Journal of the Nevada Water Resources Association

Spring 2005

A publication of the Nevada Water Resources Association, providing hydrologic information to the people of Nevada and adjacent States

Lake Tahoe Edition

Volume 2, Number 1

The no-project alternative analysis: An early product of the Tahoe Decision Support System

DAVID L. HALSING, U.S. Geological Survey, 345 Middlefield Road, Mail Stop 531, Menlo Park, CA 94025 (dhalsing@usgs.gov)

MARK L. HESSENFLOW, U.S. Geological Survey, 345 Middlefield Road, Mail Stop 531, Menlo Park, CA 94025 (mhessenflow@usgs.gov)

ANNE WEIN, U.S. Geological Survey, 345 Middlefield Road, Mail Stop 531, Menlo Park, CA 94025 (awein@usgs.gov)

ABSTRACT

We report on the development of a No-project alternative analysis (NPAA) or "business as usual" scenario with respect to a 20-year projection of 21 indicators of environmental and socioeconomic conditions in the Lake Tahoe Basin for the Tahoe Regional Planning Agency (TRPA). Our effort was inspired by earlier work that investigated the tradeoffs between an environmental and an economic objective. The NPAA study has implications for a longer term goal of building a Tahoe Decision Support System (TDSS) to assist the TRPA and other Basin agencies in assessing the outcomes of management strategies. The NPAA assumes no major deviations from current management practices or from recent environmental or societal trends and planned Environmental Improvement Program (EIP) projects. Quantitative "scenario generation" tools were constructed to simulate site-specific land uses, various population categories, and associated vehicle miles traveled. Projections of each indicator's attainment status were made by building visual conceptual models of the relevant natural and social processes, extrapolating trends, and using available models, research, and expert opinion.

We present results of the NPAA, projected indicator status, key factors affecting the indicators, indicator functionality, and knowledge gaps. One important result is that current management practices may slow the loss or degradation of environmental qualities but not halt or reverse it. Our analysis also predicts an increase in recreation and commuting into and within the basin, primarily in private vehicles. Private vehicles, which are a critical mechanism by which the Basin population affects the surrounding environment, are a key determinant of air-quality indicators, a source of particulate matter affecting Secchi depth, a source of noise, and a factor in recreational and scenic quality, largely owing to congestion. Key uncertainties in the NPAA include climate change, EIP project effectiveness, and external population, economic activity, and air pollution.

INTRODUCTION

We report on the goals, progress, methods, findings, and limitations of an early product of the Tahoe Decision Support System (TDSS) project called the No-project alternative analysis (NPAA). We summarize the NPAA and place it in context. The full report (Duffie and others, 2004) is available from the authors and should be consulted for more details. The long-term project vision is to construct an integrated and well-quantified decision support system to be used

by the Tahoe Regional Planning Agency (TRPA) and other Lake Tahoe Basin management agencies to project outcomes of various strategies or project implementations. The TDSS software tool will be a contributor to the Pathway 2007 process by which local, State, and Federal agencies – TRPA, the Lahontan Regional Water Quality Control Board, the Nevada Division of Environmental Protection, and the U.S. Forest Service – are updating their 20-year plans.

The idea for the TDSS grew out of the Tahoe Constrained Optimization Model (TCOM) (Bernknopf and others, 2003), which sought to help managers gain a better understanding of the tradeoffs between housing values and sediment delivery to the lake, an economic and an environmental objective, respectively. The TCOM approach generated interest in an expanded version to look beyond one watershed and a single environmental consideration to include multiple indicators of conditions in the basin as a whole, the economic and social costs of changes in these indicators, and impacts arising from efforts to address indicators through management controls. The TDSS would help maximize the benefits of management decisions, while minimizing the negative impacts by providing an integrated representation of the influences and feedback among natural and social processes. It would link models, data, and interactions between basin dynamics, external factors, population, land use, and other relevant inputs and simulate the system-wide outcomes of those dynamics. The TDSS would accept user-selected inputs regarding regulations and management decisions, thereby forming an alternative that would be run through the various models. The output would be projections of the status of each indicator.

