LTFAC Final Recommendation for Lake Tahoe SNPLMA Round 10 Science Themes as of 5/5/09

All research should leverage previous and existing efforts to the extent possible, including the synthesis and analysis of existing data to further understand environmental processes, conditions and trends. These analyses should aim to extract possibly unknown, yet critical information from existing data sets. Models should leverage previous and existing efforts to the extent possible, including the use and application of existing data and models or model elements. Proposals should identify which research needs in the Tahoe Science Plan that their proposal helps to address; furthermore, as part of their conclusions, projects should identify appropriate steps to advance scientific understanding, environmental policies, and management activities in the Basin. Stakeholders in the Lake Tahoe Basin should be engaged early and throughout the research. The Pacific Southwest Research Station, as the sponsor of this science program, will work with the recipients of funds and management agencies to help ensure that projects meet these objectives.

Title	Type of Research	Management/Policy Need	Description		
Forest Health				$1,025,000	$1,100,000
Understanding long term ecological effects of forest treatments	Conventional Investigations and/or Synthesis & Review	Agency managers want in-depth and complete information to evaluate long-term ecological effects of alternative forest treatments. Several studies are ongoing that examine the short-term impacts of fuel treatments on forest health, yet more information is needed to compare and evaluate long-term impacts of fire suppression, prescribed fire, pile burning, mechanical harvest, hand thinning, mastication, and other treatments on ecosystem resiliency to drought, insects, diseases, wildfire, and/or climate change. Some agencies also are interested in better understanding the long-term potential for Tahoe forests to sequester carbon or otherwise contribute to reducing greenhouse gas emissions, particularly across sites that vary in quality or stage of forest development, and in evaluating any tradeoffs between reducing greenhouse gas emissions and maintaining a frequent fire regime through prescribed burning.	How does forest health or resiliency vary in response to treatments over the long-term, possibly considering the influence of climate change? Research should evaluate the ecological effects of forest treatments, including one or more of the following: 1) forest structure, 2) fuel loads and/or fire behavior, 3) water quality (especially delivery of very fine sediment and nutrients), 4) soil quality (including compaction), 5) plant or animal species, including those that are sensitive or vulnerable, 6) spread of exotic plants, diseases, or insect pests, and/or 7) carbon sequestration/greenhouse gas emissions associated with forests. Proposed research can consider resiliency across a variety of forest settings, including the Wildland-Urban Interface, Stream Environment Zones, and higher elevation forests, and can identify and validate appropriate metrics to evaluate treatment effects.		Keep all sub-themes and increase theme funding by $75K
Modeling and decision support tools for multi-objective forest management	Conventional Investigations and/or Synthesis & Review	The Tahoe Fire Commission Report (2008) identified a need for resource managers and regulators to have tools that help them to better evaluate alternative strategies for reducing fire risk to public safety, property, and environmental values in the wildland urban interface. Current and future forest management activities include hand thinning, cut-to-length harvest, whole tree removal, mastication, chipping, understory burning, pile burning, road management, and defensible space practices. Well-designed decision support tools and systems can help to efficiently implement treatments across diverse landscapes and generate shared understandings between implementers and regulators regarding risks, costs, and benefits of activities. Relevant forest management objectives include wildfire hazard reduction; improvements in forest health and habitat; conservation of biodiversity; and protection or improvement of air quality, soil quality, and water quality (especially reducing fine sediment particles and nutrients that threaten Lake clarity).	Research should develop, refine, and/or validate tools to improve current forest management decision-making and management processes, including: 1) strategic planning, 2) project-level environmental analyses, and/or 3) implementation of the Lake Tahoe TMDL. To improve broad-scale strategic planning in the Basin, research should help develop a decision support system to design, locate, and schedule forest management treatments to best achieve multiple relevant management objectives while meeting applicable (typically short-term) constraints. To improve project-level environmental analysis, existing research could be synthesized and/or new field research conducted to validate and improve models used to evaluate project effects. Research to improve TMDL implementation should help to better account for potential impacts of forest management activities and wildfire. Researchers should collaborate with agency representatives and/or other research teams to ensure the products are well-supported and useful.		
Watershed, Water Quality, and Habitat Restoration				$925,000	$1,000,000
Roadway and urban stormwater management	Conventional Investigations and/or Synthesis & Review	TMDL research indicates that stormwater from urban land uses is the largest contributor and presents the greatest opportunity to control fine sediment particles (< 20 µm) and total phosphorous. However, pollutant loading and reduction estimates are based upon limited information, particularly with respect to the fine sediment particle size class. Improved characterization of urban stormwater is needed for the purposes of load reduction modeling, BMP design and TMDL crediting. A better understanding of the factors and processes related to the generation, mobilization, transport and fate of pollutants is needed. Furthermore, a better understanding of treatment and control/recovery mechanisms is needed to inform feasibility and cost-effectiveness evaluations and refine implementation plans and strategies. Roadways are a land use of primary concern, as these have the greatest pollutant yield potential. There is a need to evaluate roadway operations and maintenance practices and optimize them for cost and effectiveness of fine sediment particle load reduction.	Research should address one or more of the following. 1) Source characterization: What are the factors controlling particle size distribution and turbidity of urban stormwater? How do these factors vary geographically, seasonally, and over the hydrograph)? How does impervious area connectivity and hydrologic routing affect pollutant concentrations and loadings? What is the correlation between suspended sediment size classes and phosphorous (total and dissolved) concentrations? 2) Pollutant control/treatment: What is the effectiveness of controls to reduce pollutant concentrations and loadings? What are the key BMP design features that influence load reductions and what are the associated ranges? What are the optimal O&M practices in terms of cost and effectiveness and under various pollutant loading scenarios? How should BMPs be designed to maximize pollutant removal? How does BMP effectiveness vary over time? Research on roadways is especially encouraged. Research should examine the full range of particle size classes (total, < 63µm, <20µm), and express suspended sediment measurements in terms of both mass and particle numbers.		Keep all sub-themes and increase theme funding by $75K
Special status species and communities and priority invasive species	Conventional Investigations and/or Synthesis & Review	The Tahoe Basin has several special status species (e.g., Sierra Nevada yellow-legged frog and Goshawks) and communities (e.g., aspen, fens, cushion plant communities, freshwater marsh and small lakes) that are a focus of multi-agency conservation and restoration efforts. In addition, management agencies are pursuing strategies and techniques to prevent, control, or eradicate priority invasive species (including, but not limited to, cheatgrass, Asian clam, quagga mussel, and zebra mussel). Changes in climate threaten habitats for native species and communities of special concern. Climate change also may influence the establishment and spread of introduced species. Management agencies need applied research to help guide and evaluate conservation, restoration, protection, and control measures, including development of monitoring plans to track long-term status and change. Research under this subtheme will aim to identify strategies, techniques, and standards that will best conserve and restore species and communities of special concern, or areas threatened by the spread of priority invasive species?	Research should address one or more of the following: 1) Evaluate the likelihood or effectiveness of current or potential approaches to prevent establishment, constrain spread, or reduce populations of priority invasive species. 2) Assess the habitat suitability of Lake Tahoe and its watershed to support the establishment of priority invasive species. 3) Evaluate approaches to conserve or restore special status plant and animal species, communities of concern, or habitats threatened by invasive species or climate change. And 4) Identify well-supported indicators and reference conditions to assess biological integrity, and status and trend of species and habitats of special concern. Research may incorporate conventional investigations or synthesis and review. Research on potential indicators should include analyses to assess how the proposed new indicators compare to existing applicable indicators. Researchers should plan to collaborate with agency representatives and other research teams to ensure that agencies can apply results.		

