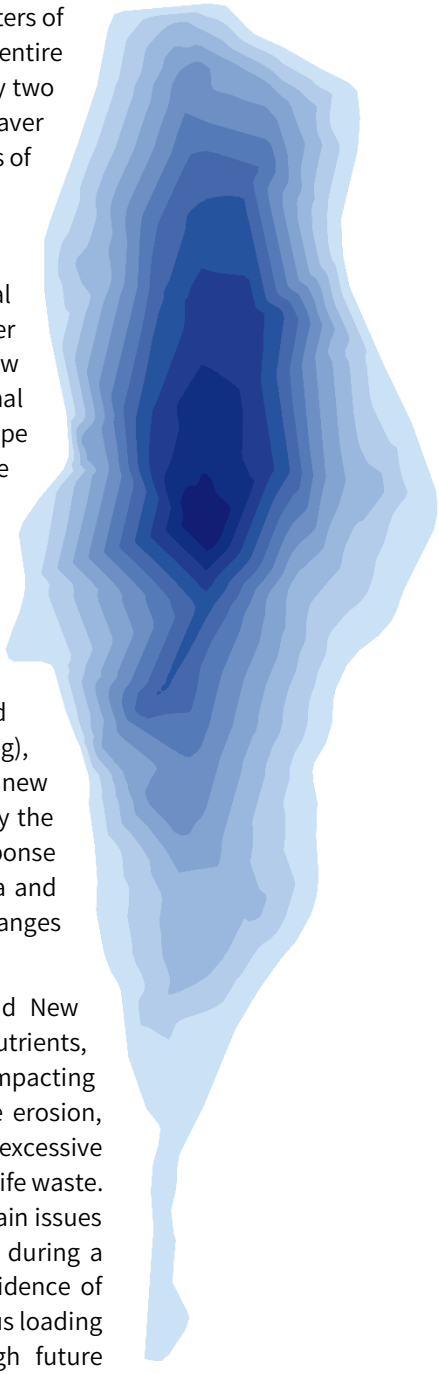
EXECUTIVE SUMMARY



Swanzey Lake is a 111-acre lake with a 874-acre watershed situated within the headwaters of the Connecticut River basin, which ultimately feeds into the Long Island Sound. The entire watershed and lake reside within the Town of Swanzey. Swanzey Lake is fed mainly by two small tributaries, one of which is part of a wetland-pond complex dammed by beaver activity. There are also several intermittent or seasonal streams connecting uphill areas of the watershed to Swanzey Lake.

The Problem

Swanzey Lake has historically experienced generally good water quality, with minimal cyanobacteria bloom history but with cautionary low dissolved oxygen levels in deeper parts of the lake. Development in the lake's watershed is primarily residential, with a few summer campgrounds. In recent years, many residences have converted from seasonal cottages to year-round homes. Paired with the steepness of the surrounding landscape and the increasing frequency of extreme storms, the impact of the watershed on lake water quality has become a major concern. In 2021, a beaver dam breach and record rainfall caused a considerable decline in lake water quality and triggered a cyanobacteria bloom alert (no sample) by the NHDES Harmful Algal Bloom (HAB) Program in mid-August of that year. Similarly, an extreme storm event in July 2023 overwhelmed existing stormwater infrastructure, washed out roads, and flushed tons of eroded sediment into Swanzey Lake. The lake's water quality response to this storm event has not yet been fully assessed. Preliminary data collected in 2023 showed a worsening of anoxia in the lake (and thus possibly internal phosphorus loading), suggesting that the extreme weather may have set the lake's water quality on a new trajectory towards more rapid degradation. Due to the scale of destruction caused by the July 2023 storm and the model limitations, we strongly recommend that the lake's response to the 2023 extreme weather be carefully monitored (especially the extent of anoxia and internal phosphorus loading) and the water quality goal be re-assessed if dramatic changes in lake response occur over the next several years.

Cyanobacteria blooms, which are becoming more common in Swanzey Lake and New Hampshire at large, are spurred by a combination of warming waters and excessive nutrients, in particular phosphorus, to surface waters. Sources of phosphorus in the watershed impacting the lake's water quality include stormwater runoff from developed areas, shoreline erosion, erosion from construction activities or other disturbed ground particularly along roads, excessive fertilizer application, failed or improperly functioning septic systems, and pet and wildlife waste. Thirty-nine (39) sites were identified in the watershed during a field survey, and the main issues found were unpaved road and ditch erosion. Additionally, 21 shorefront properties during a shoreline survey were identified as having some impact to water quality due to evidence of erosion and lack of vegetated buffer. The model results revealed changes in phosphorus loading and in-lake phosphorus concentrations over time from pre-development through future conditions, showing that the water quality of Swanzey Lake is threatened by current development activities in the watershed and will degrade further with continued development in the future, especially when compounded by the effects of ongoing climate change.