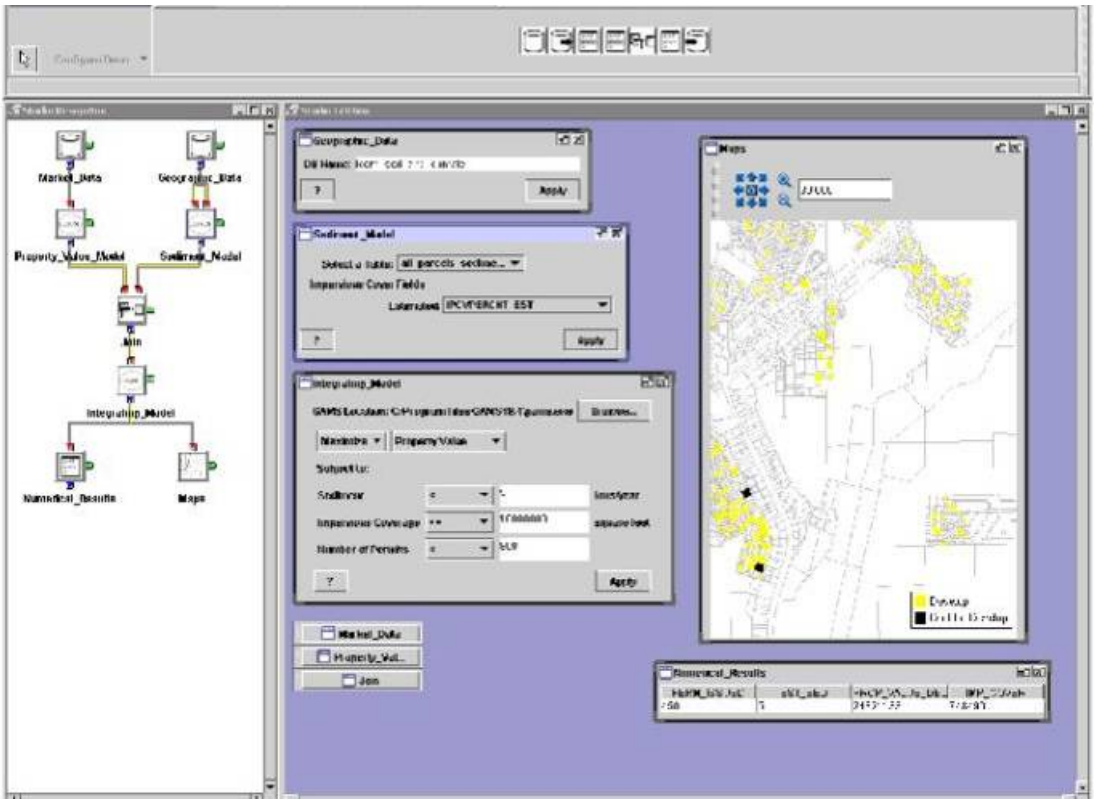

Figure 1. The Tahoe Integration Platform, Prototype Implementation.

Successful early products of the TDSS project were a data storage and retrieval system and a software application to reconcile and integrate disparate data via a graphical user interface. Figure 1 shows a screen-saved image of the Tahoe Integration Platform, Prototype Implementation.

However, the paucity of models or quantified connections between controls and their impacts currently impedes such a product. EMFAC2000, a working air-pollutant-emissions model developed by the California Air Resources Board (2004) has been customized for use in the Lake Tahoe Basin. Numerous studies are currently underway to quantify other connections, including a Lake Tahoe Basin watershed model being developed by Tetra Tech Inc. for Lahontan (expected in spring 2005); a lake-clarity model (Schladow and others, 2000), a transportation model (Parsons Brinckerhoff, 2004), goshawk habitat-suitability models (Schaffer et al., 1999; Timossi and others, 1995); and urban-biodiversity models being developed by the U.S. Forest Service. Models simulating the effectiveness and/or feasibility of Best Management Practices (BMP) or Environmental Improvement Program (EIP) projects do not exist, although efforts are being made to create them (Strecker and Howell, 2004). No systematic understanding exists of how visitation, employment, housing prices, or the basin economy would change because of environmental degradation or costly and restrictive attempts to avoid degradation (Murphy and Knopp, 2000a).

These limitations led to a focus on a specific future alternative to lay a foundation for generating future alternatives and the integration and projection of multiple concerns in the Lake Tahoe Basin. An assessment of the likely impacts of a "business as usual" scenario—the No-project alternative—on 21 environmental and socioeconomic indicators was identified as a useful short-term product and an important first step toward fulfilling the larger project goals.

Many of the indicators are measured by TRPA as a way to monitor of the status of various basin conditions in categories such as air quality, water quality, and noise (see Table 1 for a list of indicators by category). TRPA also manages basin development to achieve attainment of a regulatory standard called a threshold for some of the indicators. Other indicators considered herein are not adopted TRPA indicators, but were included in the study to assess their possible future utility. The indicators related to water quality and hydrology—Average Annual Secchi Depth, Stream Environment Zones, and Percent BMP/EIP Project Implementation—often seem of primary importance in the Lake Tahoe Basin, yet TRPA's charter requires all adopted indicators to be treated equally.

