarity among sectors that typically competed with one another for scarce resources. Co-chaired by the League to Save Lake Tahoe, the Lake Tahoe Gaming Alliance, and a ski resort representative, the TWQC quickly evolved into a highly effective representative body that could speak with one voice in Washington, DC, Sacramento, and Carson City. Following the Presidential Forum of 1997, the TWQC has become an effective venue for the exchange of ideas and a forum attended periodically by key managers and line officers of public agencies.

The TWQC also has proved to be an effective lobbying body and has been known to use its collective voice to build support for public programs and budgets in the basin. Members of the TWQC make frequent trips to Sacramento and Carson City to submit formal testimony before state legislative committees and to meet with legislators to educate them about the complex multi-jurisdictional efforts in the basin. Similarly, TWQC members coordinate educational efforts in Washington, DC, and have been credited with keeping legislators and administrators at the national level focused on basin issues.

As a further testimony to their informal power, the TWQC frequently has been referred to as a "de facto FACA committee." One of the key provisions of the presidential commitments was to form a federal advisory committee (often called a "FACA committee") to provide oversight and legal legitimacy to collaboration among the governmental and non-governmental interests and to formalize policy-oriented discussions with various sectors of the public. It took several months more than anticipated to form the FACA committee. In the interim, the de facto power structure, characterized in significant measure by the TWQC, became increasingly important in providing guidance and helping the federal agencies' fulfill their roles in meeting the presidential commitments in the basin.

On more than one occasion, interviewees commented that the unelected and unappointed body appeared to be the forum at which critical policy decisions were being made. However, members of the TWQC insist that any decision by the coalition to pursue a particular policy direction should be carried forward to appropriate governing bodies and be subjected to full public process. It is difficult to determine at this time the relative equity or efficacy of the relations currently being built through such coalitions as the TWQC. Apropos the earlier discussion of local capture, state and federal agencies are likely to play a key role in ensuring transparency and access in the processes of information exchange, communication, and political representation.

There are three other major coalitions in the basin that have importance in to collaborative strategies flowing from the presidential commitments. The first, noted above, is the FHCG. This group was formed in 1992 at the request of the governing board of TRPA to provide a broader public forum to advise the agency on ways to manage the forest health crisis. The FHCG now serves a much broader purpose than was originally anticipated under its original charge as an advisory group. Beyond evaluating proposed changes in thresholds or management practices, the FHCG has the additional effect of increasing levels of social capital and fostering collective learning curves among diverse stakeholders (Nechodom and Kusel forthcoming). Moreover, scientists working on forest health and watershed integrity issues for the watershed assessment have found the group a ready source of local knowledge and a useful venue for dialogue.

The TTREC was formed in 1992 as an evolution of the earlier Economic Round Table, had met informally for several years to discuss various economic issues facing the resort community in the larger region, including the Tahoe basin, Donner Lake, and Truckee. TTREC's ultimate focus is on the nexus between economic and ecological sustainability in the region. For several years prior to the Presidential Forum, TTREC was considered to be the most focused economic forum in the region. However, TTREC has been a less active player in

formulating and advancing a regional economic vision for the basin. Evidence suggests that other interest groups and coalitions have taken up similar activities, albeit perhaps at a more limited geographic scale. These interest groups and coalitions include the NLTRA, the Incline Village/Crystal Bay Visitors and Convention Bureau, and the Tahoe-Douglas Chamber of Commerce. While these associations are active at a subregional scale, representatives interviewed stressed the need to focus their constituents' attention more at a basin-wide scale. The business community is highly diversified, even fragmented. Recreation industries in the basin focus their attention on entirely different markets but integration of these markets is left to the lodging associations and visitors bureaus. Small businesses are well represented through some chambers of commerce but not all. There is no comprehensive effort to integrate small business concerns at a basin-wide scale.

One of TTREC's early convictions was that regulation on behalf of environmental quality would increase the value of natural assets in the basin and would translate into economic vitality and social and economic development. From an institutional perspective, one may conclude that the stratification of the business community into large corporate ownership, large private ownership, and small businesses contributes to continued fragmentation and reduces the ability of the business community to support environmental improvement and restoration activities. For example, based on discussions held by the socioeconomic and institutional working group during the watershed assessment process, significant disagreement exists over the ultimate purposes and design of redevelopment efforts in the basin. A more complete analysis of redevelopment and regional economic development would need to clarify both socioeconomic goals and intended markets.

