Nevada's TMDL Program – Strategizing on TMDL Development Needs

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Introduction

Nevada's TMDL program is confronted with the challenge of revising and developing a larger number of TMDLs than previously identified. Many of the existing TMDLs are too simplistic and need to be updated. In some instances, impairment of waterbodies has been determined based upon water quality standards that are not appropriate. In most cases, biological or physical information was not used in a weight-of-evidence approach for impairment/support determinations. This paper provides initial thoughts on these issues and future approaches needed for TMDLs in Nevada.

Key Questions to be Considered in the TMDL Development Process

TMDL is a bad name for a good idea. Setting TMDLs (or the maximum amount of a pollutant (lbs/day, etc.) that a waterbody can receive and still meet water quality standards) has been a useful threshold for controlling point source discharge. However, setting pounds per day thresholds for nonpoint source impaired waters does little to address the problem. Before a problem can be corrected, it first needs to be well understood through source assessments, watershed and waterbody health assessments, and other tools. There are some key questions that need to be considered in the development of TMDLs. How they are answered will direct the strategies taken for a particular TMDL project.

- **Is the beneficial use appropriate?**

  One of the keystones of the Federal Clean Water Act is the establishment of beneficial uses. In Nevada, most waters have the following beneficial uses:

  - Irrigation
  - Livestock watering
  - Contact recreation
  - Noncontact recreation
  - Industrial supply
  - Drinking water supply
  - Propagation of wildlife
  - Propagation of aquatic life

  The setting of inappropriate beneficial uses can lead to imappropriate 303(d) listings, unnecessary TMDLs, and unneeded remediation projects. Therefore, the first step on the TMDL road should be an evaluation of the beneficial use in question. For example, most rivers in Nevada have "propagation of aquatic life" as a beneficial use. On some systems, naturally propagating fish populations have not existed since settlement in the late 1800s. Also, non-native fish such as rainbow and brown trout have been introduced into systems

(not always supportive of their propagation) and maintained through stocking activities. As the TMDL process is worked through, it needs to be recognized that the waterbody conditions required to support a naturally propagating fishery can be substantially different from a put-and-take fishery.

- **Is the beneficial use impaired?**

  The objective of the Federal Clean Water Act is to "…restore and maintain the chemical, physical and biological integrity of the Nation's waters." Historically, Nevada and other states have focused on the chemical integrity portion through the use of numeric water quality standards and water chemistry data. While far from perfect, this approach is relatively simple to apply which probably explains its common use throughout the country. However in order to get a more accurate representation of the health of a system, the physical and biological conditions need to be considered in conjunction with chemistry conditions. The State can no longer depend solely on water chemistry data for 303(d) List and TMDL development.

  Currently, our bioassessment program is in its infancy. With time, NDEP will be developing more detailed biological and physical condition information, and protocols for assessing waterbody health. As this program develops, our assessment protocols can become more comprehensive. More work is needed to better understand the conditions needed to support the various beneficial uses and to bring these considerations into the TMDL assessments

  Another issue is the existence of inappropriate numeric water quality criteria in the regulations. A primary example is the nutrient standards used for much of the state. The typical phosphorus standard is 0.1 mg/l and is based upon general recommendations in EPA's Gold Book as a "desired goal for the prevention of plant nuisances". Given the native soil conditions in the Great Basin and the topography that exists over much of Nevada, the suitability of the total phosphorus standard must be questioned. Additional investigations are needed to quantify natural phosphorus contributions and establish linkages with dissolved oxygen levels and actual impairment levels.

- **What is the cause of the impairment and is it due to natural causes?**

  It is important to adequately characterize the impairment causes during the TMDL process. Without this information, it becomes difficult to develop strategies for improving conditions as needed for beneficial use support. For instance, if it is not know whether sediment problems are due to watershed erosion versus stream channel erosion, one cannot determine where to focus improvement projects.

  Also, it is important to understand if the impairment is due to natural conditions. If a spring discharge or mineral outcropping has led to water quality problems, this needs to be recognized. According to Nevada regulations, water quality standards are not considered to be violated if the cause is due solely to natural causes.

A variety of parameters appear on Nevada's 2002 303(d) List that may be naturally occurring. For example, given the native soil conditions in the Great Basin, it is possible that many of the 303(d) listings for phosphorus and iron are due to natural conditions. Some may argue that higher sediment levels are the result of the river system attempting to naturally heal following some past change to its hydrology and geomorphology. Also, some systems may have naturally high sediment levels. It is obvious that more research and data collection are needed to define the natural levels of some pollutants prior to TMDL development.