The baseline future alternative for the Lake Tahoe Basin is defined in terms of four components:

- Land use, as allocated according to TRPA regulations;
- Population, as accommodated by land use and affected by visitation and demographics;
- Management controls, including BMP/EIP project implementations; and
- Climatic conditions.

Baseline assumptions for these components were identified to reflect no radical departures from current management practices and controls, EIP plans, or trends. The status of each component was predicted for 2027, the 20-year basin agency planning horizon. Against this backdrop, the study projects the status of the environmental and socioeconomic indicators. Thus far, the projections of indicator status are largely based on historical observations and extrapolation of trends, where available, or qualitative assessment, otherwise, owing to the lack of computational models to project them. Further, only the land use and population projection components of the No-project alternative and the Vehicle Miles Traveled indicator are addressed mathematically, though a very simple extension of current practices and trends. In the process of conducting this analysis; however, key factors affecting components of the No-project alternative, indicator attainment status, and the functionality of the indicator and knowledge gaps were revealed.

METHODS

To develop the specifics for the baseline alternative, the project team collaborated with TRPA experts. From various land use, allocation, and retirement rules, a probabilistic model in a GIS framework was built to project the site-specific development and numbers of parcels designated for residences, tourist-accommodation units, commercial use and associated impervious cover, and overnight-visitor capacity (see Duffie and others, 2004).

The various types of human population in the Lake Tahoe Basin—permanent residents, seasonal residents, overnight visitors, day-use visitors, and commuters—have different types and magnitudes of impact on the indicators. The TDSS team thus developed a method, based on U.S. Census data, state and county data, visitation studies and surveys, traffic counts, and the new housing and tourist accommodations estimated by the land-use projection system, of parsing out current population data into the different sectors and projecting each separately. The lack of historical traffic counts at basin-entry points and knowledge of the frequency of trips into and out of the basin per visitor stay have limited the certainty of these projections, especially for day visitation.

The scientific literature on global climate change includes predictions for regional mean temperatures and the amounts and types of precipitation. These predictions were used to formulate the climate-related assumptions of the No-project alternative.

Ideally, a list of the management controls—regulations, policies, monitoring and abatement programs, and BMP/EIP projects (Tahoe Regional Planning Agency, 2004a)—to be implemented under the business-as-usual scenario would have been available for analysis. However, with the exception of the Regional Transportation Plan (Tahoe Regional Planning Agency, 2004b), which includes a list of projects with designated funding, no list was available; and the analysis is otherwise limited to statements about what *could* happen under various control implementations.

One final aspect of the No-project alternative concerns the identification of influential factors external to the Lake Tahoe Basin. Forest fires, urbanization, and industrial development outside of the basin will continue to affect basin air quality. Demographic change and the economies of California and Nevada could increase demand for Tahoe visitation, housing, or

recreation. Although the NPAA cannot quantitatively analyze these factors, it has tried to describe the expected or potential effects of significant occurrences or changes in these external factors.

The list of indicators for analysis, which was a result of Adaptive Management Framework (AMF) workshops (Tracy, 2004), includes existing TRPA indicators, as well as some newly proposed or potential future indicators. To analyze the indicators, available information (Murphy and Knopp, 2000a, 2000b; Tahoe Regional Planning Agency, 2004a, 2004b, 2004c, 2004d; Tracy, 2004; see references cited in Duffie and others, 2004) was used to describe each indicator, characterize the available data and models, note historical trends, recognize applicable standards and relevant management controls, itemize factors affecting them, identify critical assumptions and uncertainties, predict their status in 2027, and describe their relation to other indicators. A heuristic sketch of the methodology is shown in Figure 2. Also, visual conceptual models (VCMs; see Figure 3) were created to illustrate the interactions between management controls and each of the indicators and components.

In general, sufficient data on the indicators' definitions, descriptions, monitoring records, and historical trends were available for the established indicators, but not for the newly proposed or recently established indicators. The factors affecting a given indicator were comprehensively identified, but quantifying or modeling these effects was not typically possible. In addition, uncertainties about status, trends, data, and the effectiveness of management controls commonly forced the analysis to be more qualitative than quantitative.