The Goal

The goal of the Swanzey Lake Watershed-Based Management Plan (WBMP) is to improve the water quality of Swanzey Lake such that it meets state water quality standards for the protection of aquatic life integrity and substantially reduces the likelihood of harmful cyanobacteria blooms in the lake. This goal will be achieved by accomplishing the following objectives:

OBJECTIVE 1: Reduce phosphorus loading from existing development in the watershed.

OBJECTIVE 2: Mitigate (prevent or offset) anticipated additional phosphorus loading from future development.

The Solution

As identified in the Town of Swanzey's 2022 Master Plan and due to concern over the threat of cyanobacteria blooms, the Swanzey Lake Protective Association (SLPA) initiated a campaign to better understand and protect the water quality of Swanzey Lake. SLPA partnered with the Southwest Region Planning Commission (SWRPC) to secure funding through the New Hampshire Department of Environmental Services (NHDES) to develop a WBMP for Swanzey Lake. As part of the development of the WBMP, FB Environmental Associates (FBE) completed a build-out analysis, land-use model, water quality and assimilative capacity analysis, septic system database development, shoreline survey, and watershed survey to identify and quantify the sources of phosphorus and other pollutants to the lake. Results from these analyses were used to determine recommended management strategies for the identified pollutant sources in the watershed. An Action Plan (Section 5) was developed in collaboration with the Swanzey Lake Work Group comprised of members of the SLPA and the Town of Swanzey (see Acknowledgements). The following actions were recommended to meet the established water quality goal and objectives for Swanzey Lake:

WATERSHED STRUCTURAL BMPS: Sources of phosphorus from watershed development should be addressed through installation of stormwater controls, stabilization techniques, buffer plantings, etc. for the following: stormwater infrastructure, the high priority sites (and the medium and low priority sites as opportunities arise) identified during the watershed survey, the medium impact shoreline properties identified during the shoreline survey, and any new or redevelopment projects in the watershed with high potential for soil erosion. Special focus by private landowners and the Town of Swanzey should be given to the highest ranked watershed survey sites, such as Talbot Hill Road, the Pilgrim Pines Campground, and the Richardson Town Beach, especially as efforts have already begun to pursue fully engineered designs for some of these locations. **We emphasize that the primary purpose of the WBMP is on water quality and not flood prevention or mitigation. The BMP recommendations are intended to help sites withstand moderate to large storm events but not necessarily extreme storm events, which can be so devastatingly intense that they typically overwhelm any infrastructure.**

MONITORING: A long-term water quality monitoring plan is critical to evaluate the effectiveness of implementation efforts over time. SLPA, in concert with the NHDES Volunteer Lake Assessment Program (VLAP), should continue the annual monitoring program and consider incorporating additional monitoring recommendations laid out in this plan. Additional data are also needed to better evaluate the contribution of internal phosphorus loading in the lake and the lake's response to the extreme weather events in July 2023.

EDUCATION AND OUTREACH: SLPA and other key watershed stakeholders should continue all aspects of their education and outreach strategies and consider developing new ones or improving existing ones to reach more watershed residents. Examples include creating a website to post information and providing educational materials to existing and new property owners, as well as renters, by distributing them at various locations and through a variety of means, such as websites, newsletters, social media, community events, or community gathering locations. Educational campaigns should include raising awareness of water quality concerns, septic system maintenance, fertilizer and pesticide use, pet waste disposal, waterfowl feeding, invasive aquatic species, boat pollution, shoreline buffer improvements, gravel road maintenance, and stormwater runoff controls.

OTHER ACTIONS: Additional strategies for reducing phosphorus loading to the lake include: revising local ordinances such as setting low impact development (LID) requirements on new construction; identifying and replacing malfunctioning septic systems; using best practices for road maintenance and other activities including municipal operations such as infrastructure cleaning; and conserving large or connective habitat corridor parcels. Future development should also be considered as a pollutant source and potential threat to water quality. Swanzey Lake is at risk for greater water quality degradation because of new development in the watershed unless climate change resiliency and LID strategies are incorporated into existing zoning standards.

The recommendations of this plan will be carried out largely by SLPA with assistance from a diverse stakeholder group, including representatives from the Town of Swanzey (e.g., board of selectman, planning boards), conservation commission, state and federal agencies or organizations, nonprofits, land trusts, schools and community groups, local business leaders, and private landowners. The cost of successfully implementing the plan is estimated at $1.3-$2.1 million over the next 10 or more years in addition to the dedication and commitment of volunteer time and support to manage plan implementation.

However, many costs are still unknown or were roughly estimated and should be updated as information becomes available. This financial investment can be accomplished through a variety of funding mechanisms via both state and federal grants, as well as commitments from the Town of Swanzey or donations from private residents. Of significant note, this plan meets the nine planning elements required by the EPA, and Swanzey Lake is now eligible for federal watershed assistance grants.