A third coalition focused primarily on public access and recreational services coordination is the TCORP. Formed in 1991, TCORP recognized that the recreation economy ultimately depends on the perceived environmental health of the basin. The problem TCORP confronted was that visitors' recreation experiences are often diminished by uncoordinated and fragmented services and infrastructure. TCORP's main focus is to coordinate planning among key recreation providers, particularly those in the public sector. One focus of their efforts was to create connections among bicycle trails on the north and west sides of the basin, which previously had been completed without a comprehensive plan. Additional examples are found in jurisdictional disjunctions between local transportation districts or in the parking management problems between, for example, the USFS and California State Parks on the west shore. Among TCORP's accomplishments has been to persuade local agencies to use the same signage conventions throughout the basin and to establish location markers to help orient tourists. Not only does this make visitor access to facilities and services easier, it tends to foster a greater sense of the basin as a whole ecological and social system.

TCORP's purpose is to provide an informal and regular forum in which coordinated solutions to institutional disjunctions can be found. Many of the same people who participate in TCORP also attend TWQC meetings, indicating that both coalitions may be focused on solving many of the same problems from different perspectives. While this may appear redundant, from an institutional perspective it is a good example of where redundancy in the system can serve to sustain attention on problems without creating costly institutional solutions.

The importance of coalitions in the basin should not be underestimated. Coalitions are often forced into existence by changes in markets or clients that make existing institutional arrangements unable or unwilling to respond. In most cases, the existence of a broad-based coalition signifies disjunctions between formal governing institutions and constituent needs. However, the existence of coalitions should not be taken necessarily as a criticism of formal institutional performance, nor should they be seen as necessarily compensating for deficiencies or incompetencies within or among formal governing institutions. Furthermore, coalitions should not be seen as mechanisms to circumvent normal governing processes. Together

they form a more or less tightly woven fabric of social and political communication.

Key questions regarding public policy and institutional performance revolve around how formal governing institutions interact with, share information with, and occasionally provide support for coalitions and informal associations. It is not a question of whether they should do so. The difficult puzzle to be solved for any regional strategy involving significant public resources is how to integrate the informal pieces of the fabric into policy formation, decision-making, implementation, and monitoring processes, while preserving transparency and accessibility. In the basin, the experiment has been underway for some time; implementing the EIP will place even greater emphasis on the need for tighter integration and cooperation.

Political Representation—The structure of political representation in the basin has become highly adaptive, particularly over the last decade, with significant evolution in non-elected associations since the early 1990s. The timing of the emergence of key coalitions appears to correspond with several factors. The basin was beginning to experience the aesthetic impact of a massive tree die-off in its forests. Following several years of drought, 1991 estimates showed that nearly 40 percent of the trees in the basin were either dead or dying. During the same period, the regional economy had flattened. Gaming revenues had declined, beginning a trend that continues today. The tourist and recreation markets had stagnated, with major changes in the demographics and socioeconomic profiles of visitors (NLTRA 1995). A study of the North Lake Tahoe "resort triangle," including the Truckee and Donner Lake communities, had concluded that traffic congestion and low-grade facilities in the northwestern portion of the region were indications that the quality of community and environment had been sacrificed to short-term economic development (R/UDAT 1989). Finally, a comprehensive "tourism master plan" study found that the "separation of regulatory control (TRPA) and governance (Placer County) creates a disassociation between public policy and local needs" (NLTRA 1995: 3).

But these factors were only part of the picture. During the last decade, the populations of Reno, Carson City, Gardnerville, and Minden have expanded by up to factors of ten. The western slope of Eldorado and Placer counties has grown at a similar pace, with the Auburn/Nevada City corridor almost doubling its population, and the Folsom/Placerville area growing dramatically. Growth in the regions surrounding the Tahoe basin is more than just an increase in numbers. The socioeconomic status, preferences, and values of the newcomers to these regions have placed increasing pressure on county planners and administrators to respond to the growing diversity of their constituents. The capacity to represent political interests in the basin vis-à-vis general purpose government has diminished as population and demand have increased on the east and west sides, downslope from the basin. For this reason, this pattern has been called a "downslope power drain."