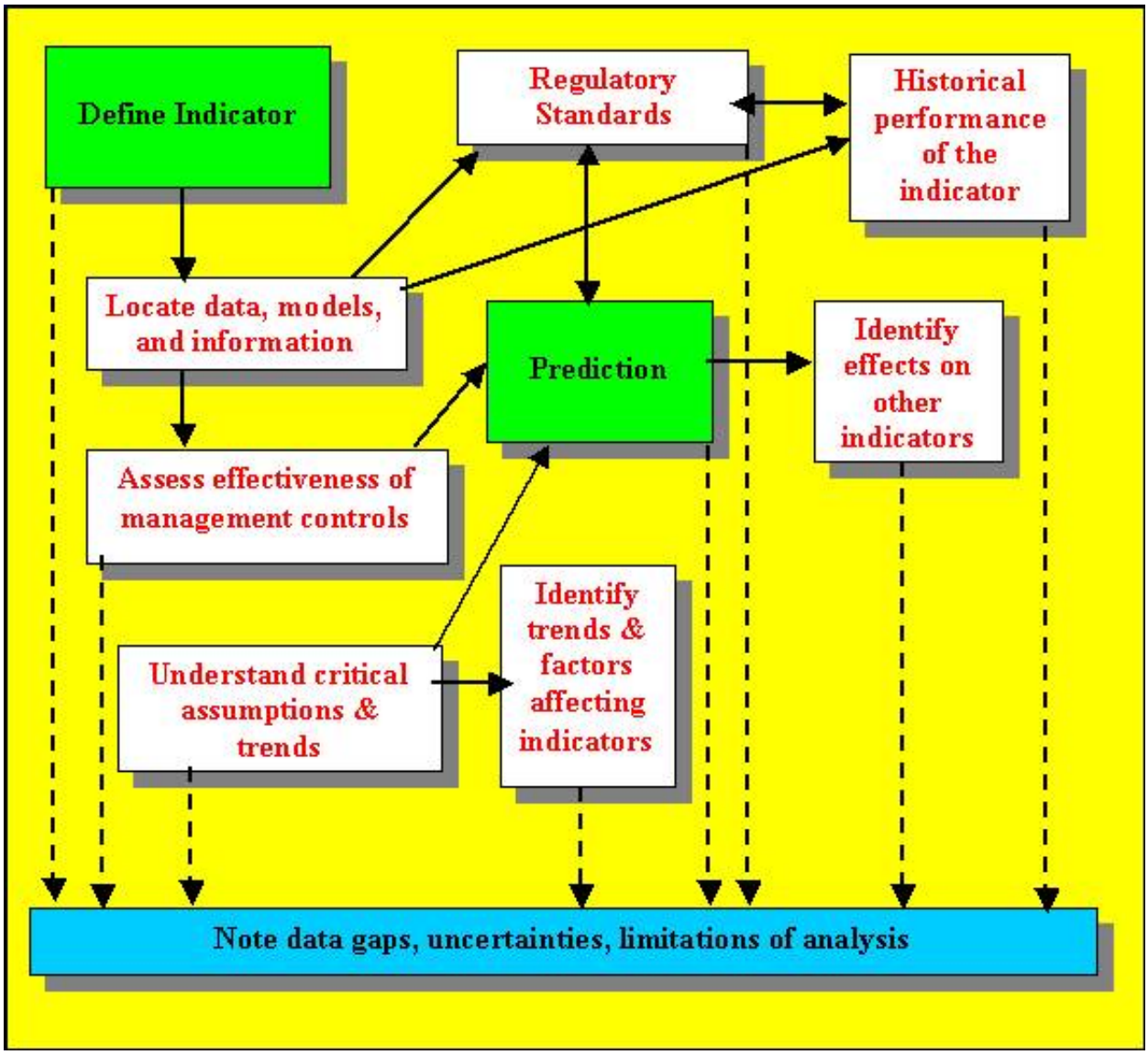

Figure 2. A heuristic diagram of the steps and process of analyzing indicators in the NPAA.