Air Quality and Meteorology				$825,000	$900,000
Title	**Type of Research**	**Management/Policy Need**	**Description**		
Impact and control of atmospheric particulate matter	Conventional Investigations and/or Synthesis & Review	The generation, transport, and deposition of fine particles directly affects both air quality and water quality in the Lake Tahoe Basin. The Lake Tahoe TMDL effort identified atmospheric deposition as a significant source of fine sediment particles and nutrients contributing to the loss of lake clarity. Anthropogenic activities including home wood burning, transportation, and road maintenance are considered important stressors to air quality potentially affecting both human and environmental health. However, source loading and control estimates of particulate matter are moderately to highly uncertain. Management agencies have the need to better refine these quantitative estimates to: 1) determine the implications for attaining the TMDL numeric targets, 2) assess the effectiveness of various air quality management strategies, and 3) identify long-term approaches to assessing status and trends and program effectiveness at various spatial and temporal scales.	Studies should focus on one or more of the following: 1) Evaluate past studies to assess sources and factors controlling the flux of particle deposition to the lake. 2) Develop a comprehensive monitoring and evaluation plan to reduce uncertainty in quantifying emissions, deposition, control, and cost-effectiveness estimates for particulate matter and phosphorous in the Basin across hydrologic seasons. 3) Evaluate past studies and conduct additional studies as needed to characterize use of and emissions from woodstoves and fireplaces in the Basin, and assess effectiveness, cost, and feasibilty of various potential control strategies. 4) Identify emission sources that cause visibility impairment in the Basin, determine their respective contributions to visibility impairment, and compare the results with the emissions inventory. 5) Prepare a monitoring plan and develop new indicators of regional and sub-regional visibility in the Basin in accordance with USEPA guidance for visibility monitoring; then conduct analyses to assess how the proposed new indicators compare to existing TRPA visibility indicators.		Keep all sub-themes and increase theme funding by $75K
Impacts and control of gaseous pollutants	Conventional Investigations and/or Synthesis & Review	Exceedances of the ozone standards are being measured in the Lake Tahoe Basin. Strategies for the control of ozone precursor emissions need to be developed and evaluated, along with recommendations for the implementation of control strategies to effectively reduce ozone concentrations.	Studies should focus on one or more of the following, although integrated proposals addressing all of these issues are encouraged: 1) Review past studies of the sources of ozone precursor emissions in the Lake Tahoe Basin. Perform field measurement studies to address gaps in knowledge in the sources of ozone-forming precursors, major pathways leading to ozone formation, and the relative contributions from in-basin vs. out-of-basin sources. 2) Review existing reduction strategies, identify viable alternative strategies for the reduction of ozone pollution in the Lake Tahoe Basin, and provide comparisons of the effectiveness and cost effectiveness of each viable strategy.		
Understanding basin meteorology	Synthesis & Review	Pollutant transport, transformation, emissions, and deposition are affected by the meteorological conditions present in and around the Lake Tahoe Basin. In addition, agencies need better information on how hydrologic parameters change under different temperature and moisture regimes, so they can more accurately estimate the potential effects of climate change on runoff and erosion. In order to develop a better understanding of the impact of meteorological processes on air and water quality, and watershed hydrology, it is necessary to comprehensively evaluate the meteorological factors that influence these processes at the regional and basin-wide scales and evaluate how these factors/conditions vary between urban and non-urban settings.	Studies should focus on one or more of the following, although integrated proposals addessing all issues are encouraged: 1) Identify past and current meterological measurement efforts (e.g., RASS and minisodar from LTADS, surface data from NDOT, UCD, NASA, and others). Compile into a publically available data base existing meteorological data for the Tahoe Basin. Conduct analyses focusing on review and synthesis of available data. Establish baseline statistics for mixing height variation on hourly to seasonal scales and develop a database for air quality and meteorological modeling in and around the basin. 2) Develop and/or improve meteorological data and monitoring tools for use in forecasting and making burn day decisions for prescribed fires as well as contributing to a better understanding of climate variability and watershed runoff processes. 3) Develop and/or improve monitoring tools and monitoring plans to obtain more comprehensive localized point source precipitation, surface runoff, erosion, and nutrient transport data to quantify potential changes in discharge loads as a function of amount, type (snow vs. rainfall), frequency, and precipitation intensity.		

