Informed Polluters

A Comparison Between Pollutant Sources of Two Lakes and Resulting Remediation Strategies

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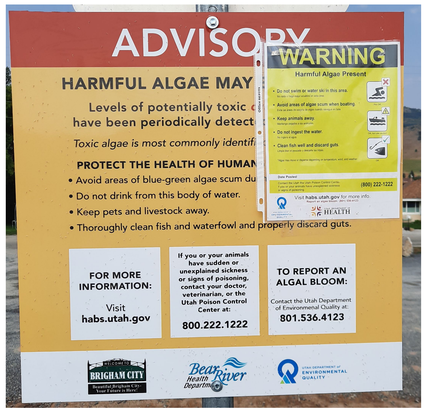
Background

Mantua Reservoir (Northern Utah) and Newman Lake (Eastern Washington) both experience high levels of nutrient inputs. These excess nutrients cause high microbial activity which lowers dissolved oxygen in the lake. Nutrients can also cause Harmful Algal Blooms, where cyanobacteria grow. These bacteria provide cyanotoxins, forcing lake closures during blooms.

Total Maximum Daily Load (TMDL) Studies performed by each state (2000 for Mantua and 2007 for Newman Lake) identify phosphorus as the limiting nutrient. These reports estimated nutrient loadings in the watershed (975 kg/yr in Mantua and 1480 kg/yr in Newman Lake) and made recommendations to help reduce loadings.

Newman Lake has an existing oxygenation device designed to encourage nutrient consumption, installed in 1992 that is not solving the problem.



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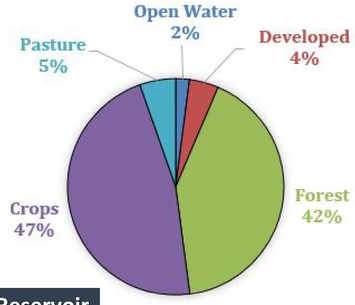
Nutrient Sources

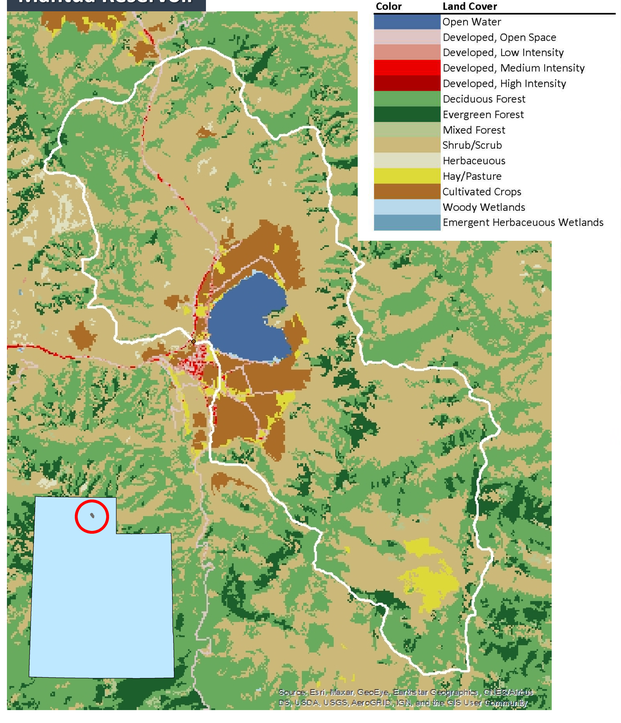
The phosphorus estimates above were found by assigning phosphorus export coefficients to the land cover values. An estimated 52% of Mantua Reservoir's phosphorus comes from agricultural land cover. Newman lake's phosphorus is 80 to 90% attributed to runoff from forest land. This estimation varies based on uncertainty in the nutrient loading from septic systems along the lake shore, which are not included in the previous estimation.

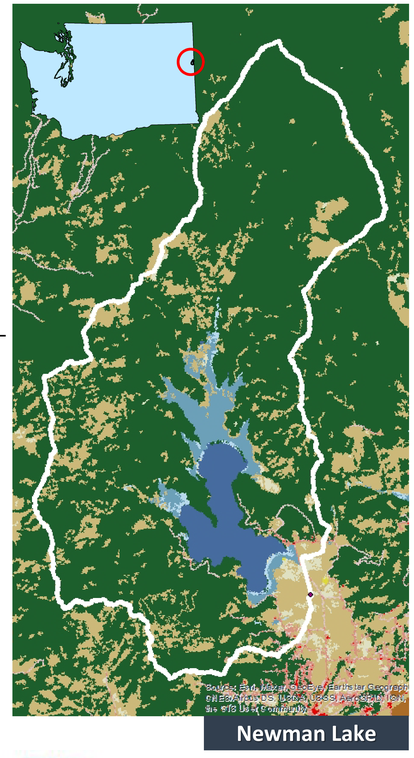
Newman Lake houses almost 500 homes within 1000 ft of the shore. These homes all have septic systems, but soil conditions provide poor treatment. As much as 555 kg of phosphorus is estimated to be released by these homes (based on occupancy rate assumptions), with soil providing limiting treatment (50% removal is assumed as a baseline, based on TMDL).

Mantua also contains one permitted point source, a fish hatchery. The hatchery has followed recommendations from the TMDL in 2000 but still contributes phosphorus as the permit is a general hatchery permit and not adjusted for the reservoir's condition.

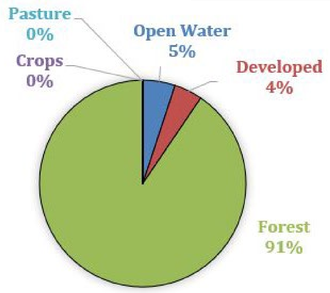


Mantua Reservoir





Newman Lake



Remediation

Nutrient Reduction is the preferred method of reducing nutrient loadings. If nutrients can be stopped or captured at the source, before entering waterways, the problem of excess nutrients is effectively eliminated.

For Mantua reservoir, management practices for agricultural land can be recommended. These often include:
- Keeping livestock away from waterways
- Applying fewer fertilizers
- Creating 'buffer' regions along streams to slow runoff

Newman Lake's watershed is almost entirely undeveloped forested land. There is no significant agriculture. Remediation efforts focused on forested land may also include management practices in building stream buffers and potentially phytoremediation. These will be more difficult to implement. Easier to target sources of nutrients are outlined in the table below, categorized on the scale with which to apply them.

Household-Specific	
Cleaning products and chemicals	This practice involves using cleaning chemicals without phosphates to reduce wastewater nutrients. It also entails properly disposing of unwanted chemicals instead of dumping them into septic systems.
Gray water diversion	Diverting gray water from showers and laundry units for use on the property effectively expands the treatment area and can reduce use of fertilizers.
System maintenance	Ensuring systems are properly maintained and pumped increases wastewater treatment efficiency.
Community-Supported	
Compost collection	Encouraging residences to compost food wastes and discourage garbage disposal use will reduce wastewater nutrients. This can be done by a communal collection or by each residence.
System upgrades	Upgrading septic systems to better treat wastewater will decrease nutrient releases to the waterbody.