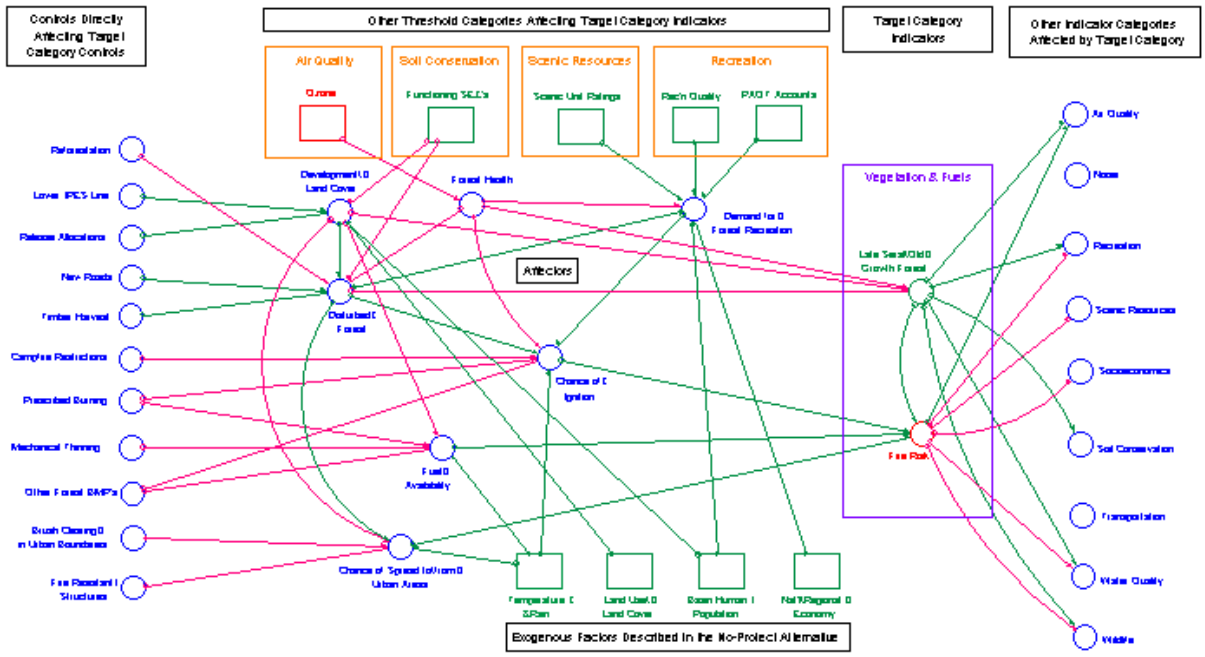

Figure 3. A typical visual conceptual model developed for the indicator analysis.

RESULTS

The results of the NPAA include a description of the components of the No-project alternative itself in 2027, changes in the indicators projected to result from that alternative, key factors affecting indicator attainment status, assessments of the functionality of the indicators, and knowledge gaps.

The No-Project Alternative

The outcomes of the four No-project alternative components (land use, population, climate, and management controls) are predicted. Under existing parcel-allocation rules, land acquisition and retirement, and recreational permitting systems, the NPAA estimates new housing and tourist accommodation units, extents of roads and trails, commercial developments, and recreational facilities. Important trends (all from Duffie and others, 2004) are that:

- Only minimal amounts of land conversions will occur.
- Little land in sensitive areas or stream environment zones will be developed.
- Residential development will outpace development of permitted recreational facilities.
- Roughly 95% of new housing units will be single-family homes.
- Tourist-accommodation capacity will increase by about 300 units.
- Commercial real-estate development will be limited to 200,000 ft^2 of additional floor space.

Peak and average summer and winter population projections, based on numerous assumptions, indicate that:

- The permanent residential population will increase by about 0.33% per year.
- Projected overnight visitation ranges from 65,000 to 133,000 for average winter and peak summer occupancy, representing a 0.23% average annual increase.
- Day visitors are assumed to increase annually at 1% per year (reflecting California's projected population growth rate; U.S. Census, 2002), to yield 31,000 visitors for an average winter day and 64,000 for a peak summer day.
- The demographic trend is toward an older population, which could change demand for recreational activities, services, and lodging types.

Global climate change models predict temperature increases of 0-2ºC by 2025. Most models agree that total precipitation will not change much, but more of it will fall as rain rather than snow (Dettinger, 2004; Jeton and others, 2004). Uncertainty about EIP projects and other management control implementation and effectiveness was limiting; most projects were evaluated on their *potential*, not *projected*, impacts.

Indicator Predictions

Few indicators could be confidently predicted, although some of them—e.g. Average Annual Secchi Depth or Carbon Monoxide—have trends strong enough to make it fairly certain that they will continue to worsen or improve, respectively. The implementation of those management controls that are currently planned may slow these trends, but probably not halt or reverse them; however, lack of information on the controls' effectiveness limits this prediction. Table 1 summarizes each indicator's recent trends, status, and year 2027 attainment projections and is supplemented by the following observations:

- The future of the Carbon Monoxide indicator looks promising, owing to continued projected technological advances regarding vehicle emissions.
- With EIP projects for ozone still in the research stage, there is no evidence that the Ozone indicator will reach attainment.
- Reductions in particulate-matter concentrations have been less decisive of late, and nonattainment of the Particulate Matter indicator is vulnerable to wildfires external to the Lake Tahoe Basin.
- The regional Visual Extinction Coefficient indicator is influenced by aerosols transported into the Basin (VanCuren and Cahill, 2002; Koraci and others, 2004); therefore, degraded regional visibility is expected regardless of basin management. The subregional Visual Extinction Coefficient indicator has been improving, but the improvement appears to be leveling off.
- The Community Equivalent Noise Level indicator will probably not be in attainment because of increased traffic, human activity, construction, and the likely need for more snowmaking, but the monitoring and standards of this indicator are under review.
- The Persons At One Time Accounts indicator (in the Recreation threshold category) has failed to meet targets and is unlikely to attain standards because of the projected lack of assignment of further land to recreational facilities.
- The subjective Recreational Quality Index indicator might be maintainable but is subject to numerous threats including crowding, congestion, funding constraints, capacity shortages, and changing recreational preferences.

