Socioeconomic Monitoring for the Four Forest Restoration Initiative

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Introduction and Background

Preparation and tracking of both the social and economic impacts of the Four Forest Restoration Initiative (4FRI) project is paramount to the success of the project. Social awareness, knowledge and support coupled with economic viability, such as a prepared workforce, adequate infrastructure, and reliable wood supplies, are critical factors that will be primary drivers of the project's progression. Typically, social and economic monitoring has not been a priority and was identified as one of the five major challenges by the Rural Voice for Conservation Coalition's (RVCC) Issue Paper (2011) in stating, "There is insufficient monitoring of the social and economic impacts of land management" and they further stressed this as a key recommendation for the US Forest Service (USFS). Robbins and Daniels (2011) affirm this by reiterating, "…that the socioeconomic aspects of restoration are 'underemphasized, or often ignored all together'" (Aronson et al. 2010). Thus, ensuring integration of ecological, social and economic impacts will augment effective management actions that will address multiple criteria necessary for community health and sustainability.

As the monitoring frameworks were conceptualized, beginning with a broad vision for both social and economic factors affected by restoration can be drawn from the 4FRI's foundational documents, such as the *Path Forward* (2010)*.* Within the *Path Forward*, the importance of integrating monitoring that includes ecological, social and economic impacts was raised in stating, "Landscape-scale restoration efforts should adopt and make full use of rigorous science, including research, monitoring, and adaptive management that enhances our understanding about their ecological, social, and economic implications" (2010).

Purpose and Application

The purpose of this report is to provide a framework to guide socioeconomic monitoring of the 4FRI project for the First Analysis Area Environmental Impact Statement (EIS). Both the 4FRI Science and Monitoring Working Group (S&MWG) and the USFS will contribute to monitoring the socioeconomic aspects of the project. The 4FRI project is funded through the Omnibus Land Management Act of 2009, Title IV-Forest Landscape Restoration. The 4FRI socioeconomic monitoring process is geared towards the purpose of the Act:

> The purpose of this title is to encourage the collaborative, science-
> based ecosystem restoration of priority forest landscapes through a process that--
> 1) encourages ecological, economic, and social sustainability;
> 2) leverages local resources with national and private resources;
> 3) facilitates the reduction of wildfire management costs, including through
> reestablishing natural fire regimes and reducing the risk of uncharacteristic wildfire; and
> 4) demonstrates the degree to which--
> (A) various ecological restoration techniques--
> (i) achieve ecological and watershed health objectives; and
> (ii) affect wildfire activity and management costs; and
> (B) the use of forest restoration byproducts can offset treatment costs while benefitting
> local rural economies and improving forest health.

The monitoring objectives identified in this report overlap with many of the key social and economic issues analyzed by the USFS in the "Environmental Consequences" section of the EIS. In the EIS, the USFS will assess the social and economic elements of 4FRI implementation. This analysis will include the Coconino and Kaibab National Forests and Coconino, Yavapai and Maricopa counties. Although Maricopa County is not within the Kaibab and

Coconino National Forests, it is included in the analysis due to the social and economic linkages between Maricopa County and the assessment area.

There are two main components to the USFS social and economic analysis that include: 1) the affected environment description and, 2) the assessment of environmental consequences. The USFS analysis of the social and economic affected environment description in the EIS considers population and demographic characteristics and trends (e.g. population change and educational attainment), employment and income data (e.g. economic specialization and median income), and environmental justice concerns (e.g. the distribution of minority and low income populations in the study area and their relationship to the Forest lands). This will include estimates of employment and income consequences during the 4FRI implementation lifecycle. Input- output-analyses using IMPLAN (www.implan.com) will estimate the employment and income effects of the 4FRI project. Ultimately, the estimates from IMPLAN can be compared to actual economic outcomes that will be collected as primary data from contractors, subcontractors, etc.