Integrating Science				$575,000	$750,000
Title	**Type of Research**	**Management/Policy Need**	**Description**		
Tahoe Science Consortium	Synthesis & Review	Continued support is needed to allow the Consortium to continue providing environmental managers and decision makers with comprehensive and well-synthesized scientific findings drawn from research, monitoring, and modeling. Continued support for the TSC also is needed to provide for science community involvement in agency programs such as the SNPLMA Lake Tahoe Program and the Environmental Improvement Program.	Funding will support continued operations of the Tahoe Science Consortium, whose activities include: 1) science planning and synthesis, 2) peer review, 3) technical consultation, and 4) science information communication. The Tahoe Science Consortium will coordinate workshops and efforts to synthesize scientific information to support decision-making in the Lake Tahoe Basin. In addition, the TSC will continue to build a reserve to fund rapid response efforts (e.g., focused research or short-term monitoring) deemed necessary to obtain information about the effects of catastrophes (e.g., wildfires, sewage spills, or earthquakes), or provide critical baseline information to understand the effects of restoration and remediation efforts undertaken in response to a catastrophe. Unexpended rapid response funds would not be redirected to other TSC activities, but would be held in reserve until needed.	Delete "Evaluation of Upland Ecological Integrity" sub-theme	Include "Evaluation of Upland Ecological Integrity" sub-theme and increase theme funding by $175K
[1]Evaluation of upland ecological integrity	Synthesis & Review	Basin agencies and the public have expressed a desire that ecological conditions of forest habitats are restored and sustainably managed for current and future generations. They also have expressed the need to monitor Tahoe forests and report on their long-term status and trends. Consequently, managers need research to identify which indicators are meaningful for assessing the ecological integrity of forested habitats. For each identified indicator, managers need to know where along an indicator gradient reference conditions exist as a basis for establishing regional condition targets. In order to establish well-justified yet pragmatic monitoring, evaluation, and reporting efforts, agencies need to work collaboratively with scientists to prepare a monitoring and evaluation plan that agencies can implement to regular assess status and trends of upland ecological integrity.	What are key indicators and associated reference conditions for upland forest habitats? Can research inform the gradient of conditions that managers should target to achieve sustainability goals? Synthesis and review and/or conventional research should address the following: 1) Identify meaningful indicators of upland habitat ecological conditions. 2) Use identified indicators to characterize ecological reference conditions that would support the establishment of environmental targets or standards for the Lake Tahoe Basin. 3) Prepare a monitoring and evaluation plan that agencies can implement to measure the identified indicators and report on the status and trends of upland forest habitats. And 4) complete analyses to assess how the proposed new indicators compare to existing relevant indicators. Researchers should plan to work collaboratively with agency representatives and other research teams to ensure the products will meet agency information and evaluation needs.		

