Table 7.4—Economics Information

	Economic	Housing affordability	Redevelopment investment	Visitor profile/ behavior	Economic impact of visitors	Comparative information
				Number of responses		
Type	Current status	3	3	3	**4**	**4**
	General trends	1	3	**5**	**5**	**5**
	Alternative futures	3	2	2	2	**4**
Spatial	Local political jurisdiction	2	**4**	3	**4**	**4**
	Community level	**4**	**4**	2	3	2
	Tahoe basin	2	1	3	2	**5**
Temporal	Seasonally	2	0	**3**	**3**	**3**
	Annually	4	**3**	3	**4**	**4**
	Every 5 years	0	**3**	0	0	1

Note: Items in bold represent the most frequent responses in each row.

impact of current visitation), and alternative futures. Information types on comparative information on similar resort communities included general trends, and current trends and alternative futures ranked equally.

The spatial extent of data was focused on community level for housing affordability, local political jurisdiction for the economic impact of visitors, and local political jurisdiction and the Tahoe basin for comparative data on other resort communities. The temporal extent was generally annual and seasonal.

Scenic Resources

There are a number of aspects to the management of visual resources and the scenic characteristics of the Tahoe basin. Views of, and from the lake, aspects of the built environment, and forest appearance all contribute to the overall scenic quality. Scenic quality directly impacts property values and underlies the choice of recreational activity within the basin as well as in choosing the basin as an overall travel destination. Important aspects of scenic quality are covered in other parts of this science plan, and are not directly discussed in this chapter. For example the issue of visibility loss because of air pollution is covered in the "Air Quality" chapter; and lake clarity, in the "Water Quality" chapter. It should be noted that the single greatest threat to basin scenic resources is a catastrophic forest fire, a topic considered in several other chapters of this science plan. However, the question of the social acceptance of various treatment options for forest fire fuels is relevant to this section and is discussed below and in the natural hazards metatheme.

Jim Markle

Emerald Bay, Lake Tahoe, in autumn.

Knowledge Gaps

The TRPA currently has indicators for four types of scenic resources: (1) travel route rating, (2) scenic quality rating, (3) public recreation areas and bike trails, and (4) community design. These indicators have numerical scores representing the visual appeal of each spatial unit. Each indicator has a regulatory threshold that the TRPA tries to maintain, and measurements are taken every 5 years. None of these indicators have achieved attainment of threshold values during any of the four previous evaluations (TRPA 2006a). In addition, the USFS conducts scenic class inventories on their lands. A recent document prepared by the USFS as part of preparing its next forest plan addresses changes since the 1988 plan in the scenic conditions as measured by the 1997 Scenery Management System (SMS). It notes that there has been no recent monitoring of existing visual conditions, which means that there are no data sufficient for trend analysis on USFS lands. It calls for more monitoring, a reorganization of TRPA's Scenic Resources threshold system, and an upgraded SMS for scenic inventories (USDA Forest Service 2006b).

In terms of the built environment, there has been a trend toward larger residential structures, which are more visible around the basin and block views of and from the lake. The Place-Based Planning and Forum portions of the Pathway planning process and workshops with the Tahoe Chambers of Commerce all revealed a perception of "urban blight" in portions of the basin, where insufficient investments have been made in redevelopment of commercial properties, rental residential properties, tourist accommodations, public spaces, and infrastructure (Regional Planning Partners 2006). As a result of the Pathway planning process, the TRPA Scenic Resources staff has recently proposed new scenic quality indicators to their governing board. These indicators explicitly recognize issues like community design and the built environment, the importance of improving the scenic quality and integrity rating systems, and even light pollution.

Research Needs

Fifteen areas for potential research were identified for the scenic resource subtheme (see tabulation on page 309). These are discussed in terms of all four categories of research; data collection and consolidation, monitoring for management need, public agency management and collaboration, and program evaluation and policy design. Basic data collection and consolidation needs are focused on determining a better estimate of the public demand for improved visual resource management (S1–S6). Of interest to management agencies is the public perception of the scenic values and appearance of environmental qualities like a healthy forest, lake, or ecosystem (S2). The public's perception of a healthy forest, or the visual impact of

fuels management, do not match that of a professional forester, and this can lead to conflict between staff on the ground and the general public. Issues of light pollution in the Tahoe basin were widely discussed at the science symposium, and it was recommended to develop a sense of how big an issue it actually is, how the public perceives it, and how it might be addressed (S1). The USFS document for updating the forest plan noted a similar demand by residents and visitors for night sky viewing and reductions in light pollution.

There is a broad perception (supported by TRPA Scenic Resource ratings) of increased private investment in larger single-family homes that block views and dominate viewscapes, and a decline in the visual appeal of commercial areas and rental communities owing to low investment in public and commercial areas. Some research into the accuracy of these perceptions is recommended (S3), as would be work on possible regulatory and economic incentives to address them. The draft Pathway report (TRPA 2006d) describes some details of desired future conditions and indicators for scenic qualities, in relatively vague language. The TRPA and other management agencies recommended obtaining more complete public input as a way of refining these goals and there has been increased discussion of more frequent and thorough scenic inventories (S5). One suggested way to do that is through a broader and more detailed public perceptions study or survey (S1, S2, and S3). This would provide systematic knowledge of how people want their communities to look (S6). This can be weighed against the various environmental regulations and other regulations to make policy. To date, limits to land coverage on a developing parcel have been guided almost entirely by ideas about soil capability. However, it is possible that alternatives to soil-based limitations would be useful. A "scenic quality carrying capacity" was proposed as a limiting factor to developments of all types, but particularly directed toward larger single-family residences (S6).

Monitoring for specific management needs was primarily directed toward understanding the link between questions about reinvestment and improving the built environment (S7) and studies of the public value of increased scenic resource protection (S8). Most stakeholders agree that the high scenic beauty of the Lake Tahoe region is a large part of why people live, visit, and recreate in the area, yet the actual value of scenic resources, and the degree to which public spending should be dedicated to preserving and improving them is largely unknown. A study of the value of scenic resources, both in economic and noneconomic terms (S8) was suggested. A combination of contingent valuation, hedonic valuation methods, and travel-cost studies could be conducted to provide some information on these values.

The only question regarding interagency collaboration was that of integrating the TRPA's visual resource management tools and indicators with those of the

USFS (S9). Although the different management mandates of the two agencies may not allow a single system, increased examination of the correspondence of the two systems and coordination with other public and private entities interested in scenic resource management are recommended.