The USFS environmental consequences analysis estimates will be primarily a qualitative assessment and will describe how 4FRI implementation activities will affect quality of life, non-market economic values and employment and income in the study area. For quality of life, some of the key indicators are: 1) Particulate matter (PM) pollution from wildfire and prescribed fire (air quality modeling) and how PM pollution may lead to reduced quality of life through activity days, respiratory events, hospital admissions, etc.; 2) recreation opportunities (e.g. 4FRI implementation may temporary displace some activities; uncharacteristic wildfire can have long-term displacement consequences, etc.) and; 3) local economic sustainability; this will extend the quantitative economic discussion of employment and income to the social sphere to discuss how changing economic conditions affect community well-being. Non-market values will be measured chiefly through ecological indicators provided by other USFS specialists in their analysis (e.g. effects on habitat, water quality, soil quality, etc.). The economic efficiency of 4FRI implementation will also be analyzed by the USFS by using data on federal and private expenditures and the projected benefits of ecological restoration.

To supplement the USFS socioeconomic monitoring data and analyses, through multiparty monitoring, the 4FRI Collaborative will utilize the information contained in this report to complete both social and economic monitoring of the 4FRI project. Although this report contains an extensive list of possible objectives that could be monitored, based on the 4FRI Collaborative's priorities and the information gaps contained in the USFS required socioeconomic monitoring, specific objectives/questions will be targeted. To assure the project's success and longevity, it is recommended that socioeconomic monitoring is conducted before project implementation and there is immediate and ongoing execution within approximately the first five years of project implementation (Personal Communication, Nielsen 2011). Once socioeconomic monitoring data verifies the 4FRI project is socially and economically on track, the pressing need to conduct this type of monitoring will dissipate and the priority socioeconomic factors can be monitored less frequently to assess longitudinal changes.

The purpose of the joint effort of the S&MWG and the USFS monitoring process is to assess the accuracy of USFS estimates and provide data for adaptive management. In this way, the information provided by the USFS in the EIS, coupled with this monitoring framework, are linked to support a thorough and on-going assessment of social and economic conditions in the study area.

Methodology in Developing Social and Economic Monitoring Framework

The 4FRI S&MWG developed both social and economic monitoring frameworks to assess relevant socioeconomic factors that will determine these effects in planning, implementation and adaptive management of the 4FRI project. Relative to other land management activities, monitoring issues that need to be addressed within ecological restoration projects are broader and should encompass objectives that affect the widest variety of stakeholders (Egan and Estrada-Bustillo 2011; Fulé 2003). As a starting point, social and economic desired conditions from the *Landscape Restoration Strategy for the First Analysis Area* (LRS) (4FRI Stakeholder Group, Oct 2010) were compiled from the report (Appendix A). Additional economic desired conditions were extrapolated from Appendix A of the LRS report. Within the LRS report, both economic and social desired conditions were defined within three spatial scales that include landscape, analysis area and firescape. These spatial scales are more applicable to biophysical conditions; therefore, for the purpose of developing this monitoring framework, the socioeconomic desired conditions were not delineated by these spatial scales. At times, the original set of desired conditions were either repeated within each scale or they were not applicable as a socioeconomic desired condition for monitoring. Omission or modifications of these desired conditions are listed and explained in tabular format in Appendix B.

Once the final set of desired conditions, or broad goals, were determined, firm, measurable monitoring objectives (UO 2011) were developed through broad stakeholder input. As objectives were developed, considerations were based on those that the stakeholder group and/or the USFS have the ability to influence and adapt (Ibid). Monitoring questions were matched to the objectives to ensure the questions asked provide essential information that is needed to measure the stated objectives. Indicator selection was based on attributes that can be easily measured, are precise, and concisely describe current conditions (Moote 2011) as well as those that are sensitive to changes overtime (Moote 2011; Eagan and Estrada-Bustillo 2011). In addition, indicators that can satisfy multiple objectives should be recognized to assist in the efficacy of the monitoring process (Derr et al. 2005). The methods used to evaluate the selected indicators are described in the Toolbox section of this report (page 6). Once the appropriate assessment(s) were delineated, the recommended frequencies of the assessments, how often the monitoring data and analyses are completed, were matched to the assessment. Lastly, data sources, whether primary or secondary, were delineated to retrieve the necessary data to answer the questions.
It is important to note that these frameworks should be viewed as a "continuing, inclusive and evolutionary process" (Personal Communication, A. Egan 2011) that is malleable and adaptive over time.