- Continuation of ongoing mixed improvement and decline in scenic quality with a gradual overall decline in the TRPA Scenic Unit Ratings indicator is projected from recent trends.
- Tahoe's economic base is in tourism and recreation, but it is unclear how wages and employment in these sectors will change under the No-project alternative. The relatively few new tourism and recreation facilities suggest slower growth in the Employment and Earnings Distribution indicator.
- The paucity of additional residential units should increase demand, drive up prices, and reduce the Affordable Housing, but to an unknown degree.
- Changes in visitation lead to changes in the Transit Occupancy Tax (TOT) and Sales Tax Receipts indicator. Although there is little projected change in overnight-tourist-accommodation capacity, the future of this indicator is unknown because of uncertainty about the growth of future day visitation.
- Although removal and further avoidance of impervious coverage on sensitive sites is expected to continue, it is unknown how the lowering of the Individual Parcel Evaluation System (IPES) line (a land-capability measure) will affect the attainment of the Land Coverage Index indicator in 2027.
- The implementation of EIP Stream Environment Zones (SEZ) restoration projects in the presence of continued protection of those areas could result in attainment of the Functioning Stream Environment Zone indicator in 20 years' time.
- The Vehicle Miles Traveled indicator is projected to increase by 0.5% annually rather than decreasing below 1981 levels, as is the goal.
- Although EIP projects addressing traffic congestion have been identified for some key locations uncertainty about their implementation jeopardizes future attainment of the Vehicle Hours of Delay indicator.
- Analysis of the Alternative Travel Mode Split indicator is challenged by the currently unknown status of alternative-travel-mode usage and human behavioral response to proposed alternative travel options and traffic congestion.
- Forests are maturing toward "old growth" status, and so the Late Seral Stage/Old Growth Forest indicator is expected to be a positive.
- The Forest Fuels and Fire Risk will remain a critical issue. Forest thinning should reduce fire risk, but increased recreational access and visitation, a shift toward a basin that is drier for more of the year, and the seral progression of forests will increase ignition risk. It is unclear which of these patterns will dominate.
- Lake clarity, as measured by the Annual Average Secchi Depth indicator, will continue to decrease as a result of additional development, impervious coverage, vehicle travel, air pollution and deposition, degraded stream networks, and other factors.
- 100% of the sites eligible for BMP/EIP project implementation are expected to be treated as planned, which makes attainment likely for the BMP/EIP % of Watershed Treated indicator.
- Although the population and habitat of the northern goshawk, a bird species of special interest, have substantially decreased in recent decades, forest protection measures and development restrictions should stabilize the Goshawk Population and Habitat indicator. Increased visitation and noise could undermine this progress, but to an unknown degree.

Key Factors Affecting Indicators

- Factors that influence multiple indicators manifested as hubs in the VCMs, illustrating how critical they are to quantify and manage:
- Two transportation indicators—Vehicle Miles Traveled and Vehicle Hours of Delay—were especially influential, affecting the Air Quality, Water Quality, Recreation, and Noise threshold categories.
- Construction-related dust, noise, vehicle miles traveled, and land cover affect the Soil Conservation, Air Quality, Water Quality, Noise, and Transportation threshold categories.
- Participation in and the quality of recreation both affect and are affected by many indicators.

Not surprisingly, these influential hubs are anthropogenic influences and a function of the local and visiting population and land use. Day visitation is a major factor in recreation and transportation predictions. An example of land-use-generated effects is the case of more workers in the hospitality sectors being priced out of basin housing and becoming commuters into the basin, increasing vehicle miles traveled and traffic congestion, and decreasing air and water quality.

The most powerful nonanthropogenic influence is climate change and the associated reduction in winter snowpack, which could detrimentally impact winter recreation, noise, fire risk, and water supply and quality within the scope of this study. Other factors are key not so much because of their broad implications but because they alone can make or break the annual attainment of an indicator. For example, a single forest wildfire outside the basin can place the Particulate Matter indicator into nonattainment status.

Functionality of the Indicators

Some indicators are limited as measures of key aspects of basin conditions. For example, traffic congestion affects air quality, but the Vehicle Hours of Delay indicator measures only summer peak delays without considering average delays, winter delays, or the frequency of peak delays, which are pertinent to winter air quality and the average annual Secchi depth. Also, improved process understanding could change the way some indicators are interpreted. The Average Annual Secchi Depth indicator is thought to reflect overall watershed health as well as lake clarity, but if it is shown to be largely unaffected by tributary water quality (because cold streamwater quickly sinks below Secchi depth), then, while still useful for lake clarity, it may not indicate overall watershed health, as it is currently believed to do.

