DRAFT

PROSPECTUS FOR EVALUATING TRADEOFF AND DECISION SUPPORT METHODS FOR THE GCDAMP

GCDAMP SCIENCE ADVISORS

DECEMBER, 2010

SCIENCE ADVISOR CHARGE

The Technical Work Group (TWG) and the Science Advisors (SAs) have for several years discussed the need to consistently incorporate more objective based approaches in evaluating tradeoffs of various science and management programs. At the TWG 2010 summer meeting it was proposed to the Adaptive Management Work Group (AMWG) that the Science Advisors be charged to evaluate decision support methods that could be utilized by the GCDAMP, especially the TWG. The AMWG at their fall 2010 meeting charged the SAs to conduct the assessment.

BACKGROUND

Over the past decade the GCDAMP has used decision support methods to evaluate alternative science and management direction. These have ranged from simplistic consensus and voting approaches to use of analytic preference tracking procedures to better inform the consensus and voting process. TWG and AMWG have also utilized models such as ECOSIM (MATA, Ecosystem, SPG Workshops) to characterize biophysical tradeoffs occurring in differing science and management approaches. Less use has been made of decision support methods which incorporate treatment of tradeoffs, costs, benefits, risks, etc.

Generally, decision making methods incorporate a mental cognitive process resulting in the selection of a course of action among several alternatives. It should be made clear that in these processes, use of more complex analytical methods do not necessarily insure better decisions. In fact, for large groups such as TWG and AMWG significant continued investment is needed in effective collaborative processes to permit application of more complex decision processes. This can prevent concerns by individuals that important information is being glossed over in the complex models. Further, and probably just as important, stakeholders sometimes prefer much less complicated information sets and models for use in decision processes. More simplistic models that are populated with accurate and effective information can often provide effective decision outcomes on many issues.

Decision processes are a necessary part of life and are common to all aspects of living. Examples include deciding what car to buy, what college to attend, and what appropriate course of actions are necessary to get to the moon or bring GM back from bankruptcy. Some individuals have unique capabilities to request and process quickly the most important information sets necessary to arrive at multiple decision points required in a complex program. Others may struggle over the most simple

decision, often unable to correctly formulate the question or issue needing resolve, a basic first step in the process.

The disciplines of "decision making" and "decision methods" have been developed extensively in science and management to assist the process, using both qualitative and quantitative approaches that range from simplistic to complex. Most often the decision process must rely on a blend of qualitative and quantitative approaches simply because complete knowledge never exists on all aspects of an issue. This is especially true of more complex problems with high uncertainty such as encountered in GCDAMP.

Qualitative decision approaches, especially more simplistic methods, have significant appeal because they are more easily structured, understood and accepted by groups. However, often even they require quantitative scales and matrices with assigned numeric values to permit assessment such as the following example.

SCALE	PROBABILITY	RELATIVE GOODNESS	AGREEMENT	FREQUENCY	IMPORTANCE	QUALITY
1	Very high	Much better	Strongly agree	Always	Very important	Excellent
2	Medium	Same as	Not decided	Occasionally	Neutral	Average
3	Low	Worse than	Strongly disagree	Never	Not important	Poor

Quantitative approaches to assist decision making has had continued support from the science and management communities since the 1960s. Development of academic disciplines such as systems theory and operations research advanced concepts such as Program which have evolved today into very articulate and often complex Decision Support Systems (DSS).

CHARACTERIZING APPROPRIATE AND EFFECTIVE DECISION METHODS FOR THE GCDAMP

In the GCDAMP both TWG and AMWG have sufficient science and technical support to evaluate the application of the full range of decision processes. As noted above, over time both very simplistic and very complex information sets and decision methods have been utilized in tradeoff and decision assessments by the TWG, albeit not consistently. Effective decision support methods could therefore be selected for evaluation from the full range of simplistic and complex approaches in existence.

The TWG conducts most of the in depth assessments of science and management alternatives for the AMP. The TWG then would be the primary focus of the SAs in this assessment. However, the AMWG may also have a need for application of more qualitative decision methods.

In accomplishing its tasks the TWG is challenged constantly by time constraints resulting from its work load, but possibly because it also does not use decision methods in a consistent manner. Because of this challenge, and also the wealth of qualitative decision methods, the SAs recommend that its evaluations in 2011 be focused on more qualitative methods and models. This does not mean that

quantitative tradeoff techniques, such as models like ECOSIM will not be incorporated, they will. However, initially it may be more productive to evaluate 2-4 approaches that represent a more qualitative approach overall.

Even though more qualitative methods are proposed in this first year evaluation, these methods will be expected to respond to selection criteria that define more robust decision methods. For example, developed screening criteria will require that methods chosen for evaluation incorporate capabilities for assessment of cost and benefits, uncertainty, risk, comparative tradeoffs, etc.

If the process proves effective and the TWG makes more consistent use of decision methodology it is proposed that the SAs evaluate 1-3 more quantitative decision support systems. This two step approach might best support the TWG and AMWG in their joint deliberations on science and management needs over the next five years, and the current expected timeline of AMP accomplishments. For example, the assessments may demonstrate that more qualitative approaches would best benefit AMWG decision processes whereas more quantitative methods may be appropriate to the TWG.