The result of this shift in representation and political influence is that basin issues and the need for services and political infrastructure in the basin portions of those counties have received less and less attention. The basin supports a permanent population of approximately 55,000. Nearly 23,000 live in the incorporated area of the City of South Lake Tahoe, the only general purpose government seated in the basin. Thus, well over a third of the population in the basin has direct local access to political representation and general services. One might expect that the remaining two-thirds of the basin's population would seek local government services through county supervisors and commissioners, or at least through the county's administrative representatives. This is not, however, predominantly what happens. Other public jurisdictions attempt to fulfill citizen demands for services.

To examine this more carefully, let us look briefly at the structure of formal political representation in the basin. While voter registration is often a clumsy indicator of political representation, the numbers are particularly revealing in the basin. With the exception of Washoe County, the most recent voter registration numbers are used to show the relative balance of political representation between the basin portions of the four counties encompassing Lake Tahoe. For Washoe County, actual voter turnout counts from the November

1996 presidential election are used.[13] There are five major political jurisdictions in the basin (excluding the City of South Lake Tahoe), including four counties from which voter registration figures are provided: Placer and Eldorado in California and Washoe and Douglas in Nevada. The fifth political jurisdiction is the Carson City Rural Area, which covers an area on the Nevada side of the basin between Washoe and Douglas counties with virtually no population. The present analysis applies only to the four counties cited above.

The total number of registered voters in the four counties is approximately 360,000, using the most recent registration figures (Table 6-37).[14] The total number of registered voters in the basin portions of those counties is just over 30,000, representing approximately nine percent of registered voters in all four counties. The county with the highest portion of voters in the basin is Douglas, with approximately 21 percent, although the actual number is about 5,400. Not surprisingly, Eldorado County has the highest actual number of registered voters, most of whom are concentrated in the City of South Lake Tahoe. Placer County has the highest number of total registered voters at 133,649, but there are only about 6,000 in the basin. The implication of these numbers for the purpose of this assessment is that basin voters carry relatively little weight in county-wide elections. The pattern is similar for state legislative districts and congressional districts.

That influential political voices exist in the politics of land use in the basin is clear; however, their influence is not necessarily exercised at the level of local government and the delivery of services. Most of that influence is exercised at the state, bi-state (i.e., TRPA), and federal levels, reflecting the jurisdictions and management regimes that hold the most sway over land use policy in the basin. Therefore, community-level services, such as public safety, health, and welfare, are even more disconnected from direct political representation than under more typical circumstances where county and municipal governments are held accountable for the delivery of services.

This pattern is exacerbated by an unfortunate composite of misperceptions; that is, that the basin is populated by wealthy people, that the need for county support for community services is minimal, and that such concerns as public assistance and affordable housing are moot issues. As an example, the City of South Lake Tahoe had a very difficult time justifying state assistance for affordable housing. The city recently completed a street-front inspection and found that 41 percent of its housing stock was substandard. The average annual household income in the basin falls between $31,000 and $35,000 per year. The broadest implication of this picture is that, while the basin may be an increasingly attractive destination for a wide array of tourists and recreationists, it is an increasingly difficult location in which to raise a family and to build a community.

Government by Special District—Despite the lack of formal local representation, municipal incorporation attempts have usually failed. The Stateline area (across the Nevada border from the City of South Lake Tahoe) has attempted to incorporate twice over the last decade, without success. The Placer County portion of the North Shore has initiated three incorporation attempts in the last decade, again without success. The cause for failure appears to be a fairly predictable reaction when voters get to the ballot box. No matter how logical the arguments are, and no matter how compelling the numbers are, voters still tend to think that incorporation means higher taxes and "another layer of government" (Sokolow 1981; Mumphrey et al. 1990; Musso 1997). Some speculate that the rejection of municipal incorporation efforts in California and the basin derives from "a pre-

[13] The actual turnout in Washoe County for November 1996 presidential election was 62 percent of registered voters. The focus here is on the *percentages* of the numbers of voters in the basin compared with the number of voters in the rest of the counties. Using registration versus turnout numbers is not likely to change those percentages significantly.

[14] Voter registration or turnout statistics are from the noted jurisdiction, current as of the following dates: Placer Co., 7/17/98; Eldorado Co., 7/8/98; Douglas Co., 7/1/98 and Washoe Co., 11/7/96.