Knowledge Gaps

Although much effort was put into the development of the NPAA, a more comprehensive account of climate change, further verification of the population assumptions and day-visitor estimates, and confirmation of EIP projects to be implemented remain to be done.

Few relations between elements of the Lake Tahoe Basin system as a whole were found to be quantifiable, limiting the NPAA. For example, without estimates of the effectiveness of BMP/EIP projects, progress toward the BMP/EIP % of Watershed Treated indicator cannot be related to actual improvements in lake clarity. Similarly, the production of terpenes, hydrocarbon

gases that are precursors to ozone formation (Winer, 2001), from the desired late-seral-stage/mature forests, is unknown.

The human response to management-control implementation and the quality of recreational facilities, transportation infrastructure, and the environment needs further study. It is unknown how visitation would change if Lake Tahoe were less blue, if travel time into and within the basin increased dramatically, if lodging tax rates increase, or if bicycle trails and ski runs were more crowded.

Table 1. Interim Adaptive Management Framework indicators by threshold category. Arrows indicate a trend toward (pointing up) or away from (pointing down) attainment. Arrows do not necessarily indicate an increase in the indicator, because some indicators are meant to be reduced (e.g. Ozone), whereas others are intended to increase (e.g. Average Annual Secchi Depth). =, no change; ?, no data or inability to make a prediction; N/A, no formal status or attainment history.

Category	*Indicator*	***Prior attainment in threshold evaluations?***			***Trend in 2001***	***Attainment predicted in 2027?***
		1991	1996	2001		
Air Quality	Carbon Monoxide	No	**Yes**	**Yes**	↑	**Yes**
	Ozone	No	No	No	=	No
	Particulate Matter (10)	No	No	**Yes**	↑↓	**Yes** (?)
	Visual Extinct Coefficient	**Yes**	**Yes**	**Yes**	↑↓	**Yes**/No
Noise	Community Noise Equivalent Level	No	No	No	=	No
Recreation	Persons At One Time Accounts	**Yes**	**Yes**	**Yes**	↓	No
	Recreation Quality Index	?	?	**Yes**	**=**	**Yes**
Scenic	TRPA Scenic Unit Ratings	No	No	No	↓	No
Socioeconomics	Employment and Earnings Dist'n	N/A	N/A	N/A	**=**	N/A
	Affordable Housing	N/A	N/A	N/A	↓	N/A (No)
	Transit Occupancy and Sales Taxes	N/A	N/A	N/A	↑	N/A
Soil Conservation	Land Coverage Index	No	No	No	↓	No(?)
	Functioning Stream Env. Zones	No	No	No	↑	**Yes**
Transportation	Vehicle Miles Traveled	No	No	No	↓	No
	Vehicle Hours of Delay	N/A	N/A	N/A	↑↓	No
	Alternative Travel Mode Split	N/A	N/A	N/A	(?)	(?)
Vegetation and Fuels	Late Seral Stage / Old Growth Forest	N/A	N/A	No	↑	No
	Forest Fuels & Fire Risk	N/A	N/A	N/A	↑↓	N/A
Water Quality	Annual Average Secchi Depth	No	No	No	↓	No
	BMP/EIP % of Watershed Treated	N/A	N/A	N/A	↑	**Yes**
Wildlife	Goshawk Habitat and Population	N/A	N/A	No	↑	**Yes**

In this study, the NPAA is predominantly determined by regulatory control rather than by economic forces or equilibrium conditions. With improved understanding, BMP/EIP project-implementation funding would probably also appear as a hub in the system diagrams. Funding itself is affected by population-generated transient-occupancy and sales-tax receipts, demonstrating another of the feedback loops in the system that has not been well characterized.

CONCLUSION

Our conclusions pertain to results for management and implications for the TDSS. The development of projections for two No-project alternative components (land use, population) was a valuable exercise that has laid the foundation for building other future alternatives. The NPAA sets the stage for describing an alternative future that addresses a wide range of concerns, and for coordinating visions of the future across multiple planning agencies. Important outcomes of the NPAA are identification of the key determinants of indicator attainment, indicator projections, and knowledge gaps, which can immediately contribute to improved management decisions and allocation of effort.

Clearly, the TDSS cannot be built without more quantifiable relations and models. This study has begun to build the tools to enable scenario generation (of the land-use and population components) and of system visualization for management purposes. Initial efforts have been made to capture the continually evolving knowledge base that would support managerial decisionmaking.