In an ideal world with unlimited funding and staff, each of these questions need to be adequately answered in order for the TMDL process to yield the ultimate, useful product. Simple and detailed flow charts depicting the ideal TMDL development process are shown in Figures 1 and 2, along with possible projects to undertake towards answering the key question. Unfortunately, unlimited resources are never available so an approach is needed whereby answers to these questions are gradually developed. It is not feasible to wait for all the answers to be in hand prior to completing a TMDL for an impaired waterbody. TMDLs must be phased, evolving over time as more and more information become available. In a real world TMDL, various activities aimed at answering any, part or all three of the above questions could be underway at any time and concurrent with each other. That said, real improvements to our waterbodies can not happen without adequate understanding of the factors impairing the uses.

TMDLs and Monitoring Needs

As already presented, TMDLs for nonpoint sources need to focus less on establishing allowable pounds per day moving through a waterbody and more on understanding the beneficial uses and how they are impacted by chemical, physical and biological factors. Under our statewide monitoring network, about 100 waterbody sites are sampled annually and tested for routine pollutants and metals. While these data are extremely useful for our overall program, they are not always that useful for the TMDL development process. In most cases, there are insufficient data to accurately calculate historic loads and load reductions (if that is the desired goal). Without appropriate problem characterization, it is not possible to design appropriate control measures. Monitoring efforts may need to shift from the more traditional routine grab sample approach to more focused special projects needed to begin answering the 3 key questions presented above. Examples of these efforts include:

- Continuous and near-continuous monitoring of dissolved oxygen, temperature, and turbidity are needed to determine if uses are impaired and to characterize the impairment sources and model development
- Detailed monitoring of dissolved oxygen, nutrients, algal concentrations, etc. needed to evaluate appropriateness of phosphorus standards and model development
- Stream channel cross sections for improved understanding of stability of channel and the possible impacts on the beneficial uses, erosion transportation modeling.