As with the other subthemes, there are numerous questions related to program evaluation and policy design (S10–S15). A simple request in the community workshops was the question of whether it was feasible to put power lines underground as part of the same construction processes that will be undertaken to put in storm drainage systems and sewers as a means of improving scenic quality (S10). Overall, there were broad discussions on examining the means of directing public and private investment to those communities with the greatest visual resource declines (S14). Various participants expressed concern about homogenous residential development being a threat to "local community character." The assertion was that TRPA restrictions on coverage and other regulations have resulted in a more uniform home style: with new homes designed to maximize profit while meeting all the regulations and the outcome leading to the decline in unique visual composition of communities around the lake. Requests were made to understand the extent to which this is true, and, if it is, what might be done to induce more diverse designs (S12). Research was requested on possible regulatory and economic incentives to address various scenic resource issues involving both public and private development (S13); this included possible methods for mitigating the decline of viewscapes owing to private residential development (S15). One issue raised was examining the feasibility of a scenic easement system—analogous to conservation easements—and purchase of scenic development rights or a scenic rights trading system were also recommended as ways to balance the public demand for high-quality scenery with private property rights (S11). Visual resources were not examined in the stakeholder survey.

Noise

The noise subtheme provoked substantially less input than the other social sciences subthemes. However, some research needs were identified. Noise is an issue in the basin largely for human aesthetic reasons, although some instances of noise pollution also may affect wildlife and the quality of their habitats. For example, the northern goshawk (*Accipiter gentilis*), requires quiet and undisturbed nesting sites for breeding and is discussed as a management issue in the ecology and biodiversity chapter. Noise in the Tahoe basin is primarily anthropogenic and includes private vehicle traffic, boats, airplanes, construction, snowmaking, off-highway vehicles, and certain special events.

Knowledge Gaps

The TRPA uses a metric called the Community Noise Equivalent Level (CNEL) to assign and evaluate noise levels based on land use compatibility. The CNEL is a weighted average of all noise in a place within a 24-hour period. The CNEL standards are assigned based on land use categories and transportation corridors. A few examples of existing CNEL standards based on land use are (1) 65 decibel average (dBA) for industrial areas, (2) 60 dBA for hotel and commercial areas, and (3) 55 dBA for high-density residential and urban outdoor recreation areas. The airport CNEL value of 60 dBA applies to approved flight paths. However, TRPA Noise Resource Area staff recently presented a set of modified noise indicators to the TRPA governing board. In addition to somewhat modified decibel levels for CNEL, the proposed indicators include effects on wildlife and single-event noise levels such as low-flying aircraft.

Noise levels are monitored in only a few locations once every 5 years. This creates a temporally and spatially incomplete data set, making it hard to assess trends, adjust for temporary noise sources like construction, capture site-specific noise sources, or test actual traffic noise against the levels predicted by current noise models. In contrast, the Tahoe airport maintains a monitoring system and reports exceedances and complaints monthly (Brown-Buntin Associates, Inc. 2004).

Research Needs

Five areas of research were identified for the noise subtheme, falling into two categories of research: data collection and consolidation, and program evaluation and policy design (see tabulation on page 309). The single largest issue with regard to noise appears to be the need for a monitoring system capable of providing a more spatially and temporally complete and uniform coverage (N1). The current CNEL-driven system does not capture one-time violations and does not provide a good estimate of average noise levels. The proposed single-event and wildlife-related TRPA noise indicators also would need more thorough and effective monitoring systems. A study into the feasibility of remote sensors to monitor noise levels over extended periods could be useful. There also is an issue of the difference between the actual noise levels and the perceived noise levels of private vehicles, off-highway recreation vehicles (like snowmobiles), and other motorized transportation and recreation vehicles. Technological improvements may have reduced the actual noise production of these vehicles, but people may have over the same time become more sensitive and perceive them as incompatible with the Tahoe experience. A number of agency personnel expressed an interest in understanding the real public demand for increased noise regulations (E2).

In terms of policy evaluations, interest was expressed in examining subsidies or other public investment in noise abatement technologies that can reduce noise levels from vehicles while still allowing their current levels of use (N3). Feasibility and effectiveness studies of mitigation opportunities were mentioned as potential topics for study (N4). Studies of enforcement options could be helpful in addressing noise issues and finding resolutions to conflicts about them (N5). Noise was not explicitly addressed in the stakeholder survey.

Metathemes and Emerging Areas of Interest

There were a number of overarching research needs that cut across many of the social science subthemes and even other thematic areas in the natural sciences. Where there were very clear subtheme research questions, they are included in the sections above; however, some issues were raised frequently enough that they warrant separate discussion. This section presents information and research needs for five metathemes: (1) collaborative information management; (2) Tahoe basin community management; (3) program evaluation, policy design, and policy process evaluation; (4) fire and natural hazards; and (5) climate change impacts.

Collaborative Information Management

A conclusion of this research process was the recognition that many types of data and research results would be useful for a variety of different regulatory and management agencies, advocacy groups, private businesses, and community interests. There was a broad consensus that it would be beneficial to the entire Tahoe basin community if there were increased collaboration on funding, collection, dissemination, and storage of social science data, rather than piecemeal data collection for specific organizational needs. There has already been substantial effort made toward the archiving and storage of social science data through the establishment of the Tahoe Integrated Information Management System (TIIMS). The TIIMS was recently established as a data clearinghouse and information hub for Lake Tahoe related data. However, based on the results of the 2008 Social Science Data Needs Assessment for the Lake Tahoe basin (Kauneckis and Copeland 2008), TIIMS appears to be underused as a data clearinghouse (fig. 7.7).

The underuse of TIIMS is likely due to its relatively recent implementation and current redevelopment of its user interface; it is possible that TIIMS will become an important component of the information infrastructure for Tahoe if sustained funding is established. At least some members of the business community have expressed a willingness to join with natural resource management agencies in sharing the cost of gathering, maintaining, and distributing mutually beneficial