Consideration of temporal and spatial scales is critical to the monitoring process and effects should be addressed at micro and macro levels as well as in the short and long-term. For example, results from project-level monitoring will provide necessary information to assess a variety of programmatic (cumulative) monitoring objectives/questions that can be tracked over time (UO 2011).

The social and economic framework matrices included in this report are not exhaustive; however, provide a basis for framing a 4FRI social and/or economic monitoring project (Appendix C and D). For example, there may be several monitoring questions for a specific objective; however, the associated monitoring questions may not be relevant and/or appropriated funding will only support answering one of the monitoring questions. Similarly,

there is a fairly comprehensive list of indicators; however, not all will be measured for a respective monitoring project. In the end, the purpose of the study, the constituency requesting the information, how the information will be used and, respective funding will ultimately dictate a specific methodology of the monitoring project.

Due to the groundbreaking nature of the landscape scale 4FRI project and the unpredictability of the results, the "If Statements" or triggers for adaptive management, are described as "Undesirable Conditions" (Personal Communication, T. Cheng 2011). The "Undesirable Conditions" have been initially expressed as broad qualitative statements that will delineate trends. As the project matures, and a baseline is established, these triggers can be adjusted to more specific acceptable quantitative ranges that will indicate whether or not adaptive management is necessary for each specific objective/question that is being assessed. In addition, once a contract(s) is awarded and contractors' business plans are identified, economic triggers can be more clearly delineated and assessments can be designed to determine whether implementation is in line with contractors' business plans.

In most cases, when socioeconomic studies are conducted, several monitoring questions can be addressed simultaneously, thus increasing the efficacy of the monitoring project. For example, a telephone survey to residents in the first analysis area can provide necessary data for multiple monitoring questions. As economic studies are planned and conducted, when contractor surveys are designed and distributed before project implementation, several indicators can be tracked and these data can be used for multiple monitoring requirements.

Program Evaluation

As monitoring protocols are established and implemented for the 4FRI project, program evaluation can be used as an appropriate social science methodology. Program evaluation is a set of "systematic procedures used in seeking facts or principles" so that theoretical positions can be tested (cited in Royse et al. 2001:2). Program evaluation follows a simple research design procedure that includes four main steps: 1. formulate a problem or question, 2. develop a research design for data collection efforts, 3. collect data, and 4. analyze the data (Ibid). Although this design is similar to a traditional research design, the underlying distinction is based on the results. In most instances, in a research design, results can be generalized to a broader population, while results from a program evaluation may only be applicable to the specific project or multiple projects that have distinct similarities. Moreover, program evaluation is designed to facilitate a "structured comparison" so that conclusions have a type of relative valuation (cited in Royce 2001:11).

Ideally monitoring should be conducted before and after implementation so that pre- and post- measurements can be compared. Due to the ongoing and malleable nature of monitoring, a process evaluation can be conducted throughout the life of the project that provides a program's description, a program's monitoring protocol and quality assurance measures (Ibid). Due to the nature of process evaluation, operations are documented and will provide the necessary information to replicate or convey the technology of a specific project. Process evaluations are typically used for research and demonstration projects as they provide information that will inform what was learned during project implementation (Ibid).

To take this one step further, a program logic model developed by the W. K. Kellogg Foundation (W.K. Kellogg Foundation Evaluation Handbook 2004) supports this application whereas evaluations are seen as adaptive, applying mid-course adjustments as needed, while at the same time, documenting its successes (WKKF 2004). This

evaluative approach also encourages a broad participatory base of all involved stakeholders, from developing the question to analyzing the data. The logic model does not just focus on the outcome but explains what you are doing, the expected results and a series of outcomes from immediate to long-term (Ibid). Moreover, this model helps to identify whether the project is on-track and emphasizes learning as an ongoing process - an integral part of the evaluation.