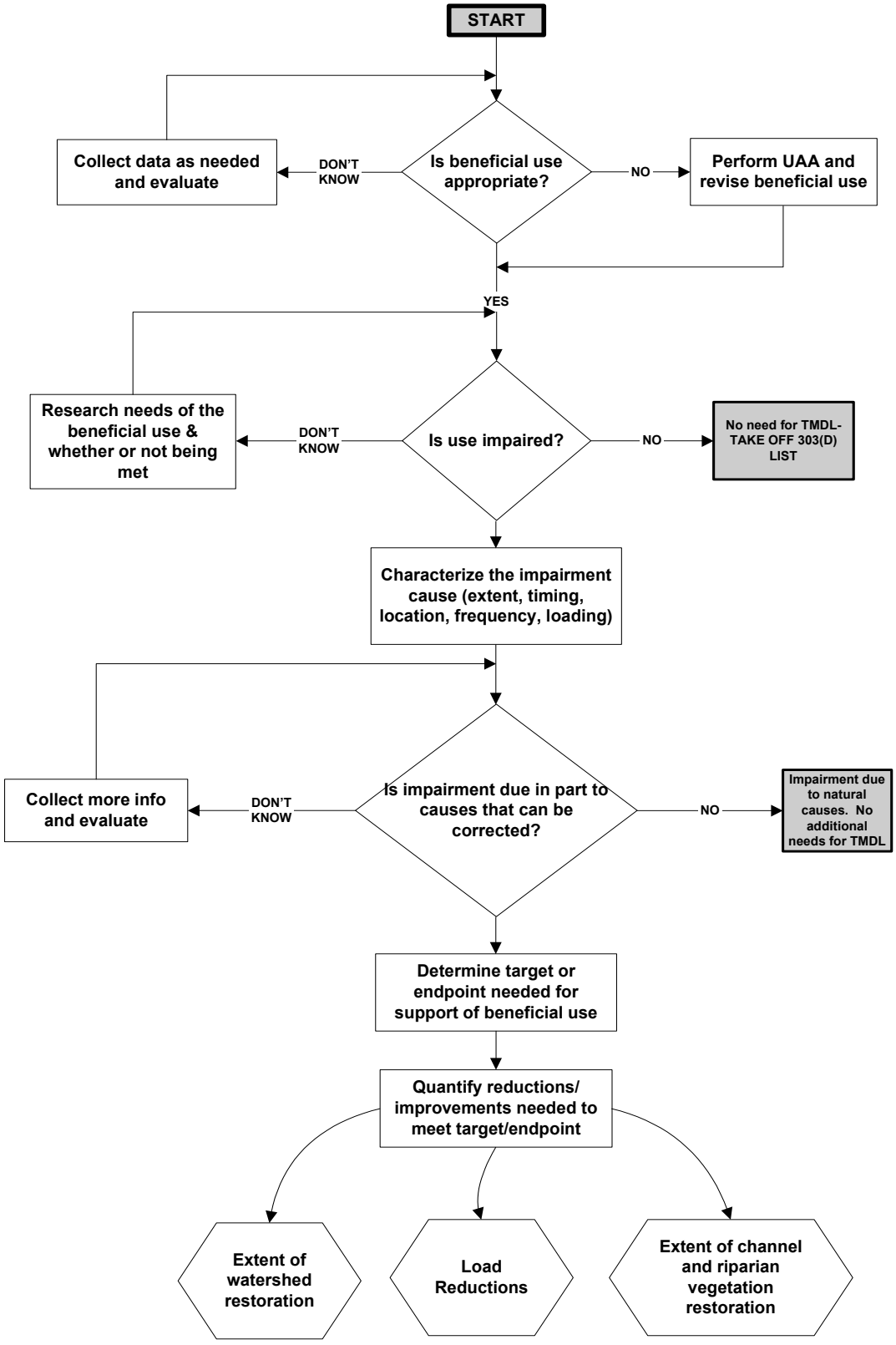

Figure 1. Simple Flow Chart of TMDL Process

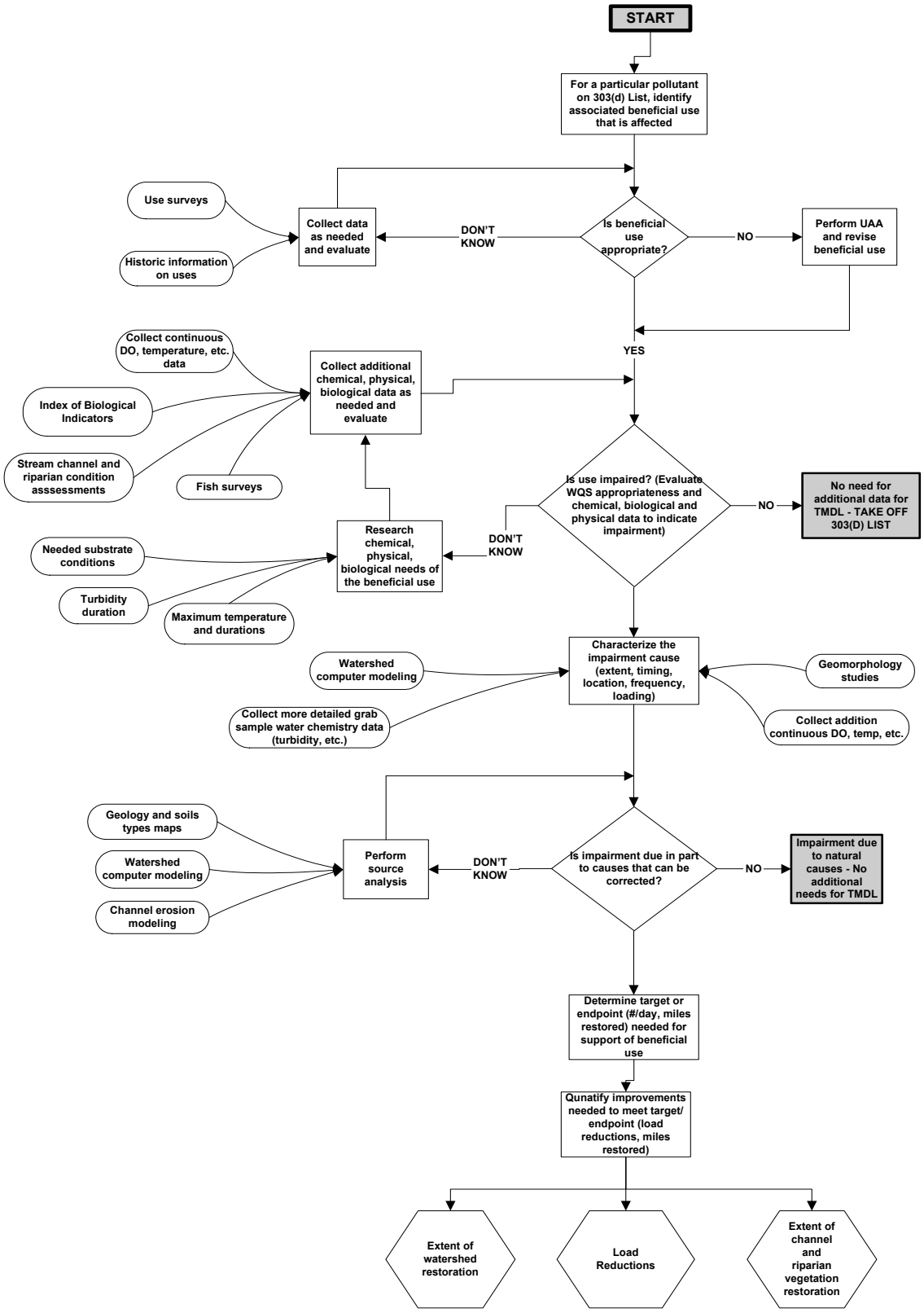

Figure 2. Detailed Flow Chart of TMDL Process