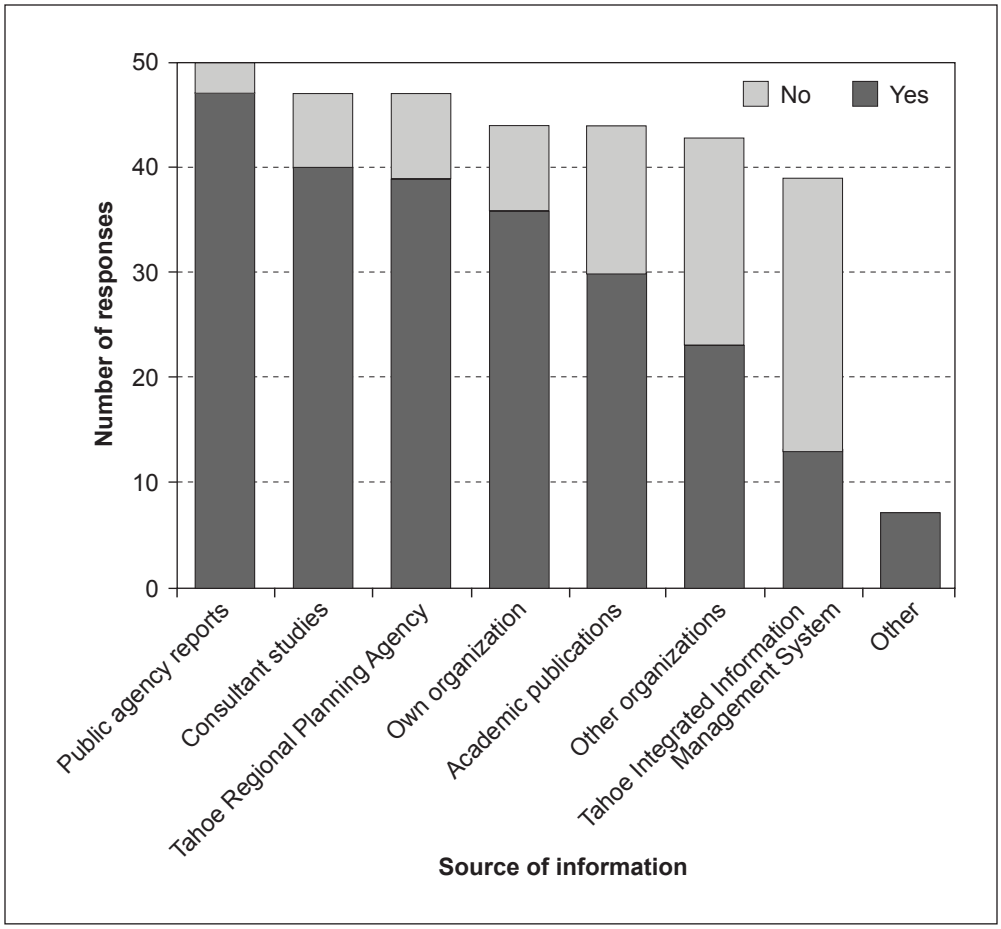

Figure 7.7—Current source of social science information (n= 50). (Source: Kauneckis and Copeland 2008).

scientific information at regular intervals. Numerous regulatory and management agencies and local governments have similarly expressed the potential utility of a clearinghouse where data could be held and distributed for common use. The Tahoe Chambers of Commerce in conjunction with the U.S. Army Corp of Engineers have recently formed a working group of stakeholders to scope the potential for developing a set of community sustainability indicators for the Tahoe basin (see U.S. Army Corps of Engineers 2008). Given the very high level of communication and collaboration already occurring among stakeholders in the basin (Kauneckis and Imperial 2007), focusing this attention on the collection and dissemination of social science information is the next logical step. Although there are challenges to designing a data product useable by such a diverse array of stakeholders, this is a broad-based interest worth pursuing.

Increasing access to the broad array of information on specific management issues adopted in other alpine-tourist-based economies was also a common point of

discussion throughout the science workshop. For example, there was strong interest in the development of a "library" of consumer choice on transportation, vehicle use, and alternative modes (T17). In another example, managers were interested in better understanding how other areas have dealt with recreational conflicts (R12) and with affordable housing in resort communities (E19). Fundamentally, decision-makers feel that they may be "reinventing the wheel" in dealing with many of the challenges at Lake Tahoe and that access to information on policy options created in other areas would facilitate the policymaking process.

Creating such a useable knowledge base is a substantial challenge. However, there are a number of immediate options available. The most common means of learning what has been done elsewhere is through informal professional networks and formal professional associations and publications. This assumes continued engagement with other practitioners and would reallocate attention that otherwise goes toward more immediate tasks. An alternative to Tahoe-based managers going outside the basin is to bring in outside experts and use consultant services to summarize current understanding of a specific topic area. This is a common occurrence at Tahoe and when combined with a focused workshop with resource management agencies can be a very effective means of getting immediate questions answered. However, there are disadvantages to this method of knowledge diffusion. Typically, the input by one person is less useful and reliable than a broader array of opinions. Given the already high level of collaboration at Lake Tahoe, scheduling by top managers tends to be overallocated and unless immediately relevant, attendance to events is often low. Additionally, most managers prefer information available on their own schedule, thus the preferred source of social science information is standard compilations in existing reports (fig. 7.7).

With the advent of Web-based knowledge systems, there are a number of technical options that may be worth exploring. The TIIMS represents an important first step in collecting Tahoe-related research by developing and cataloging reports and data in a searchable format. However, there have been complaints about difficulties in accessing data stored on TIIMS. Information consumers are increasingly demanding immediate usability of the information output and TIIMS structure as a data clearinghouse does have some limitations. Given the specificity of the knowledge needs for particular policy issues, and the underlying complexity of many of the questions public and private stakeholders are interested in addressing, there are no immediate simple technical fixes. Web-based delivery of information would require substantial upfront investment in an information infrastructure and continued resources dedicated to upkeep and management. There are, however, some potential technology-based experiments that could be considered. One of the

most-used sources of Web-based information is open-source discussion groups dedicated to specific topics. If Tahoe-based decisionmakers are having problems finding information on the impact of something like parking fees on recreational experience, it is likely that other transportation and recreation managers have as well. Lake Tahoe is often on the forefront of emerging management issues and this could potentially be leveraged to develop new discussion groups with resource managers facing similar issues. It is recommended that this be done experimentally and in close association and perhaps co-sponsorship with professional associations. This might involve only a subset of alpine lake resource management associations, or even just agency officials within the basin. The challenge is to design a means of leveraging the experience and knowledge of other alpine-resort-based communities. Other options include various forms of information and knowledge architectures. For example, an open discussion and contribution-based Web site such as a "Tahoe-wiki' where general questions could be posted with response options open to other resource managers or the general public. Many Tahoe residents do tend to be highly educated and can bring time and technical expertise to management questions. There are obviously numerous challenges with designing digital knowledge systems that produce useful results; however, Tahoe's unique environmental characteristics, national prominence, and proximity to the epicenter of the digital economy may give it an advantage in being at the forefront of the development of new knowledge systems for managing natural and human-made environments.

Tahoe Basin Community Management

A consistent point of discussion was moving management questions from a central focus on environmental management toward broader issues of basinwide community management (TRPA 2007a, b). This was not directed at weakening environmental regulations, as most stakeholders have come to accept the importance of environmental quality as central to the character of Lake Tahoe, but rather an attempt to bring a similar commitment to social aspects as well. This represents the natural evolution of public management questions in the Tahoe basin as businesses and communities have adapted to the regulatory structure necessary to preserve lake water quality and the broader ecosystem, they increasingly understand the interdependence of the Tahoe basin in terms of a regional economy and a set of interconnected communities.