Table 6-37—Voter registration in Lake Tahoe basin and surrounding counties.

	Total Voters All Counties	Total Basin Voters All Counties	Total % Basin All Counties
Total Registered or Voting	353,728	30,408	9%
Democrat	129,641	10,854	8%
Republican	168,730	12,704	8%
Nonpartisan	30,871	4,491	15%
Other	23,729	2,426	10%

Sources: County registrars; authors' calculations

Proposition 13 mentality," in which voters are concerned that a municipality will abuse powers of taxation.

In the breach, a fascinating matrix of special districts and quasi-governmental entities has gained increasing power and influence through a historical evolution of service delivery. In the case of the North Shore, the TCPUD and the NLTRA work hand in glove to build sidewalks, gutters, visitors facilities, and community recreation facilities for local permanent residents. The NLTRA contracts with Placer County to provide a wide array of services to local residents, even though its formal role is to represent the various private sector resorts on the North Shore.[15] NLTRA receives approximately $3 million per year in TOT (transient occupancy tax, or "bed tax") from Placer County, part of which is used to leverage other dollars (e.g., CTC funding for water quality improvements) to fund capital investments for transportation infrastructure. The 64-acre Tract Intermodal Transit Center in Tahoe City is an important example of a project that was moved along significantly by the TWQC, the North Tahoe Transportation Management Association, NLTRA, and TCPUD.

IVGID is another interesting case, wherein Washoe County essentially has ceded a broad range of authorities to a general improvement district. IVGID works very closely with the Incline Village/Crystal Bay Visitors and Convention Bureau to provide local services for many of the part-time residents that make up a fair portion of its population. IVGID also has one of the most aggressive prescribed burning programs in the basin, funded largely through cooperative agreements with the NDF. This funding originally was pursued at the behest of a local organization called Neighbors For Defensible Space, which worked very closely with IVGID's fire marshal to develop a program. No attempt was made to pursue funding through Washoe County. Instead, the small citizens' organization saw the IVGID board as the most logical location of political representation for its cause.

In Douglas County, there are seventeen GIDs, with varying powers. Historically, the county had the authority to create them but was not obligated to oversee them fiscally. Nor was the county obligated to provide services that the GID could not afford or was not chartered to provide. This prompted change in legislation approximately 15 years ago in Nevada, forcing counties to work much more closely with GIDs and to provide such services as snow plowing and trash removal that otherwise in some cases were neglected for lack of an accountable authority. As demands in Gardnerville and Minden grew rapidly, GIDs in the basin portion of Douglas County found it increasingly difficult to get the attention and support of county commissioners. This contributed to the so-called "secessionist movement," in which basin constituents in Washoe and Douglas counties mobilized to petition the Nevada state legislature to authorize the formation of Tahoe County on the Nevada side of the lake.

There is an additional constraint that is almost guaranteed to have an impact on the implementation of the basin's EIP. Nevada's

[15] Only recently formed (1994), the NLTRA's main mission is to provide coordinated links between tourists and resorts. Their key accomplishment is a centralized reservation system for North Shore hotels.

portion of the EIP funding will come from an $82 million bond act, requiring funding distributed in the basin to have state-local mechanisms for implementing projects. Because GIDs in many cases are politically and geographically well suited to implement, oversee, and monitor projects, it would be logical to channel funding through them. However, the language of the bond act stipulates that funding for GID-based projects must be authorized and administered through the county, a strategy designed to improve oversight and accountability of bond act funding. Discussions with administrators in the state of Nevada reveal an expectation that Washoe and Douglas counties would improve their working relationships with the basin portions of their jurisdictions. One way of forcing this issue is to require the use of the two counties' institutional capacities to support the implementation of EIP projects through the GIDs.[16]

In Eldorado County, the City of South Lake Tahoe and the STPUD are the two most important local government entities that affect environmental planning. The fact that the City of South Lake Tahoe is an incorporated, general service government means there are fewer links with non-governmental agencies in developing binding ordinance and policy. However, STPUD, as the public agency that provides water and sewer services to more than 30,000 people on the South Shore, is a key player in project implementation and monitoring.