Institutional Review Board (IRB)

When collecting information on human subjects, an Institutional Review Board (IRB) should complete a review of the proposed project. As subjects participate in research projects, he/she should be informed their participation is voluntary and all of their answers are confidential and reported as an aggregate, or as a group response. If research is conducted remotely, through the telephone or the Internet, informed consent is completed verbally or in a screen that is read by the respondent. If participants are interviewed face-to-face, participants should sign consent forms before the interview/focus groups begin. The consent and reviews protect the rights of human subjects when used in research and prevent unethical treatment during the process (IRB NAU 2011).

Tool Box for Assessment

Scale – Sampling Frame

As the purpose of socioeconomic studies is conceptualized, and objectives/questions are designed to study a specific population (e.g. "local"), a concise, self-determined definition is necessary to pinpoint the sampling frame, or scale, of the population under study (UA 2011). Since this definition is dependant on the purpose of the study and, ultimately how the information will be used, it could vary considerably from study to study. The definition of the study's population, or the sampling frame, should reflect one or more factors that include geographic (natural, physical), administrative, social, and/or economic boundaries/conditions that are adequately representative of the location, political and/or public service jurisdictions, group of people or economic factors (EPA 2002).

Study Design

Both social and economic monitoring should begin with an assessment of current conditions by establishing baseline data before project implementation and/or education and outreach programs or events. Once a baseline is established, proceeding data collection should occur after major interventions to assess the change from the baseline to post-intervention and continue to assess changes longitudinally to track them over time. Depending on the selected social or economic analysis, accounting for specific issues and concerns within the population or the designated area of the study (e.g. community, city, county, EIS Analysis Area, etc.) should be considered and integrated in the study design (Egan and Estrada-Bustillo 2011). In addition, the study's design will be dependant on the goals of the study, the constituency, or who is requesting the monitoring results, and ultimately, how the monitoring information will be used. Ideally, socioeconomic monitoring should be a priority and should be implemented immediately and tracked for the first five years to assure the projects success (Personal Communication, Nielsen 2011).

The type of study that is initiated will dictate whether the purpose of the study is exploratory, descriptive or explanatory. Exploratory studies are typically conducted when researchers are breaking new ground, want to better understand the issue at hand, test the feasibility of developing a more extensive study and/or develop

methods to employ in a subsequent study (Babbie 2010). Descriptive research is precise reporting or measurements and answers the what, when, how and where questions and explanatory research reports relationships among the area of study and answers the question, why (Ibid). In general, as socioeconomic research designs are conceptualized, more than one study type will be integrated in its design.

To illustrate utilizing multiple study types in assessing social systems affected by the 4FRI project, understanding the general publics' perceptions will most likely take two types of research to adequately answer the monitoring questions. First, an exploratory study that consists of focus groups of the general public and personal interviews with land managers will provide information that is specific to the defined area of study (e.g. 1st Analysis Area, city, county, Forest etc.). Once this qualitative data is analyzed, this information will give researchers a basis for a more structured (quantitative/qualitative) descriptive and/or explanatory study that is geared towards the population in question. For example, if exploratory studies were conducted in the first and second analysis areas, commonalities and differences can be identified between the subpopulations and subsequently, questions relevant to both populations can be formulated as well as modules that are specific to each subpopulation.

Another key driver in the study's design is how the information will be used. If the constituency requesting monitoring data requires findings to be representative of the population in question, probability sampling must be employed. This occurs if all of the individuals in the population have an equal chance of being selected and the selection method is randomized. If this is the case, the results of the study can be generalized to the population as a whole (Babbie 2010). Probability sampling verifies the sample is not biased and enables estimates of the precision that the results reflect the study's population (Fowler 2002). These results can be statistically verified with a sampling error, the degree of inaccuracy in the sampling design, as well as a confidence level, that the results are representative of the population. Non-probability sampling can be appropriate when a complete list of the study's population is unavailable, resources are limited, study requirements do not dictate stringent probability sampling results or the purpose of the study is exploratory. For example, "purposive sampling" is appropriate when a select number of key informants provide information needed to understand the key issues and is either used to understand specific circumstances and/or develop a more stringent study that can be generalized to a broader population.

