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Outside Readin

Get comfortable with Uncertainty in Resource Management Decisions

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This section, "Outside Readings," includes reprints or abstracts of editorials, features, articles or other published materials that appeared in various publications and would like interest readers of the "Arizona Water Resource" newsletter. The following piece was published in the Washington Water Research Center newsletter, E-Water News.

Science-based management seems to have become an accepted buzzword as of the late 90 Most seem to agree that it is something we should do. But what does it really mean in the important resource management decisions facing us today? Decisions facing us today are usually complex. Most of the science that can be applied to those decisions is based on questions that can only be answered in a statistical sense, because few relevant problems a simple enough that science can tell us categorically yes or no. Most scientists were trained statistics where the allowable confidence level for a valid result was either 95 or 99 percer confidence. We were trained that a relationship only certain at the 80 or 90 percent confidence level was technically unsupportable so nearly all results at that level have neve been published.

So what usually happens? The scientists, uncomfortable with presenting results at those lower confidence levels, tell the managers that that question cannot be answered, so the scientists search for a simpler question that is answerable with higher confidence. Scientis are generally very adverse to risk taking, especially when the risk in question is the risk of being wrong. However, the difficult question MUST STILL be answered by the resource manager, or even in some cases by the public through a referendum. So managers or politicians, or citizens, who are generally not trained in the scientific disciplines relevant t the question, are forced to translate the scientifically confident answer to the more comple question at hand. Is this the best way to make science-based decisions?

I suggest that we demand that the relevant, although complex, questions are studied and answered; even if the uncertainty is only 80 percent confidence. Some may say that 80 percent confidence is not enough, and for questions where much is at stake, that is likely t However, we usually do not consider the uncertainty associated with the do-nothing alternative, which is probably what happens when we reject an answer because it is not certain enough. Most people are comfortable, (though not pleased) with uncertainty in son areas of life. Many weather forecasts as little as one or two days out are probably no more

confident than 60-70 percent. We have come to accept and appreciate getting the forecast even if it has an unknown uncertainty.

Some, as potentially affected land owners or industries, say they want nearly complete certainty in the outcome before they are asked to make changes in their practices that wou cost them money or time. This makes sense except that often the do-nothing alternative ha serious (and often costly) outcomes as well. And if the science-based decision was handle correctly including all factors as well as economic ones, it can sometimes be used to answ the appropriate question with the optimum benefit for all.

Examples where relevant, although complex questions are replaced with easier questions:

1. In the Northwest today, many environmental questions revolve around salmon. A relev question would be how many salmon are likely to be restored by taking this or that action (dam removal, banning some type of fishing, etc.). If we could answer some of those questions, then we could compare alternatives in a much more sensible manner. In the dan removal case, the scientists have translated that question to a simpler one like, sediment loading in the stream will increase or decrease," or dam removal will increase the velocity water movement in the downstream reservoir, which should help the smolts. Recently in Washington State, the voters were asked to answer the question of whether commercial fishing should be severely limited in order to save salmon. Very little science was offered either campaign's advertising and so it became mostly an emotional decision about what t value more.

2. Choosing which best management practices (BMPs) to encourage and support. Many BMPs have been identified and limited resources need to be used for the BMPs that are m beneficial. Most often this decision is based on judgment alone. If this decision were aide with a statistical approach, it would usually involve some kind of multiple regression whe many factors are correlated against a result. Many multiple regressions involving several factors do not satisfy the 95 percent confidence level, yet it still might be helpful to know which factors are most likely to help, if even only at the 80 percent confidence level. This known uncertainty might make some people uncomfortable, yet the judgment decision mi have had even less confidence, though it was unknown.

We scientists must be willing to answer the more difficult, but more relevant questions ev though the uncertainty is more than we like or are accustomed to. We must be willing and allowed to publish results at lower confidence levels. For this change to be effective, we n clearly communicate our findings as well as the confidence level estimates, but also our o judgments about how certain we are about the answer and the estimate of the confidence. must help people understand all the good and bad about particular question-answering eff so that they can properly make their own conclusions about our results. Resource manage who generally fund scientists, should demand that relevant, though complex questions are investigated.

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