There are, of course, several other special districts and local government entities to which citizens turn for services. For example, there are more than a dozen school districts represented in the basin. Two resource conservation districts (RCDs) exist whose role in planning, implementing, and monitoring could prove critical, especially as key federal programs funded through the Natural Resources Conservation Service (NRCS) are implemented in coordination with the EIP, such as the Clean Water Action Plan (CWAP). In recent years, the RCDs in the basin have not played a central role in setting priorities for projects basin-wide. It may be that the historical orientation of NRCS and the RCDs does not make watershed restoration in a recreation-driven economy a high priority. Because the relationship between NRCS and the RCDs, and the institutional and social capacity of the RCDs themselves, is potentially a very powerful contributor to accomplishing EIP goals, the RCDs' institutional processes and ways of relating to other entities warrant further investigation.

Summary—Political representation and access to political processes in the basin are mediated by a complex network of coalitions, special districts, chambers of commerce, visitors and convention bureaus, and special interest groups. While this constellation of local powers is not unique, what is striking about the basin is the degree to which both local citizens and larger planning institutions interact with this local network to achieve political goals. As in any other relatively bounded political system, many of the same individuals serve in official capacities in multiple local institutions. For example, one might at the same time be the vice president of the resort or business association and a member of the board of the PUD and serve on the board of the local chamber of commerce. While this is not at all atypical, in the basin it has meant that many of the key players in political decision-making processes have moved through critical learning curves on regional environmental issues and have benefited from having perspectives from a number of different capacities. This helps to explain the high levels of human and social capital in the system and why proposed changes in institutional relationships may require several iterations of consultation and negotiation.

The gradual evolution of this de facto form of government underscores the importance of understanding the social and political history of resource protection in the basin. The PUDs have a long-standing presence in the basin and a long record of delivering services to growing populations. Among the few entities with elected officials, PUDs and GIDs provide the context within which many citizens have become accustomed to political

[16] Some speculated that it would make implementing the EIP more politically attainable if Nevada were to use the distribution of bond funds to foster unity and head off a secessionist success, at least in the short term.

participation. Moreover, through competition for elected office, citizens develop political competencies and a sense of ownership in the power structure. This sense of ownership is invariably tied to the ability to deliver goods and services to constituents. As PUDs have been approached with greater frequency to meet citizens' demand for services and as other local government mechanisms have been unable to meet that demand, the political legitimacy of the PUDs and GIDs have been strengthened.

Finally, understanding the complex nature of local government in the basin is directly tied to the watershed assessment's charge to "display consequences of alternative management strategies" and to "design monitoring protocols." Because any management strategy has implications for institutional structure and response, it is imperative to understand the institutional capacities and opportunities to leverage resources and create collaborative strategies. Given the high expectations in the basin for participation in advancing the environmental agenda, it is essential to know how to integrate changes in management strategies with local decision-making structures that do not fit textbook descriptions. Not only does the institutional structure of local government in the basin challenge normal expectations, it is likely that the continued evolution of localized decision-making to reach regional goals will grow from the historical matrix of local decision-making.

The legal and statutory framework of the basin is complex and influences the range of legally and politically viable options for collaboration in the basin. While several cases have established clear legal precedents on key issues, collaborative solutions may depend to an important degree on legal ambiguity or lack of definition. The basin's legal and statutory framework represents years of litigation and compromise. And while the courts have provided important clarification on specific authorities or procedures, they do not provide the usual venues for give-and-take on which trust and compromise are built. Nevertheless, experience in the basin demonstrates that occasionally a legal decision can provide the circumstances within which effective collaboration and compromise may be carried out (e.g., the consensus process following the Garcia injunction in 1985). Therefore, one may assume that legal and statutory decisions only partially drive decision-making processes. There is a delicate balance at work in the basin between legal definition and political compromise. As the EIP process moves forward, and particularly when the full level of funding becomes available, scientific information will play an increasingly critical role in fortifying the balance between legal and statutory definition and collaborative processes.

Cooperation, Collaboration, and Definitions of Success—As was noted in the SNEP case study, the basin has a long history of multi-sector and multi-jurisdiction cooperation. The geography of the basin, the common focus on recreational and aesthetic experiences, and the relative sensitivity of the ecosystem to disturbance all contribute to the need for cooperation in the basin (Elliott-Fisk et al. 1996). Note, however, that while "collaboration" has recently become something of a buzzword, there is reason to be circumspect about its usage in the context of the basin. It is useful to make a distinction between cooperation and collaboration. Cooperation refers to people working together toward commonly held goals in which the ends or outcomes are largely determined. Collaboration brings together people with disparate interests and perspectives who first clarify the questions themselves before looking for solutions. Collaboration often involves a fundamental reframing of issues in light of new information or new questions.