ASSESSMENT APPROACH

Decision support methods exist and are used at some level in most management and science disciplines. The area of Business Management has provided much of the leadership over time on this issue. Yet, the area of Natural Resource Conservation and Management, especially since the 1960s, has developed excellent methods that demonstrate capabilities to incorporate environmental cost and benefits, risk assessment, uncertainty analysis, etc.

The assessment approach used will be Literature Review and Case Study Evaluation. The following tasks will be performed between January, 2011 and August, 2011.

- A review of literature that provides overviews of development of decision analysis methodology; qualitative and quantitative methods; appropriate applications of differing qualitative methods, etc.
- Develop criteria for coarse screening and selection of 4-8 qualitative decision support methods in current use (past five years) in natural resource management and business. Conduct screening and selection.
- Refine criteria for fine screening and selection of 2-4 methods for in depth evaluation for application as a GCDAMP decision support tool.
- Evaluate candidate methods potential application to GCDAMP needs using hypothetical case evaluations.
- Develop report for TWG and AMWG.

Presentations to TWG and AMWG and discussions of methodologies with members will depend on AMP schedules and available resources. Recommendations to AMWG may require a short workshop with TWG.

SCHEDULE AND RESOURCE AVAILABILITY

All project tasks and activities for completion of the final report are proposed to be conducted during the Science Advisors contract year, i.e., January to January. Expansion of the project assignment or multiple presentations and or a workshop could require the SA Coordinator to adjust completion schedules or budgets to accommodate the $20,000 assigned to the project. If this schedule needs to be revised to accommodate the TWG, the SAs will attempt to respond with an alternate schedule.

A PROSPECTUS TO EVALUATE TRADEOFF AND DECISION SUPPORT METHODS FOR GCDAMP

AMP SCIENCE ADVISORS

MARCH , 2011 TWG MEETING

GENERAL CATAGORIES OF DSS

- QUALATATIVE APPROACHES
- QUANTATATIVE METHODS

QUALATATIVE APPROACHES

- SIMPLISTIC METHODS AND MODELS
- EASILY UNDERSTOOD AND APPLIED
- LOW USER COST AND TIME INVESTMENT
- LIMITED USE OF COMPLEX ASSESSMENTS
- CONSTRAINED TO MORE COARSE ANALYSIS
- USEFUL FOR REAL TIME APPLICATIIONS

QUANTATATIVE APPROACHES

- COMPLEX METHODS AND MODELS
- MORE DIFFICULT TO UNDERSTAND SYSTEM DETAIL
- REQUIRES ANALYSTS TO OPERATE
- HIGH DEVELOPMENT COST
- SUMMARY OUTPUTS USEFUL IN MORE SIMPLISTIC MODELS
- USEFUL FOR COMPLEX ASSESSMENTS AND MICRO-ANALYSIS
- MORE LIMITED REAL-TIME APPLICATION

DSS SHOULD INCORPORATE SEVERAL CAPABILITIES

- INTEGRATED ASSESSMENTS OF GOAL OUTCOMES
- COST ASSESSMENTS
- BENEFIT ASSESSMENTS
- ASSESSMENT OF RISK
- EVALUATION OF LEARNING AND UNCERTAINTY
- TRADEOFF ANALYSIS
- EASE OF USE AND UNDERSTANDING

SA ASSESSMENT APPROACH

- LITERATURE AND USER REVIEW
- CRITERIA FOR COARSE SCREENING, SELECT 4-8 METHODS IN CURRENT USE
- REFINE EVALUATION CRITERIA AND SELECT 2-4 METHODS FOR ANALYSIS
- EVALUATE APPLICATION TO AMP
- FINAL REPORT TO TWG : SUMMER 2011

GENERAL APPROACH TO CMP DEVELOPMENT

- DEVELOP A GENERAL CORE MONITORING PLAN
- CONDUCT INFORMATION NEEDS WORKSHOPS WITH TWG
- CONDUCT PEPS FOR EACH RESOURCE GOAL
- DEVELOP INDIVIDUAL RESOURCE GOAL CMPs

RECOMMENDATION FROM SAs ON 2009 CMP DRAFT

- MANAGER AND STAKEHOLDER GUIDELINES FOR SPECIFYING DFCs; GOALS; ARTICULATING PRIORITY INFORMATION NEEDS; LEVELS OF NEEDED RESOULUTION IN DATA AND ACCURACY FROM ANALYSES; RESOURCE IMPACT PROJECTIONS; TRADEOFFS; LEVELS OF PROJECTIED RISK; ETC., NEED TO BE INCLUDED IN THIS DOCUMENTATION .

CRITERIA TO EVALUATE MONITORING CONFORMANCE TO MANAGEMENT NEEDS

- AMWG PRIORTY
- MOs AND CMINs
- COMPLIANCE
- LEGACY
- DATA QUALITY AND AVAILABILITY
- COST/BENEFIT AND RISK ASSESSMENT
- STATUS OF KNOWLEDGE
- METHODOLOGY