To all extent possible, in conducting the socioeconomic studies, assuring the results are reliable, they would consistently yield similar results and valid, they adequately represent the concept under consideration, should be an underpinning of the research design (Royse 2001). However, at times, there is a trade off between the two and the purpose of the study, the constituency and how the results will be used will assist in determining whether there is an emphasis on reliability or validity and/or whether this distinction is necessary.

Data Sources

Data sources listed in both the social and economic frameworks include both primary and secondary data. The social analyses primary data collection includes focus groups, interviews, surveys and content analysis. Secondary data sources for social analyses included reports by forests, government reports (city, county state and federal) and federal and private databases, such as Headwaters Institute and Firewise Communities USA.

The economic analyses primary data sources include contractor, visitor and business surveys. Secondary data for the economic analyses include various government reports (forest, municipal, state and federal), previous studies and government databases used in similar studies. As monitoring projects are developed and conducted, data sources in the frameworks will be reassessed and refined and new data sources will be added.

Literature Review

Generally, upon initiation of a socioeconomic study, background research through a literature review is conducted to assess previous research on the topic. More specifically, previous studies can assist with determining a study's design, questionnaire/protocol development, relevant data sources, various analyses that were used and, whether previous studies reveal consistent findings. In addition, this information can reveal whether there are consistent flaws in previous research that may be remedied (Babbie 2010).

Census Research

Census data provide information that is inclusive of all individuals in a population (Fowler 2002). Census data covers 200 specific topics that describe a population or a "community" that includes demographic information such as employment, education, income, a population's size, and "urban" versus "rural" communities (EPA 2002). Census data can also be used to verify the demographic data in the study group is reflective of the demographics of the area under study.

Survey Research

The choice of data collection mode, whether its through the mail, telephone, personal interviews or group administration will be based on the sampling frame, the research question, characteristics of the sample, required response rates, question format, availability of trained staff and facilities and funding available for the project (Fowler 2002).

Surveys are one of the best methods used to describe a population's attitudes and orientations that are too large to observe directly and provide a standardized measurement across individuals in a given population (Ibid). There are self-administered questionnaires and survey administered by interviewers. Self-administered surveys through the mail or on the Internet are generally less representative of a population due to typically low response rates. In administering Internet surveys, many times the population is not representative as the sampling frame is not inclusive of the entire population, nor is the Internet regularly accessible to a broader population. However, Internet surveys can be appropriate to populations that have known computer access, such as USFS employees. In general, telephone surveys delivered by a live interviewer tend to be the most reliable method to collect data as the response rate is much higher, thus reveling results that are more indicative of the group that is being studied. Also, telephone survey methodology, although not perfect, provides a sampling frame that is most inclusive of a population. A note of caution - automated telephone surveys will not yield reliable results for many reasons such as, the respondent's identity is not verified (e.g. a child on the phone), there may be screener questions that verifies specific information about a respondent in the household and there is no assurance that the question was understood and did not need to be repeated. In general surveys, coupled with valid operationalization of concepts through appropriately worded questions, provide uncanny accuracy of a population's beliefs and attitudes (Babbie 2010). In addition, data collection through surveys can also provide a population's characteristics (demographics) that can be linked to the responses thus, increasing understanding of specific group's perceptions or beliefs (EPA 2002).

Data collection of telephone surveys is streamlined through the use of computer programs, such as Computer Assisted Telephone Interviewing (CATI). These programs allow for survey question programming and results are recorded as the interview is conducted. Not only does this improve data collection entry error but also, the phone numbers in the sample are randomized (Random Digit Dialing -RDD) and shown on the screen for the interviewer to call. In addition, programs such as these allow for responses, whether they are closed- or open-ended, to be directly exported into programs such as Statistical Package for the Social Sciences (SPSS) for analysis. Nicholls et al.

reports use of programs such as CATI, are more efficient than conventional techniques (paper and pencil surveys) and do not affect data quality (cited in Babbie 2001:265).