Important Notes

The success of this plan is dependent on the continued effort of volunteers and a strong and diverse stakeholder group that meets regularly to coordinate resources for implementation, review progress, and make any necessary adjustments to the plan to maintain relevant action items and interim milestones. It will be important for private landowners to understand that the burden of plan implementation rests on the entire community and not a single stakeholder (such as SLPA or the Town of Swanzey), just as it will be important for the Town of Swanzey to understand that Swanzey Lake is a valuable public resource that contributes to the annual tax revenue and that plan implementation cannot be successful without their ongoing participation. A reduction in nutrient loading is no easy task, and because there are many diffuse sources of phosphorus reaching surface waters in the watershed, it will require an integrated and adaptive approach across many different parts of the watershed community to be successful. The recommendations in this plan are idealized and, in some cases, may be difficult to achieve given the physical and political realities of the community dealing with old infrastructure, lack of access to key lakefront areas, and limited funding and volunteer or staff capacity.

Finally, we all have a common responsibility to protect our lakes for future generations to enjoy. Private landowners arguably hold the most power in making significant impact to restoring and maintaining excellent water quality in our lakes; however, engaging private landowners as a single stakeholder group can be difficult and outreach efforts often have limited reach, especially to those individuals who may require the most education and awareness of important water quality protection actions. SLPA will continue to engage the public as much as possible so that private individuals can help review and implement the recommendations of this plan and protect the water quality of Swanzey Lake long into the future.



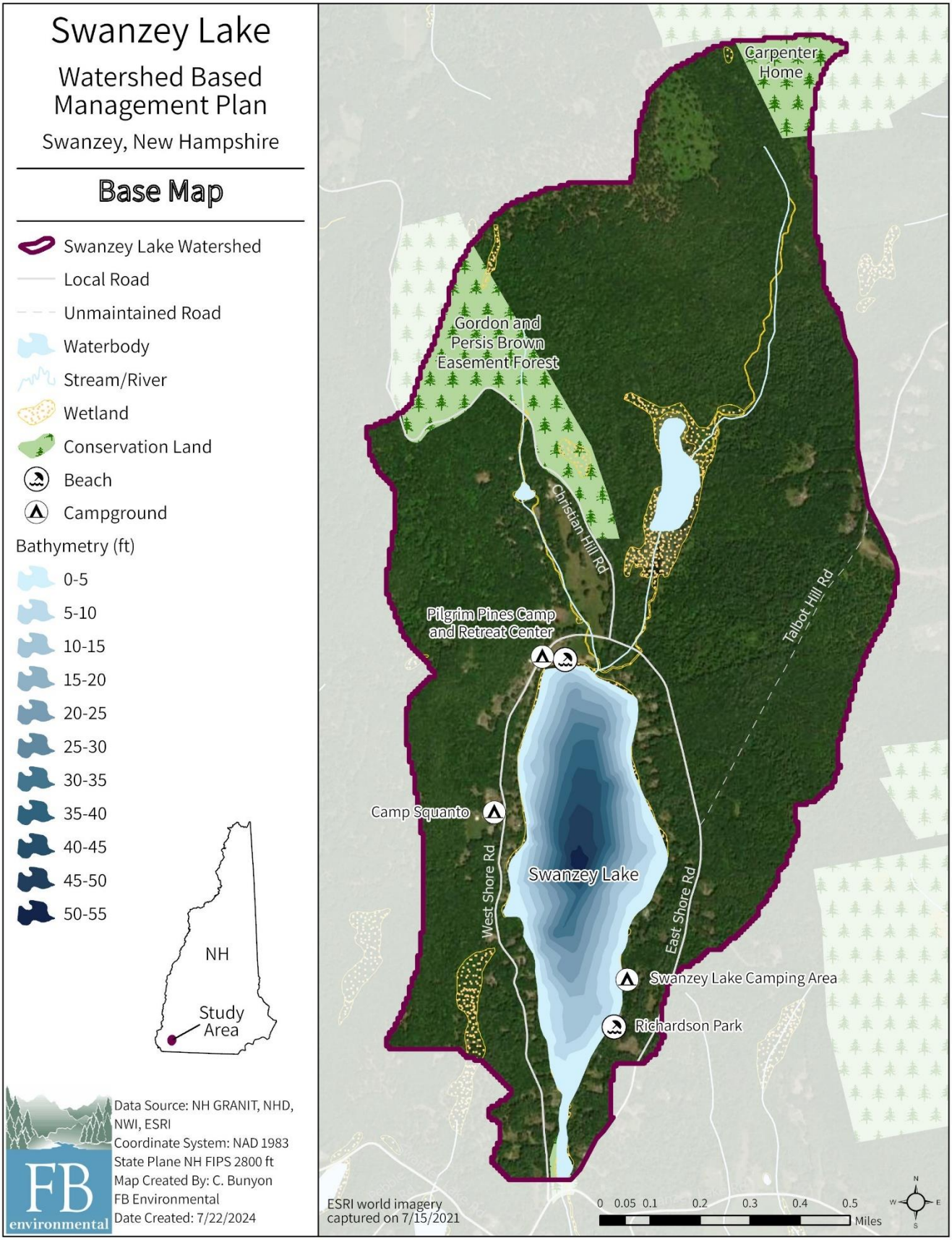


Figure 1. Swanzey Lake watershed.