Examples of immediate areas of research integrated with community decisions included basinwide methods for prioritizing and improving local infrastructure that impact local quality of life. Although the allocation of infrastructure projects is partially discussed in the EIP plan, some stakeholders felt the central focus on

environmental aspects may weaken some community priorities. A related infrastructure issue was that of the lack of DSL or other high-speed Internet access basinwide. This may be an important business diversity issue for likely a large percentage of Tahoe-based professionals who work out of home offices. Discussions of the lack of a basin- or regionwide communication infrastructure that would help emergency response in the aftermath of a natural disaster, extreme weather event, or other emergency situation were an additional concern. Coordination of the various local government units could improve the response, but there is little direction or infrastructure to support it. It is recommended that alternative energy and environmentally sustainable design be considered part of the ongoing Tahoe basin management, and yet they do not fit into any thematic category. There has been some local interest in the development of regional forest biomass conversion facilities for renewable energy. Additionally, participants in workshops held by the chambers of commerce expressed the need to further develop public gathering places, community and nonoutdoor recreation centers, increase the level of arts and culture, town centers, and other community-related amenities. Information on the return to public investment as well as how to better target the type of public space infrastructure investments was a shared concern by both local planners and regulatory agencies, and private businesses.

A number of recent activities suggest there is a substantial movement toward redirecting and coordinating management decisions at the community level. The Pathway process involved a number of direct engagements between the regulatory agencies and communities. The Community Enhancement Program produced a set of community visions (from which many of the questions examined in the survey and discussed in this chapter were drawn). The recent effort toward the development of a set of sustainability indicators (U.S. Army Corps of Engineers 2008) suggests substantial room for collaborative work between the public and private sectors.

The discussion above presents the primary issues brought forth during meetings and workshops, yet additional insight is revealed in the stakeholder survey results. Based on a review of the literature and discussion with local stakeholders, the survey was designed to specifically capture other community-based research issues not directly addressed in the subthemes above. Community well-being consistently ranked high among issues addressed in the survey (fig. 7.4). In terms of specific community well-being issues, school quality ranked as most import, followed by fire vulnerability, the population living below the poverty line, housing affordability, and public space (fig. 7.8).

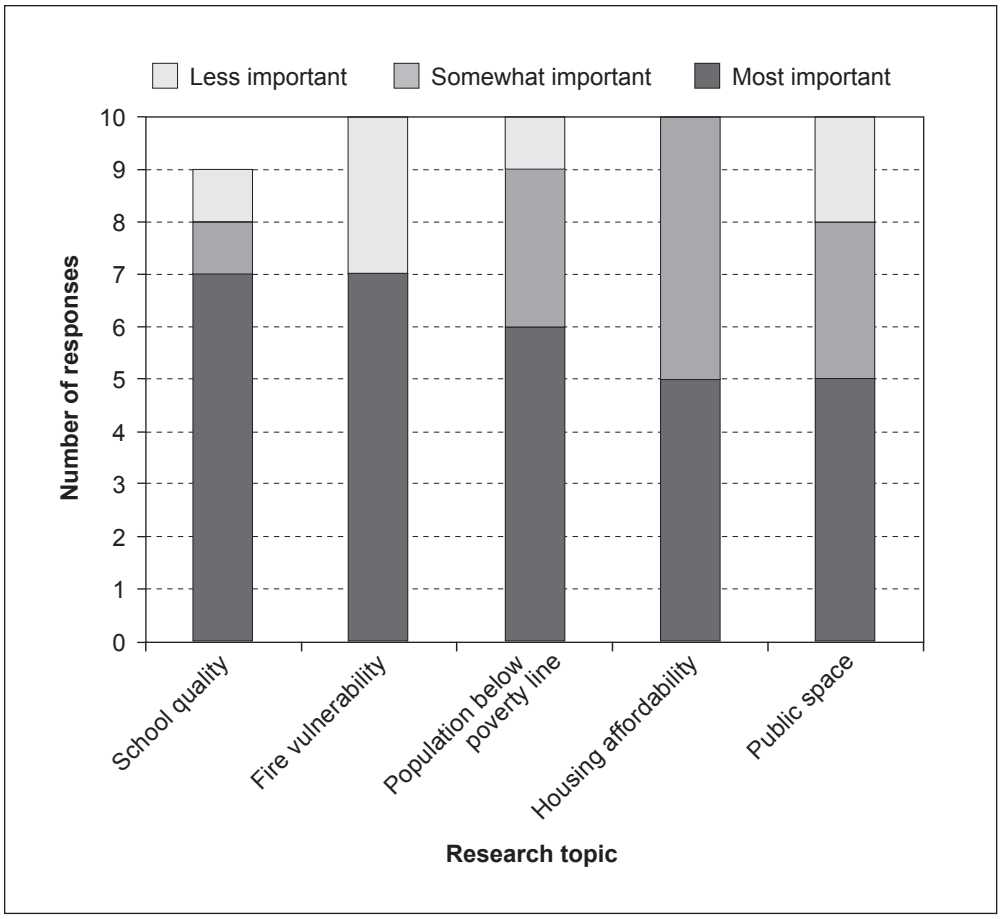

Figure 7.8—Ranked importance of community well-being issues (n = 10). (Source: Kauneckis and Copeland 2008).

An examination of the type of data needed for each of the above (table 7.5) reveals that the most important need is for information on current status, followed by future projections and general trends. The spatial extent of the data varies according to the specific issue (table 7.5). School quality data were both important at the basin and local political jurisdiction level. Fire vulnerability was included in the survey under community management, and interestingly the spatial extent of the necessary data was at the individual level, likely a recognition of the importance of establishing defensible space on private parcels. Fire risk was also considered important at all other spatial extents. In terms of the temporal extent of data, the results were predictable, with school quality and the population below the poverty line important annually, fire vulnerability and public space seasonally, and housing affordability biannually and seasonally, probably recognizing the unique nature of the seasonal employment flows to Tahoe.

Table 7.5—Community management

	Community	School quality	Fire vulnerability	Population below poverty line	Housing affordability	Public space
				Number of responses		
Type	Current status	5	**6**	**6**	**6**	4
	Future projections	2	5	**6**	5	4
	General trends	3	3	2	**4**	3
Spatial	Local political jurisdiction	**5**	4	**5**	**5**	3
	Community level	3	**4**	**4**	2	3
	Tahoe basin	**4**	3	3	2	3
Temporal	Seasonally	1	**4**	2	2	3
	Annually	2	1	**3**	1	1
	Biannually	1	0	0	**2**	0

Note: Items in bold represent the most frequent responses in each row.