For the 4FRI project, generally if researchers are seeking broad public opinion and attitudes about a number of issues, telephone surveys will yield results that can be generalized to the population. For more specific economic data, if secondary data is available from reliable sources, these will be used. In addition, primary data collected through self-administered surveys from contractors or others involved in the restoration process, are the best method, as contractors need to track the information and refer to their records. In collecting primary data from contractors, the sooner they are aware of these efforts and receive the survey forms/files, the easier it will be for them to track the necessary information.

Personal Interviews and Focus Groups

Personal interviews that occur face-to-face can be appropriate when the questions require: qualitative in-depth answers, high response rates, interviewer observation, longer interviews, rapport building and allow for multi data collection modes that could include diagrams (Fowler 2002). Personal interviews can include key informants that will provide valuable in-depth information such as, USFS personnel and community leaders such as, the County Board of Supervisors. Focus groups are a useful tool and usually engage 12-15 people in a guided discussion of a topic. The participants would not statistically represent segments of the population; therefore, this mode of observation is used to more deeply explore a topic and become more familiar with the issues under consideration (Babbie 2010). These results can be used to design a descriptive or explanatory study and/or used for strategic planning efforts (EPA 2002).

Content Analysis

Content analysis is used when various mediums of communication provide information in either a written form, such as newspaper articles, or in a multimedia format such as movies, speeches, photos etc. (C. Marshall and G. Rossman 2006; EPA 2002). These analyses reveal recorded historic human communication or the artifacts of a social group (Babbie 2010; Marshall and G. Rossman 2006). Content analysis will reveal what has been communicated and the analysis will answer the question "why" it was communicated and "what was the effect" of the communication (Babbie 2010). To complete the qualitative analyses of the various formats, a software program, NVivo (2012), can be used for evaluation of the data.

Collaborative Performance

The first collaborative performance evaluation has been conducted through a Survey Monkey instrument developed in conjunction with the 4FRI Stakeholders and the US Institute for Conflict Resolution (October 2011, Appendix E). In addition, a separate evaluation conducted by Northern Arizona University (W. Greer, E. Nielsen) and Colorado State University (T. Cheng) that includes a 4FRI Case History and a Collaborative Governance Case History will supplement the 4FRI Collaborative's effectiveness and performance measures (May 2012). The intent is to track performance over time and to adaptively manage the Collaborative so that improvements are made to key areas identified by stakeholders.

Economic Analyses

Economic analyses are essential tools for planning, prioritizing and evaluating restoration projects (Robbins and Daniels 2011). Economics will provide a suite of tools to inform decision-making and improve transparency in

selecting projects (Ibid). Based on a recent review of literature in describing economic concepts in the context of ecological restoration, Robbins and Daniels (2011) outline decision-analysis frameworks that incorporate an inclusive array of restoration benefits and costs. A "travel costs method" is employed to determine values associated with recreational sites by assessing visitor time and expenditures. "Stated preference method" or assessing willingness to pay for environmental improvements is used when indirect values, such as watershed protection, are being assessed. The stated preference method can be measured by a "contingent valuation," or how much individuals are willing to pay for a policy or project. As an alternative, an "experimental choice method" can be employed as a non-monetary valuation that asks individuals to choose from a set of alternatives and rank their preferences. "Benefit costs analysis" includes total benefits or revenues and costs (using a weighted distribution of each) of a project over time with a defendable discount rate. Alternatively, "cost effective analysis" can provide a framework to compare relative costs of alternative methods geared towards achieving the same outcome. Lastly, "multi-criteria decision analysis" uses nonmonetary values through relative quantitative or qualitative performance scores. This review also revealed that although direct costs and revenues should be easy to capture, they are rarely reported. To address this lack of accounting, as suggested early in this report, streamlining expenditure, revenue and employment data reporting with prepared protocols and contractor reporting forms as well as creating a centralized data base prior to project implementation, should assist in closing this gap.

