



State of Utah

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Department of
Environmental Quality

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DIVISION OF WATER QUALITY
Walter L. Baker, P.E.
Director

MEMORANDUM

TO: Water Quality Board

THROUGH: Walt Baker, P.E.
Director 

FROM: Sandy Wingert
Watershed Protection Section

DATE: October 14, 2016

SUBJECT: Total Maximum Daily Load (TMDL) for Upper Nine Mile Creek: Request to initiate rulemaking to adopt TMDL

The Division of Water Quality has completed a TMDL study to address water quality impairments in Upper Nine Mile Creek located in the Uinta Basin Watershed Management Unit. Since the cost of implementation is below \$10 million, Legislative review is not required for approval.

Finalization Timeline

October 26, 2016	Water Quality Board Preliminary Approval of TMDL/Petition to initiate rulemaking
October 31 – December 1	30-day Division of Administrative Rules Public Notice
December 14, 2016	Petition Water Quality Board for formal adoption of TMDL into rule
December 21, 2016	Submit TMDL to EPA for approval



Upper Nine Mile Creek TMDL Summary

Nine Mile Creek does not meet the 3A cold water aquatic life criteria for temperature. The TMDL study supports the development of a TMDL for the upper part of the watershed while a designated use change or site specific temperature criteria is warranted for the lower reaches. It is necessary to split this watershed into two parts (Upper and Lower) to properly address the cold-water aquatic life use

impairment (see Figure 1). Lower sections of Nine Mile Creek regularly exceed the cold-water aquatic life temperature standard of 20° C due to natural and uncontrollable conditions which is also supported by recent and historic fish surveys that do not show any historic presence of cold water species such as trout. This water quality report recommends a use attainability analysis (UAA) for the lower reach. This UAA will be developed in coordination with stakeholders and submitted for approval to EPA after the temperature TMDL is approved.

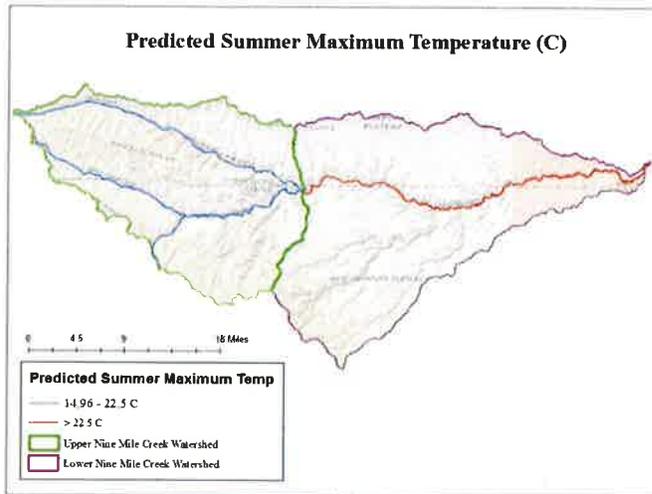
Sources

There are no permitted point sources in this watershed so potential sources of thermal loading are non-point in nature. High stream temperatures are attributed to decreased effective stream shade levels due to lack of riparian vegetation. This leads to increased incident solar radiation on the water surface and therefore increased thermal loading. The elevated summertime stream temperatures attributable to anthropogenic causes in Nine Mile watershed result from the following conditions:

1. Channel widening (increased width to depth ratio) increases the stream surface area exposed to incident solar radiation
2. Lack of riparian vegetation reduces stream surface shading, riparian vegetation height and density
3. Reduced summertime base flows that result from instream withdrawals

Modeling Approach

A regression model was developed to predict in-stream temperature using an in-stream temperature metric (maximum weekly maximum) as the response variable and several geospatial predictor variables including stream slope, drainage area, elevation, and maximum summer air temperature. The resulting regression equation was applied to the NHD shapefile in ArcGIS which revealed a break point at the confluence of Argyle and Nine Mile Creeks. This area is referred to as Upper Nine Mile Creek (Figure 1).



Thermal loading modeling required additional inputs such as bankfull width, riparian canopy cover, and solar radiation. Channel widths and riparian shade were calculated using imagery data from Google Earth Pro. Solar radiation data originated from the solar radiation tool in ArcGIS 10.1.1.

The USGS SSTEMP model was used to validate the riparian shade targets required to meet the 20 °C in-stream temperature. Input requirements include

stream temperature, channel geometry, flows, vegetative shade, and weather information for single stream segments. The model predicts mean, minimum, and maximum water temperatures. All scenarios of the model were run for the month of July; the most critical month for elevated water temperature. Estimated maximum temperatures were predicted and compared from changes in total shade from “current” conditions to “expected” conditions based on the riparian shade targets for each reach. The SSTEMP model predicted remarkably similar to the regression model used to demarcate an attainable maximum water temperature.

Figure 1. Upper and Lower Nine Mile Creek Watersheds.

TMDL Recommendations

The TMDL target is to achieve in-stream temperature of 20° C which will require a 72% reduction in solar loading equating to a 36% increase in riparian shading. Since there are no permitted point sources, the necessary reduction in solar loading comes solely from nonpoint sources.

Implementation Strategy and Estimated Costs

In order to achieve the TMDL target and endpoints, it is necessary to implement a system of Best Management Practices (BMP) to protect the physical and biological integrity of Upper Nine Mile Creek with regard to nonpoint sources. Using the NRCS conservation practices as a guide, both structural and non-structural BMPs are identified. BMPs include increasing riparian vegetation, stabilizing streambanks, updating grazing practices, developing a beaver management strategy, and addressing runoff. This implementation strategy is estimated to cost \$681,000 and should take 16 years to complete. This TMDL report also includes the 9 Required Elements mandated by EPA for a watershed plan.

Public Involvement

- March 2014: Kickoff stakeholder meeting
- September 2015: Technical approach stakeholder meeting
- October 2015: Introduction to the Water Quality Board

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May – August 2016: Stakeholder Review of Draft TMDL

September 2016: Draft TMDL Report Stakeholder Meeting

Active Participants

Carbon County

Duchesne County

Bureau of Land Management

Nine Mile Coalition

EnerVest Company

Nutters Ranch

Utah Department of Agriculture and Food

Natural Resource Conservation District

The Upper Nine Mile Creek Temperature TMDL can be found here on UDWQ's webpage:

<http://www.deq.utah.gov/ProgramsServices/programs/water/watersheds/docs/2016/2016-09-09-nine-mile-temperature-tmdl.pdf>