Program Evaluation, Policy Design, and Policy Process Evaluation

Many participants in the various workshops and meetings, from the public, private, and nonprofit sector expressed interest in a variety of public policy evaluation issues. These are grouped here into three overlapping areas of policy research: (1) program evaluation, (2) policy design, and (3) policy process evaluation. Program evaluation involves research questions on the efficacy, efficiency, and equity of current public programs and regulatory policies implemented in the basin. Policy design addresses questions of the specific components of existing and new programs and how these can be adjusted to improve desired outcomes. Policy process evaluation includes research and methods for improving the decisionmaking and collaborative process itself. Typically this includes such issues as coordinating policy implementation across different agencies, public management, managing program implementation in networked environments, developing conflict resolution mechanisms, and increasing public participation.

In terms of program evaluation needs, a number of participants, including management agencies and representatives of the Tahoe Chambers of Commerce, expressed interest in identifying conflicts between various regulatory policies. One example discussed was installation of a flashing light to warn motorists of a crosswalk, which was proposed and planned but could not be implemented owing to its direct violation of TRPA scenic regulations. Another is the perceived incompatibility of vegetation management for fuel reduction and habitat enhancement versus the impacts these actions can have on soil and water quality. These interventions produce positive public outcomes, but they present challenges for reconciling local

and regional goals and clearly communicating actions to the public. Developing an explicit means for the systematic investigation of these types of clashes was also discussed. The fact that the request was not to resolve specific conflicts, but rather for a process to frame future discussions, suggest various methods of policy process evaluation could be useful. This incompatibility is further discussed in the recent emergency fire management report (California-Nevada Tahoe Basin Fire Commission 2008).

The social science data needs survey was designed explicitly to address various aspects of the policy environment at Lake Tahoe and included questions about a variety of public agency management issues (fig. 7.9). The highest ranked items of interest were the relationship between government agencies and the public, followed by improving interagency cooperation, evaluation of the effectiveness of current policies, cost-effectiveness, and conflict reduction tools.

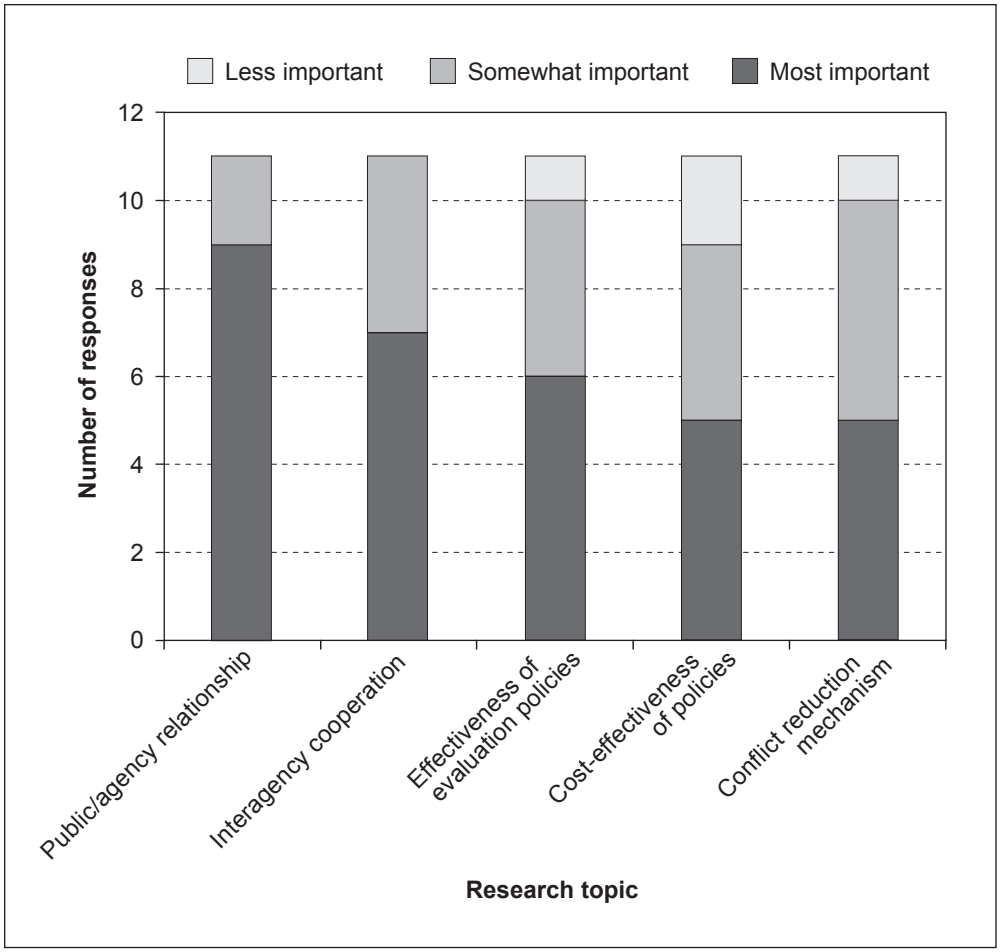

Figure 7.9—Ranked importance of public agency management issues (n = 11). (Source: Kauneckis and Copeland 2008).

With regard to the types of data, current status was highest in importance in the areas of public/government relations, interagency cooperation, and conflict reduction (table 7.6). Evaluation of program effectiveness was directed toward future projections suggesting an emphasis on improving the participation and compliance with existing policy programs. Across all issue areas, the spatial extent of interest was the Tahoe basin, with some attention to administrative jurisdiction for effectiveness evaluation of policy and cost-effectiveness. The temporal extent was generally focused on annual or biannual evaluations (table 7.6).

Table 7.6—Public agency management and collaboration

	Agency	Public/ agency relationship	Interagency cooperation	Effectiveness of evaluation policies	Cost effectiveness of policies	Conflict reduction mechanisms
				Number of responses		
Type	Current status	**5**	4	1	2	4
	General trends	2	2	2	**6**	2
	Efficiency improvements	1	1	2	**3**	**3**
Spatial	Local political jurisdiction	2	1	0	0	**3**
	Administrative jurisdiction	0	1	3	**4**	2
	Tahoe basin	**8**	7	5	5	6
Temporal	Monthly	2	2	1	1	**3**
	Annually	3	2	**4**	3	1
	Biannually	1	0	1	1	**3**

Note: Items in bold represent the most frequent responses.

