

# Municipal Wastewater Treatment with BioHaven® Floating Treatment Wetlands

## Project Location: Big Sky, Montana, USA

This case study demonstrates the ability of BioHaven® floating treatment wetland (FTW) technology to improve municipal wastewater effluent quality. The goal of reducing the total nitrogen (TN) concentration by at least 10 percent was greatly exceeded during the first year of operation, even at the low temperatures experienced at this facility. A net TN removal rate due to islands of 0.94 lb/yr per cubic foot of island was calculated.

### Overview

Watershed Consulting of Missoula, Montana, a local distributor for Floating Island International (FII), installed BioHaven floating islands in Moonlight Basin wastewater retention Pond #2 in May 2016. This resort community is at a high elevation (7600 feet) and cold climate in southern Montana. The primary objective was to reduce the effluent TN concentration by at least 10 percent, which meant reducing the historical effluent concentration of 7-9 mg/L by about 1 mg/L.

Location	Big Sky, Montana, USA
Parameters Studied	Total nitrogen
Environment	Privately-owned wastewater retention pond
FTW Size	Area of 560 ft <sup>2</sup> (52 m <sup>2</sup> ), thickness of 8 inches (20 cm)
Water Source	Moonlight Basin Water & Sewer Public Water Supply
Installation Date	May 31, 2016
Flow Rate	Annual average of 20 gpm (4.5 m <sup>3</sup> /hr)
Water Body Depth	4-16 ft (1.2-5.0 m)
Water Body Area	90,000 ft <sup>2</sup> (8,400 m <sup>2</sup> ) at a depth of 8 ft (2.4 m)
% Coverage	0.6% of retention pond covered by BioHavens

This privately-owned wastewater system currently serves 271 residential units and three commercial facilities. The highest flows are during ski season (Dec.-March) and summer (June-August). Treated water accumulates in Pond #2 (total capacity = 12 MM gal) from September through June, and is all discharged via land application during July and August. Therefore, the pond level, volume and area vary substantially throughout the year. Floating islands tethered to the shore rise and fall with the water level.

Figure 1 shows the total nitrogen reduction achieved shortly after BioHaven installation in 2016, and Figure 2 shows the reduction compared to previous years. Water sampled was Pond 2 effluent.