Combinations of cooperation and collaboration have long operated in the basin to bring innovative ideas to the table. Particularly when responsible and accountable agencies lack sufficient resources to meet their mandates, cooperation is likely to be emphasized. But in cases where interagency cooperation has not yet accomplished sustainable solutions, despite years of planning and public meetings, a collaborative process may prove more effective. Transportation provides an example in the basin, as it has been focused largely on visitation and automobiles. Other modes of transportation, such as watercraft and bicycles, have been regarded as recreational activities, therefore

treated as a destination or "draw" issue in the transportation picture. In this circumstance, cooperation might solve the problem of a fragmented public transportation system, but collaboration could help to understand why and how people move from one place to another around the basin. This raises the question of whether basin-wide transportation issues might be ripe for collaborative processes—bringing fresh perspectives to the table to ascertain the nature of the problem—rather than focusing on increasing cooperation among the responsible agencies to solve the problem in its current expression. The recently formed Metropolitan Planning Organization (MPO) may prove to be a venue through which such collaboration can take place effectively.

Collaboration in the basin is most needed where important policy questions have not been fully clarified and institutional commitments and prerogatives are not directly threatened. In order to assess which issues are amenable to collaborative processes, it will be necessary to identify issues that are nonnegotiable. From the perspective of most interviewees, it is clear that the TRPA thresholds and the regional plan fall into this category. Therefore, in assessing the measures of success or failure vis-à-vis the presidential commitments, care must be taken to understand how implementing those commitments fits into the balance of negotiable and nonnegotiable issues.

Implementing the EIP and making progress toward achieving threshold compliance are the key components of a successful cooperative framework. Nearly every discussion of measures of success included three categories:

- *Funding and resources*—The Presidential Forum and the subsequent negotiation of the Presidential Commitments involve promises of very large sums of funding in several issue areas. The inability to deliver funding as promised was frequently cited as constituting failure.
- *Process*—The forum brought national media and political attention to the accessibility of the various forms of collaboration in the basin. Several interviewees commented that the President's visit helped the basin participants take themselves more seriously and "do what they kept saying they would do." A key measure of success therefore, will be the relative degree of openness with which EIP priorities are established, EIP projects are implemented, and EIP outcomes are monitored. A number of interviewees urged the watershed assessment science team to see their work as providing tools and scientific rationale to support these processes.
- *Distribution of benefits and burdens*—The basin's political and business communities feel they already live on a tight margin of taxation and regulation in order to support socioeconomic well-being and environmental quality. Some complain that a small adjustment in any direction will likely put someone out of business or make it impossible for public agencies to meet their mandates. The EIP, which will require spending nearly $1 billion to implement currently identified projects, provides hope for many that the basin will attain its environmental goals in an economically and socially sustainable fashion. Success will be measured by how the costs and benefits of this new phase of protection will be distributed.

There is an important political dimension to success of the EIP and presidential commitments as well. The EIP is perhaps as much a political document as it is a series of technical recommendations; therefore, the distribution of benefits must include political successes as well. One local government official described success as giving every local jurisdiction, board, or coalition in the basin an opportunity to approve an EIP project that benefits their constituents, so that they have something concrete to point to when the EIP project is done. This is no small formality. It is a critical acknowledgement that approval of local projects for regional benefits and that general support for improving environmental quality require broad support from a number of sectors and interests.

Gaps, Overlaps, and Institutional Relationships—A key element of this analysis was to examine areas of activity in which institutions interact, fail to interact adequately, or duplicate their actions. One purpose to this element was to see where efficiencies might be realized in agency and institutional management activities. Another was to identify where agencies are working at cross purposes. It is a common mistake among institutional analysts to propose remedies for communication and procedural problems by changing institutional structures (Swieringa and Wierdsma 1992; Watkins and Marsick 1993; Cook et al. 1997). Analysis of the Tahoe case suggests a greater emphasis needs to be placed on institutional processes, as opposed to organizational structure.