A related issue discussed by some public agency representatives was the extent to which the public understood the environmental quality issues at Lake Tahoe and the impact of the various policies. Although some research has been conducted on public attitudes and perceptions of the TRPA and its regulatory policies (Kauneckis 2008, TRPA 2005a, Weible 2007), very little work has been done pertaining to the role of public education in helping organizations and agencies in the basin promote collaboratively defined desired conditions (for an exception see Ward et al. 2003). This includes understanding the impact of current public information and interpretive programs, as well as how these can be designed to be more effective.

One of the best examples of the crosscutting nature of policy evaluation is the current program of private and commercial property BMPs. In the Lake Tahoe basin, BMPs are structural and landscape design components intended to reduce soil erosion and polluted runoff from private parcels. Best management practices include building infiltration systems for stormwater runoff from impervious

surfaces such as driveway and rooftops, mulching and revegetating bare or disturbed soils, stabilizing steep slopes and loose soils, and paving dirt driveways and roads. Best Management Practices were required on new construction and remodeling projects beginning in the 1980s. The TRPA instituted BMP requirements as part of its basinwide ordinances in 1992 and in 2002 created the BMP Retrofit Program targeting existing structures as well as new constructions. As of 2003, TRPA ordinance requires BMPs on all private residential, commercial, and industrial parcels. Implementation of BMPs on existing private parcels was prioritized into three watershed groups, and deadlines have been set for compliance and certification. The deadlines for compliance in priority 1 and 2 areas passed in 2000 and 2006, respectively, and are set for 2008 for priority 3 areas. Despite active public outreach via TRPA, university cooperative extension programs, resource conservation districts, and the Natural Resources Conservation Service, average rates of compliance for the BMP retrofit program are at 16 percent for California and 25 percent for the basin as a whole (TRPA 2009: 25). So far there has been little attempt at enforcing BMP retrofit requirements on existing structures and few actual sanctions imposed. Compliance has occurred on a voluntary basis and is likely linked to home renovations (Kauneckis 2008).

The environmental aspect of BMPs is the primary management strategy for dealing with water quality and soil management issues in the Tahoe basin. Their environmental aspects are discussed in the "Water Quality" and "Soil Conservation" chapters. Although relatively limited, some work has evaluated the water quality benefits of private and commercial BMPs (see Schuster and Grismer 2004). However, BMPs also are important to understand as a component of the social sciences, as the primary questions raised by stakeholders involved increasing implementation on private parcels, the efficiency and cost-effectiveness of current designs and location selection, and means of coordination and prioritizing public investment in community-scale BMPs for targeting the most effective projects.

The most salient contemporary program design issue is that of modifying regulations that work at cross purposes for protecting environmental quality and reducing excess forest fuels following the Angora Fire (California-Nevada Tahoe Basin Fire Commission 2008). This included clarifying the private homeowner's responsibility to clear vegetation and pine needle debris to create defensible space and requirements to maintain native vegetation and ground cover to minimize erosion and polluted runoff. This issue also extends into undeveloped areas such as fuel management of areas in stream environment zones, and balancing forest thinning practices and biomass management with water quality and erosion control functions.

Social science applications for improving environmental management include aspects of the management organizations as well as those of the public. Issues of engaging public participation, compliance, information, education, and general relationships between public agencies and private citizens also were addressed explicitly in the stakeholder survey. Public willingness to participate in programs was ranked as the most important, followed by public understanding of environmental issues at Lake Tahoe, public perceptions and understanding the effectiveness of current policies, access to information on BMPs, and general knowledge of public policies (fig. 7.10). In terms of the types of information needed, the majority of social science research needs were around items of current status, with some attention to future projects (participation and perceptions of policy effectiveness), and efficiency improvements (table 7.7). The spatial extent of the data requirements were almost universally at the basin level, with some interest in community level.

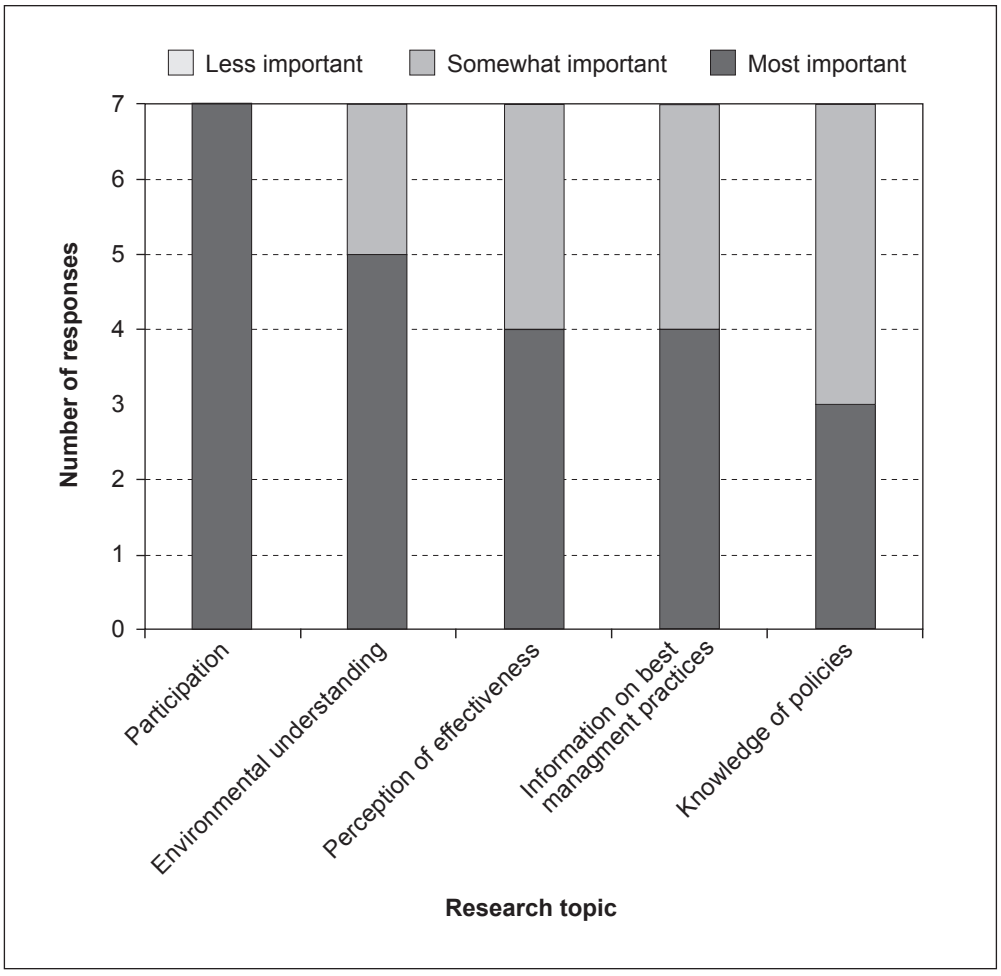

Figure 7.10—Ranked importance of public information issues (n = 7). (Source: Kauneckis and Copeland 2008).