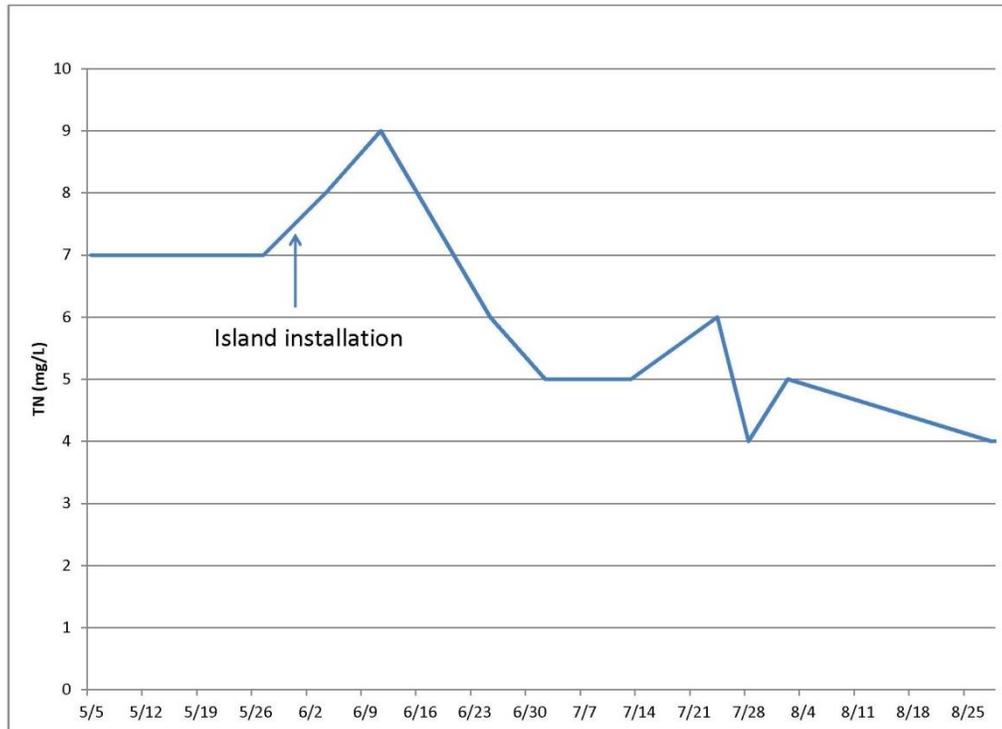


Figure 1. 2016 Total Nitrogen Results

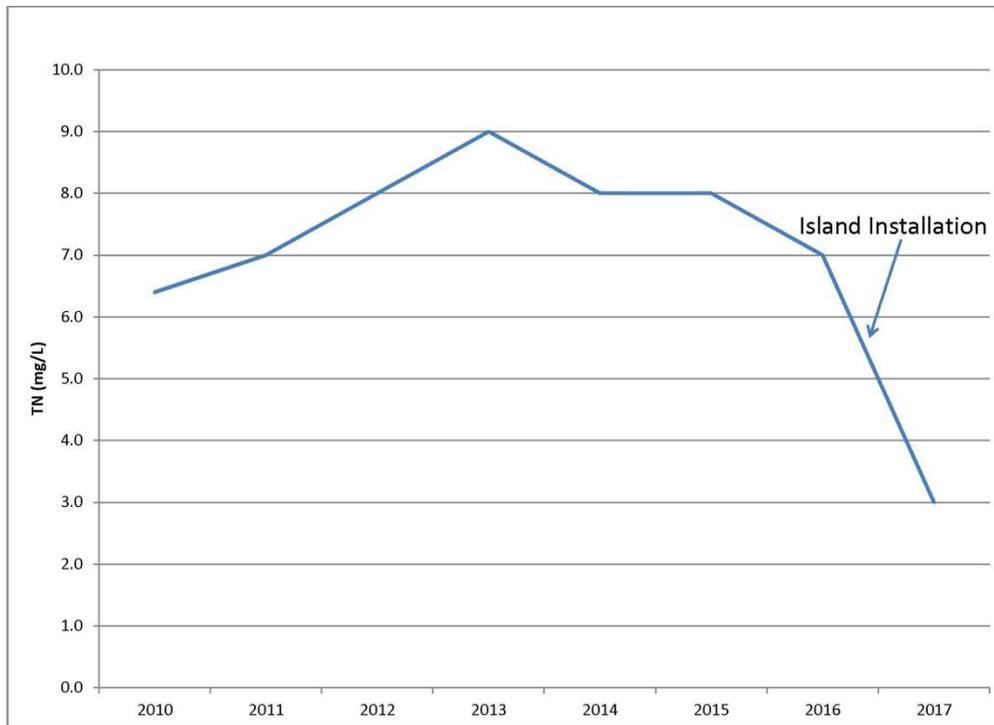


Figure 2. Annual May Sampling Results



BioHavens shortly after installation in late May 2016



BioHavens during pond ice-out in late April 2017

Although data are limited at this time, the TN reduction appears to be due to improved removal of both ammonia and nitrate. Islands also improved total phosphorus removal compared to the last sampling data from 2012.

## Conclusions

With a spring 2017 TN effluent concentration of 3 mg/L, floating island efficacy has far exceeded the owner's goal. In reducing the Pond 2 effluent TN from 7 mg/L (pre-installation in 2016) to 3 mg/L (post-installation in 2017), the BioHaven removal rate for TN is approximately 0.94 lb/yr per cubic foot of island. At an average water temperature of about 10°C during the treatment cycle, this rate and removal achievement pleasantly surprised both the owner and the FII team.

*The performance of the Floating Treatment Wetlands has far exceeded our expectations. Disposal of treated effluent for our utility has been nutrient-constrained, specifically nitrogen, and the reduction we've seen greatly improves our operating capacity. And we're proud to be applying considerably less nitrogen to the environment. We're excited to see what this technology can do for us in the future.*

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