Relatively few instances suggest that two or more agencies are trying to accomplish the same goals in direct conflict with one another. In general, most planners and implementers in the core institutions are well aware of the activities of their peers and colleagues in other agencies. Disagreements and a healthy level of debate can occur when agency approaches are in conflict with one another. Centralized approaches or fully coordinated approaches often have an unintended outcome of suppressing innovation (Wheatley 1992; Senge 1994; Marquardt 1996). It may be more appropriate to ask whether institutional structures, communications, and relationships optimize competition for the desired benefits and outcomes.

It is rare in the basin to find two agencies implementing programs at cross purposes on the same piece of ground. Significant implementation and information gaps tend to occur in communications among institutions or sectors that are affected by common decisions, are potential clients for agency research, or are potential constituents for overarching directions in agency management strategies. Undoubtedly, agencies can have severe disagreements about the treatment of a particular piece of ground. In such cases, communication strategies and venues could be much improved with institutionalized modes of communication and information sharing .

Significant structural gaps generally are created by a mismatch between authorities and responsibilities (as in the case of the separation of planning and regulation cited by the R/UDAT team) or caused by disagreements over who should pay for which benefits. Transportation provides a good example in the basin. The fragmentation of the current transportation system both geographically and in terms of user base is not for lack of effort or because a problem is not recognized. Many in the political community agree that a coordinated transportation system (CTS) is a reasonable, logical and much-needed change. However, efforts to develop a truly regional transportation management plan—or at a minimum a viable public transit option—have periodically stalled because of lack of agreement about the distribution of cost and benefits or the statutory authority to garner and allocate public and private resources. One basin- or region-wide authority has been technically able to control revenue streams or allocations of resources at the geographic scale at which transportation needs are manifest. That agency, the Tahoe Transportation District (TTD), made two unsuccessful attempts in the 1980s to generate revenue through voter-approved taxes. Since then, the TTD has been largely inactive, and most transportation issues have been addressed to the extent possible at the subregional and local jurisdiction scale. The TWQC's strategy has been to encourage local jurisdictions to use their authorities to help integrate local actions at a basinwide scale.

Despite this deficiency, however, significant strides in transportation policy and funding coordination have been made over the past decade through the establishment of two nonprofit public-private transportation management authorities (TMAs). TMAs provide an institutional opportunity to combine public and private resources to solve complex transportation and air quality problems, guided by governing boards that represent both public and private agencies and organizations. While most TMAs in California are in densely populated urban areas and tend to focus on commuter transportation, the Tahoe TMAs were the first to try to integrate the needs of workers and visitors into a single regional intermodal system. Both TMAs were initially funded by seed grants from the California Department of Transportation (CALTRANS).

The Truckee-North Tahoe TMA (denoted in its own documents as TNT//TMA) was formed in 1990, one year after a comprehensive grassroots-driven study of Tahoe-Truckee regional patterns of development and visitor needs made strong recommendations for a coordinated approach to transportation infrastructure development (R/UDAT 1989). The TNT//TMA has accomplished a number of coordinated projects, among the most visible of which are the trolley and bus services on the Highway 89 and Highway 28 corridors, connecting the west shore and the north shore through Incline Village to Sand Harbor and Squaw Valley (TNT//TMA 1995). In addition, the TMA initiated a similar trolley service in Truckee.

The South Shore TMA (SSTMA) was formed in 1994 and has played an active coordination role in bringing significant amounts of funding from state and federal sources to bear on south shore air quality and transportation problems. As with the north shore, the various institutions with transportation policy responsibilities constituted an uncoordinated patchwork, including eight municipal, county, and state agencies. One of the SSTMA's explicit purposes is to provide an ongoing forum to coordinate policies and funding affecting transportation issues on the south shore (Leigh, Scott & Cleary 1993). It has helped develop trolley and shuttle services throughout the south shore area and links to north shore services. Among its key institutional roles, it has provided a forum for numerous stakeholders to examine the economic and environmental tradeoffs of several possible solutions to the traffic congestion and air quality issues that historically have been difficult to resolve on the south shore. A recent successful effort to develop the South Shore Coordinated Transit System (CTS) was aided by the public forums and negotiating venues provided by the SSTMA (Powers and Teshara 1999). Similar to the TNT//TMA, the SSTMA's diverse public and private representation, as well as its deliberate role in providing a transparent public forum, has added significantly to the cumulative experience with coordination and collaboration in the basin.