[1]Evaluation of nearshore ecology and aesthetics	Conventional Investigations and/or Synthesis & Review	A comprehensive approach to managing Lake Tahoe nearshore ecology and aesthetics is needed. The Pathway Water Quality Technical Working Group acknowledged that existing indicators, standards and monitoring plans were unlikely to be appropriate for assessing the condition of the nearshore environment. Due to the inherent complexity of the nearshore environment, collaborative development of nearshore indicators, standards, and monitoring plans was postponed. Although several studies have been funded over the last several years, an integrated effort is needed to obtain suitable environmental/ecological indicators and monitoring plans to assess nearshore conditions, and to provide research results that can inform the selection of nearshore standards. In addition, specific sources of pollutants affecting nearshore condition need to be identified and characterized in terms of loading rates, transport mechanisms, impacts, and the effectiveness of controls.	Synthesis and review and/or conventional research should address all of the following: 1) Synthesize and review previous and ongoing research efforts need to identify scientifically-supported environmental indicators that could be used to measure multiple dimensions of Lake Tahoe's nearshore environment. 2) Prepare a monitoring and evaluation plan that agencies can implement to measure the identified indicators and report on the long-term status and trends of the nearshore environment. 3) Synthesize and review previous and ongoing research to identify and quantify impacts to the nearshore environment from various land uses and nonpoint sources in terms of loading rates, transport processes, and the resulting impacts. 4) Evaluate the feasibility and cost-effectiveness of various measures to control/reduce the identified impacts. And 5) Complete analyses to assess how the proposed new indicators compare to existing relevant indicators. Researchers should plan to work collaboratively with agency representatives and other research teams to ensure the products will meet agency information and evaluation needs.		
[2]Total Science Funding				**$3,350,000**	**$3,750,000**

[1]Science work under these sub-themes would be pursued as a 'directed action' under the Tahoe Science Consortium work plan. This would mean the projects would not be determined as part of the normal Round 10 RFP, but would instead be implemented based on scopes of work developed at the direction of the TSC in collaboration with appropriate agency representatives. One or more proposals may be solicited by the TSC based on each scope of work and all proposals would undergo independent peer review for an evaluation of technical merit. Appropriate agencies would need to dedicate technical staff time to work in collaboration with the selected scientists to complete the projects. The intent of this approach is to maximize agency-researcher interactions needed to achieve the products desired by agency representatives in an efficient and timely manner.

[2]The full amount available for science has been allocated among four theme areas, with a target level of funding identified for each theme area. Actual funding levels may vary from targeted levels based on the merit of the proposals received and the specific dollar amount of the selected proposals; however, it is intended that all theme areas receive funding close to their targeted funding levels in order to accomplish the objectives identified as priorities by the TSC based on input from relevant agencies. Regardless of the allocation among theme areas, the total funding will not exceed the amount approved by the Secretary of Interior. Rapid Response funding would be allocated at $25,000 and up to $35,000 (if any funding remains after the award of Round 10 science proposals). The cost to the Pacific Southwest Research Station of administering the funding will be calculated as a percent of the total and will be deducted from the final funding for each theme area. Administrative costs will be minimized to the extent possible.