Additionally, to capture local economic conditions, economic base theory, a causal model, can be employed that divides the local economy into two sectors: 1) a basic, or non-local and 2) non-basic, or local. This theory is grounded on the premise that the basic sector, or those businesses that are dependant on non-local firms to buy their products, is the driver of the local economy. Thus, the local economy is strongest when it is not dependant on local factors and can better insulate itself from local economic downturns. This distinction is important because the means of strengthening a local economy is to develop and enhance the basic sector (McClure 2009; Chapin 2004).

Prioritization

Although there are a multitude of monitoring objectives/questions in both the social and economic frameworks, due to identified preferences of the stakeholders and limitations in resources, objectives/questions need to be prioritized by the 4FRI Stakeholders . A basis for prioritizing the questions/objectives are issues and concerns that are relevant to the communities that are directly affected by the ensuing forest restoration efforts as well as those across the four Forests and the State.

In a study conducted by Egan and Estrada-Bustillo (2011), a model to prioritize socioeconomic indicators was developed through a Delphi process. Based on project objectives and availability of resources, results indicate there are three levels of indicators that include: 1) a core set that utilizes minimum effort at the forest or stand level; 2) includes the set of core indicators and balances ecological with socioeconomic dimensions and is used for long-term projects requiring more time and expertise and; 3) includes the first two sets of indicators; however, the primary focus is socioeconomic outcomes and is used across jurisdictions on landscape-scale projects and requires the highest level of expertise and resources. In addition to the recommended intensity of the socioeconomic monitoring, specific indicators can be weighted in using an average/median rating. Based on these results, overall socioeconomic objectives/questions can be identified, will provide guidance in selecting the best indicators for the assessment, and can guide resource allocation for a given project. Although prioritization is necessary, it is

Important to keep in mind, as socioeconomic studies are conducted, multiple monitoring questions can be addressed simultaneously, thus increasing the efficacy of the monitoring project and stakeholders can select groups of objectives/questions as priorities.

Adaptive Management

To complete the adaptive management loop, an initial assessment of the public's awareness, knowledge and support of pressing issues, as well as critical economic factors and conditions, is necessary to determine effects of outreach as well as implementation. Once these factors are understood, hypothesis testing of changes in behavior are developed, empirical data is collected and tracked to monitor the effectiveness of future outreach and implementation efforts. These steps tie back in to the logic model that explains what you are doing, the expected results and a series of outcomes from immediate to long-term (WKKF 2004). Using this model helps to identify whether the project is on-track and emphasizes learning as an ongoing process - an integral part of the evaluation and a critical component of the adaptive management model.

Included in the both the social and economic frameworks is a column "Management Action THEN…" that will be used to describe what needs to be done if an "Undesirable Condition," initially described as a qualitative statement, delineates a trend in the wrong direction. As the project matures, and a baseline is established and awarded contracts and contractors are determined, these triggers can be adjusted to more specific acceptable quantitative ranges that will indicate whether or not adaptive management is necessary for each specific objective/question that is being assessed. In describing the "THEN," stakeholders will need to work closely with the USFS in protocol development of recommended management actions. Additionally, economic forecasting models can be verified and refined with empirical data collected by the S&MWG.

According to a study conducted by Brown and Squirrell (2010), adaptive management is premised on flexibility and job security that enables risk taking. To integrate consistent adaptive management within the USFS, results from this study suggest the need to establish mutual trust between key stakeholders, such as other agencies, nongovernmental organizations, citizens, politicians and the courts, and the USFS. Due to the groundbreaking nature of the 4FRI project and the lack of science based adaptive management within the USFS, solidifying the adaptive management process is a critical step in ensuring the project's success. Stakeholders that are concerned about potential management outcomes are more likely to support management actions if they are confident results from these actions are carefully monitored (RVCC 2011). In the end, monitoring should not be viewed as an added expense, but as an instrument that can ultimately reduce overall costs by minimizing ineffective management practices and potentially reducing appeals and litigation (Ibid).

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