Other institutional gaps tend to be caused or exacerbated by a lack of communication, information, and knowledge. For example, preserving Lake Tahoe's famed clarity now drives land use management, land acquisition, and forest practices throughout the basin. But it appears that insufficient communication of knowledge about the relationships among upper watershed management, sediment, and nutrient budgets has contributed to uncoordinated and imprecise use of best management practices (BMPs). Design of BMPs has been based on the best available scientific knowledge, coupled with accumulated management experience. However, in many cases, the application of a given BMP may or may not have a significant effect on the problem it is designed to solve. The problem is not so much the design of the BMP itself, but its application in a particular location under particular conditions. Insufficient knowledge of site conditions, compounded with a lack of communication about how specific BMP objectives meld with larger watershed goals, often generates significant uncertainty for managers, regulators, and property owners.

A perception of duplication of services is more pervasive than actual overlap in the provision of services or the application of regulations. Little evidence can be found to support the perception that agencies tell conflicting stories, apply conflicting regulatory requirements, or recommend conflicting management strategies for the same clients or for the same piece of ground. While conflicts and disagreements about practices exist, it appears relatively rare that management decisions are made without knowledge of the disagreements. The explanation therefore for what appear to be gaps or inconsistencies must probe more deeply into the reasoning behind the decision, the information that supports the decision, or the political and social context in which the decision is made.

The structure of governance, decision-making, and political representation in the basin is part of a highly evolved and complex system. While a significant amount of energy and capital have gone into establishing the regional plan, the thresholds, the EIP, and related management practices, the scientific foundation for management actions in the basin is still under development.

A cursory review of the role of coalitions in policy implementation illuminates their volatility, but coalition behavior is generally responding to changing institutional and political conditions. As discussed above, the key public policy issue is to determine how to interact effectively with coalitions. The first step should be to understand thoroughly the conditions that gave rise to their formation. The various coalitions in the basin are fluid and adaptive; there are important lessons to be learned from their adaptive strategies. Coalitions and other consensus building processes develop and behave as quasi-institutions, and several common patterns of organizational development may be found in their behavior. Institutional relationships in the basin may be usefully analyzed in light of what is known about organizational development and learning organizations. Interagency efforts to coordinate information and management might well understand structural changes as phases of development in learning organizations (Senge 1994; de Gues 1998).

This analysis finds that collaborative efforts and innovations in institutional communication and coordination will grow predominantly from demand, not from command. The political community and the larger public in the basin have accumulated especially high levels of social and human capital. Collaboration and sharing information are not foreign notions in the Tahoe basin. The level and breadth of knowledge about environmental issues in the basin is high, but it is also clear that institutional barriers must be better understood and altered in order to facilitate more effective collaboration and cooperation. To accomplish this difficult task, three critical factors must be in place: mandates to solve problems in a collaborative manner, risk-taking leadership to support collaboration, and constituent demand—not to drive or control the process but to participate effectively (Berry et al. 1993). Effective collaboration in the basin can be measured by the degree to which those who have invested effort and political capital feel they have a share in concrete and enforceable outcomes. Continued investment in iterative and broadly based cycles of implementation, monitoring, and adaptation will be increasingly required to ensure balanced achievement of environmental, social, and economic goals.

In his historical analysis of land acquisition programs in the basin, Fink (1991) found that increasingly precise quantitative measures of the relationships between sensitive parcels and water quality have been essential to the success of the programs. As the information base became more robust and as greater consensus developed among scientists about the relationships among disturbance, coverage, and water quality, the basin was able to move from qualitative to quantitative criteria for acquisition. Further, Fink attributes the success of the CTC's acquisition program in large measure to the use of "its land acquisition power in specific ways to attain the broader goals of 'enhancing . . . governmental effectiveness in the region [CA PRC § 66905.2].'" (Fink 1991: 544). Collaboration as a policy implementation strategy is fundamentally dependent on developing and communicating reliable scientific information. The core institutions' effectiveness in adaptive management in the basin will depend increasingly on the links they are able to create and maintain among well-defined policy directions, scientific information, and stakeholder participation.

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