Table 7.7—Public information and outreach

	Public	Participation	Environmental understanding	Perception of effectiveness	Information on Best Management Practices	Knowledge of policies
			Number of responses			
Type	Current status	3	2	3	3	**6**
	Future predictions	**3**	1	**3**	2	2
	Efficiency improvements	**2**	0	**2**	**2**	**2**
Spatial	Community level	2	0	0	1	**3**
	Administrative jurisdiction	0	1	1	1	**2**
	Tahoe basin	4	3	**5**	3	4
Temporal	Seasonally	**3**	2	**3**	0	2
	Annually	0	0	0	**3**	1
	Every 5 years	**2**	1	**2**	**2**	1

Note: Items in bold represent the most frequent responses in each row.

Although the expected relationship was that this information would be most useful on an annual basis, respondents indicated that seasonal was more important. This is tied to the winter/summer recreational seasons and likely the need to understand the new dynamic of second-home ownership.

With much of the policy focus at Tahoe on issues of private land management, such as BMP implementation and fuels management, the role of public participation is becoming increasingly important. However, the growth of second-home ownership presents challenges to maintaining public involvement in community and basinwide issues. Yet there are a broad array of methods for informing and engaging the public in policy decisionmaking including traditional forms of public engagement through community workshops, consensus visioning, public education, and interpretation. There also are a number of methods for more explicitly addressing the role of the public. Community-based mapping, using Web-based geographic information systems or other visualization techniques were discussed in various meetings. The TIIMS is currently developing an online map service to show the location and relevant information about EIP projects, and progress on defensible space on a parcel-by-parcel basis. Commercial and other open-source data visualization programs also are available for better presenting information to the general public. Other technology-based methods include such approaches as alternative futures and consensus modeling. Alternative-futures modeling presents various possible scenarios in land, water, and natural resource management and permits stakeholder discussion around the state they would prefer for their community. Alternative-futures modeling has been useful in a number of environmental

management applications (Baker et al. 2004, Van Sickle et al. 2004). Consensus and alternative-futures modeling involves simulations of different scenarios in order to engage both stakeholders and the broader public in terms of the consequences of their actions (or inaction). This typically presents visual output that is easily interpreted by the public and allows various parameters over which decisions can be made to examine outcomes (Costanza 1998, Van Den Belt 2004).

Although the history of the creation of the current regulatory structure at Tahoe accompanied a high degree of contention, today it may offer a competitive advantage for marketing Lake Tahoe as a center of businesses and community sustainability. There are numerous areas of potential collaboration between the public and private sectors for not only data collection that serves a common interest, but also creative partnerships that move beyond regulatory policy and toward forms of voluntary and market-based policy instruments. There has already been some success with relatively creative programs such as transferable development rights and the BMP programs (Kauneckis and Reid 2006, Reid and Kauneckis 2008). Other areas worth exploring might include formal recognition of environmentally friendly activities by Tahoe-based businesses through green business certification programs. There are a number of well-established industry-specific, regional and international environmental management and certification systems (ISO 14001 and Europe's Green Dot are the best known). There is good reason to consider creating something like a "Tahoe Blue Dot" system that can simultaneously engage and reward the business community and allow the marketing of regulatory compliance as an asset and sustainable business practices. Other nonregulatory approaches can include various forms of "social marketing." Social marketing programs represent a method of communicating public goals, targeting programs to citizens, and focusing the distribution of information to specific population subsectors. Rather than regulatory policy and negative sanctions serving as the principal tools to increase participation in public programs, it relies on information and positive psychological rewards using methods from the private sector to gain brand loyalty and understand market niches. Successful applications of social marketing toward public goals have been noted in public health and human services delivery (Goldberg et al. 1997, McKenzie-Mohr and Smith 1999).

Managing Fire and Natural Hazards

The effects of wildfire and fuels management were crosscutting themes in many of the discussions. Following the 2007 Angora Fire, fuels management became particularly salient to the public and government agencies. Additionally, the presence of faultlines in the basin has also alerted stakeholders to the possible threat

of seismic events. Both hazards generate important social science needs as well. A major forest fire in or near the Tahoe basin would have broad effects on all of the theme areas considered in this science plan, including most of the social science subthemes. Fire impairs both the quality and quantity of recreation and scenic resources, and a major fire could do so for an extended period. This would have broad implications for the regional economy, both in terms of direct and indirect costs. The more immediate economic concerns have to do with paying for fuels management on public, private, and state lands, and prioritizing fuel reduction projects. Other concerns discussed in stakeholder meetings include the social acceptance of various treatment options for forest fuels.

Transportation issues are directly linked to community safety questions and most discussions regarding public agency management and natural disaster management were directed at creating a basinwide communications network for public officials. The Tahoe basin is a seismically active area with potential for large-scale events including earthquakes, landslides, and earthquake-triggered seiche waves in the lake that would act like a tsunami and flood major portions of the near-shore areas (Ichinose et al. 2000). Assessment of the vulnerability and resilience of transportation networks, recreation areas, and communities to these natural hazards is recommended, so that mitigation strategies can be developed and their likely effectiveness understood. This will certainly aid management agencies and local governments in long-term planning goals.

Climate Change Impacts

Finally, global climate change represents a relatively new research area that deserves some discussion. Because the projected changes are so broad-based, there are impacts on all the subthemes discussed in this chapter. The most immediate effect would be in terms of the interactions between recreation, scenic resources, and the local economy.

If changes occur as projected by most climate models, the Sierra Nevada is likely to experience substantial reductions in the amount of snowfall, and the snowpack that does exist is expected to melt off earlier in the year (Cayan et al. 2006). Both of these effects will lead to a reduced areal extent and season length for ski resorts and backcountry snow-based recreation while simultaneously increasing the season of some forest-based recreation such as hiking and mountain-biking, all of which are important parts of the recreation experience at Tahoe. Changes in precipitation and temperature will likely affect vegetation and pest dynamics and increase the threat of major forest fires (Ibañez et al. 2006, Westerling et al. 2006). The short- and long-term economic responses to, for example, a ski season shortened

by the reduced snowpack expected from climate change or summer recreational opportunities impacted by increased wildfires are important to assess now so that mitigation and response plans can be developed. Reduction in snowfall, the risk of wildfire, and resulting impact on water quality and scenic resources related to forest cover all suggest major changes for the regional economy, which could be examined through alternative futures modeling.