REFERENCES

Bernknopf, R.L., Champion, R., Duffie, E.S. Graffy, E.A., Ng, P., and Taketa, R., 2003. Tahoe Constrained Optimization Model: Final report to TRPA. U.S. Geological Survey, Western Geographic Science Center, Menlo Park, CA. 94 p.

California Air Resources Board, 2004. EMFAC2002 release. California Air Resources Board. URL:<http://epa.gov/fedrgstr/EPA-AIR/2003/April/Day-01/a7815.htm> Accessed April 2004.

Dettinger, M.D., 2004. From climate-change spaghetti to climate-change distribution. Technical report, Prepared for California Energy Commission.

Duffie, E.S., Hessenflow, M.L., Wein, A., Halsing, D.L., Jeton, A.E., and Schulz, K.M., 2004. Tahoe decision support system: No-project alternative analysis, Report to Tahoe Regional Planning Agency (unpublished as yet). U.S. Geological Survey, Western Geographic Science Center, Menlo Park, California. 227 p.

Jeton, A.E., Dettinger, M.D., and Smith, J.L., 1996. Potential effects of climate change on streamflow, eastern and western slopes of the Sierra Nevada, California and Nevada. U.S. Geological Survey Water Resources Investigations Report 95-4260. 44 p.

Koraci, J.L.K., Tarnay, L., and Gertler, A.W., 2004. Modeling impact of regional versus local emissions on nitrogen deposition in the Lake Tahoe Basin. Presented at 2nd Biennial Conference on Tahoe Environmental Concerns, Research as a Tool in Tahoe Basin Issues, May 17-19.

Murphy, D.D. and Knopp, C.M., (Eds.), 2000a. Lake Tahoe watershed assessment, volume I. USDA Forest Service, Pacific Southwest Research Station, General Technical Report PSW-GTR-175.

Murphy, D.D. and Knopp, C.M., (Eds.), 2000b. Lake Tahoe watershed assessment, volume II. USDA Forest Service, Pacific Southwest Research Station, General Technical Report PSW-GTR-176.

Parson Brinkerhoff, 2004. Appendix D: VMT forecasting results for the 2004 Regional Transportation Plan update. Parsons Brinkerhoff, Inc.

Schaffer, W., Beck, B., Beck, J., Bonar, R., and Hunt, L., 1999. Northern goshawk reproductive habitat: habitat suitability index model (version 3). Internal report, Foothills Model Forest, Alberta, Canada. URL:<http://www.fmf.ca/HS/HS_report24.pdf> Accessed April 2004.

Schladow, G., Losada, J., Swift, T.J., Reuter, J.E., and Jassby, A.D., 2000. University of California at Davis – Lake Tahoe clarity model: Initial results. Technical report, University of California Tahoe Research Group publication. URL: <http://trg.ucdavis. edu/research/annualreport/contents/lake/article5.html>. Accessed August 2004.

Strecker, E. and Howell, J., 2004. Lake Tahoe feasibility study water quality information—initial review, 2004. Memo to the Lake Tahoe Nutrient and Sediment Total Maximum Daily Load Program, Geosyntec Consultants.

Tahoe Regional Planning Agency, 2002. TRPA threshold evaluation study.

Tahoe Regional Planning Agency, 2004a. Best management practices information and resource guide. URL: <http://www.tiims.org/Content/BasinTopics/soilcons/default.asp> Accessed July 2004.

Tahoe Regional Planning Agency, 2004b. Lake Tahoe Basin Regional Transportation Plan 2004-2027.

Tahoe Regional Planning Agency, 2004c. Lake Tahoe DFC/thresholds update report, recreation (draft). Tahoe Regional Planning Agency. 11 p.

Tahoe Regional Planning Agency, 2004d. Lake Tahoe desired future condition / thresholds update report, socioeconomics (draft). 8 p.

Timossi, I.C., Woodard, E.L., and Barrett, R.H., 1995. Habitat suitability models for use with ARC/INFO: northern goshawk. Technical Report 14, California Department of Fish and Game, CWHR Program, Sacramento, CA.

Tracy, J.C., 2004. Final report for the adaptive management framework development project phase I. Technical report, Desert Research Institute. 259 p.

U.S. Census Bureau, 2002. 2000 Census of Population and Housing, Summary Population and Housing Characteristics. U.S. Census Bureau, PHC-1-1, United States, Washington, DC.

Winer, A.M., 2001. Development and validation of databases for modeling biogenic hydrocarbons in California's airsheds. University of California, Los Angeles. Contract #97-320, 200 pp. URL:<http://www.arb.ca.gov/research/abstracts/97-320.htm>.

VanCuren, R.A., and Cahill, T.A., 2002, Asian aerosols in North America: Frequency and concentration of fine dust, Journal of Geophysical Research, v. 107, no.D24, p. (19) 1-16.