Near-Term Social Science Research Priorities

The most consistently discussed topics related to issues of transportation, economics, recreation, and the quality of the built landscape. Common metathemes were the development of a collaborative information management infrastructure, increasing the evaluation and effectiveness of current policy, a refocusing of management decisions toward the community level, and management of fire hazards and climate change impacts. Table 7.1 illustrates items identified as the highest priority.

The selection of this subset of priorities was based on a number of criteria. First, a social science research issue area had to reappear across the multiple information collection methods used here: literature review, stakeholder meetings and workshops, focused discussions with key public and private representatives, and the stakeholder survey. Second, there was an estimation of the complexity of the research issues and the likelihood that resources dedicated to a specific topic would lead to immediate improvements in environmental management decisions. This was balanced against a movement toward more complex tasks and laying out the necessary information infrastructure for improving long-term decisionmaking as discussed in more detail below. Finally, emphasis was placed on research issues that served the broadest array of stakeholders. Those that were requested by a mix of private, public, and community interests were considered more important than those of a smaller set of agency representatives. The specific justification for the selection of priority research items are indicated in table 7.1. The conceptual model in fig. 7.5 illustrates the relationship between the highest priority social science research needs and the causal driver and linkages to specific management components.

In the opinion of the authors, the crosscutting metatheme of collaborative information management is the highest overall priority. This is based on three rationales. First, this was the most common request across all the subthemes and by that fact alone can be ranked as the highest priority. Second, in terms of practically advancing the goals of this document, strategically allocating resources toward data collection will allow a common focal point for stakeholder input by

creating a platform for distribution of results from other research areas. Third, there has already been substantial activity by stakeholders in this direction. Input from the chambers of commerce has enthusiastically expressed support for joint data collection and a subset of priorities for data inventory and consolidation has recently been released (U.S. Army Corps of Engineers 2008). Taking advantage of the current level of interest and the resources that have already been dedicated should move this to the top priority. Creating a platform for a small subset of common topics of interest will make data collection and consolidation in each of the individual subthemes easier. There are exceptional opportunities for creative public-private cooperation.

There also has been interest expressed toward the creation of a Tahoe basin decision-support system. Decision-support systems (DSS) use a common computer platform that brings together multiple data sources on management issues to better inform decisionmakers about the relative tradeoffs of various policy options. These have most commonly been used for natural resource management agencies making decisions for multiple-use areas; however, there is considerable potential for using DSS for integrating the social sciences with environmental goals. The advantage of a DSS is that it creates a library of integrated data sets, models, and methods. It can act as a focal point of discussion for research across different disciplines and stakeholders. Additionally many are scalable and present data in a useable visual output that implicitly incorporates uncertainty and highlights missing and needed data (Reynolds et al. 2000). The concurrent discussions on the implementation of DSS and community indicators by very different stakeholders presents an opportunity for better integrating the social sciences with management decisions.

It is worth repeating a couple of final comments and caveats. The process outlined here for scoping the need and form of various types of social science data was intended to develop a framework for further discussion, not the priorities of data collection needs. These priorities are best determined by specific stakeholders and focused on direct policy needs. This is particularly true in collaborative situations involving multiple organizations as much of the academic literature stresses that collaboration works best when there are substantive outcomes that each participant recognizes as useful (Kauneckis and Imperial 2007, Lubell 2004, Singleton 1998, Wondolleck and Yaffee 2000). This document outlines a broad array of social science data needs and perceptions of the relative utility of various forms of data in terms of the type and spatial and temporal scales. However, it does not measure the costs of obtaining the data in its most useful form, nor the willingness by stakeholders to commit resources toward the collection, management, and distribution of useful information products.

There may be opportunities to advance the research needs discussed here by establishing closer ties with one or more of the regional campuses. The University of California, Davis and the Desert Research Institute already have close research connections with resource managers in terms of the natural sciences. A similar effort can be made in the social sciences. University of California, Davis has numerous departments—particularly the Department of Environmental Policy—that can bring expertise and student resources to many of the research issues discussed in this chapter. The University of Nevada, Reno (UNR) likewise has seen recent activity in expanding its research capacity in the social sciences. New research centers and programs established in the past 5 years include the UNR Academy for the Environment, the School of Journalism's Interactive Environmental Journalism program, in addition to well-established programs in cooperative extension and other departments. Graduate programs on both campuses include business and economics, resource economics, land use planning, public administration, and policy analysis. Much of the research discussed here involves relatively straightforward data collection, consolidation, and statistical analysis, all of which are amendable to graduate student research.

Finally, it is worth returning to the concepts discussed earlier about the distinction between the collection and consolidation of data, making that data relevant and contextualized for informing policy, and turning that information into knowledge about the social dynamic of Lake Tahoe. Although the feasibility of data collection and research on the various topics of interest listed here has not been explicitly measured, few of the issues are beyond the scope of contemporary social science research methods. However, some of these studies would require substantial costs and are best addressed in terms of the relative benefits to informing policy decisions. Although the majority of input from stakeholders was on data collection, most of the subsequent discussion was about its priority as useful information and bringing the relevant knowledge to bear on policy decisions. Because of the high costs of primary data collection and continued monitoring, it is recommended that the starting point of prioritizing research efforts be on the direct application of the information for a specific management need, rather than only a generalized unspecified perception of the importance of more information on a topic. Stakeholder meetings often included interest in having information on an issue of concern without the necessary followup discussion of how that information can be put to direct use. Focusing on the management use of prior data collection efforts will help focus the priority of even basic data collection and consolidation, as well as assist in honing it down to those pieces of information that will best inform the broadest array of decisions and serve the most stakeholders.

Acknowledgments

A number of people helped schedule and coordinate the community workshops, agency meetings, and breakout session at the Tahoe Science Symposium: Steve Teshara, Carl Ribaudo, and Andrew Strain of the Tahoe Chambers of Commerce; Zach Hymanson of the Tahoe Science Consortium; Neil Crescenti, Keith Norberg, and Lisa O'Daly of the Tahoe Regional Planning Agency; Ken Anderson of California State Parks; Cindy Gustafson of the Tahoe City Public Utilities District; Susan D. Kocher of the UC Davis, Cooperative Extension, El Dorado County; Christy Prescott of the U.S. Forest Service, Lake Tahoe Basin Management Unit. Marlene Rebori was the facilitator for the breakout session at the Tahoe Science Symposium; Kevin Drake was the notetaker. A number of anonymous external reviewers at the U.S. Environmental Protection Agency offered valuable input and comments.

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