SCIENTISTS IN PARKS
Fellows
2021 Project Descriptions

NPS UNIT: ZION NATIONAL PARK	PD #: 2021306

Project Title: Harmful Algal Blooms in the Virgin Wild and Scenic River, Zion National Park
Primary natural resource discipline: Physical Sciences
Project keywords: Water quality, algal blooms, cyanobacteria, aquatic ecosystems, watersheds, rivers
Location: Springdale, UT, Utah

COVID-19 NOTICE

As the COVID-19 pandemic continues to change and evolve, project timelines and structure remain flexible and it may be necessary to postpone start dates, begin work remotely, or reformulate the project's description. Should any development in the COVID-19 outbreak impair a project's timeline or results, the SIP Team will work with the park and project mentors to assess the situation and determine the best course of action at that time.

PROJECT DESCRIPTION AND WORK PRODUCTS

Position Description: Harmful algal blooms (HABs) are increasingly an environmental and public health concern in freshwater rivers and have significant economic costs as well. HABs are abundant algal growths that cause adverse environmental impacts such as toxin production, oxygen depletion (e.g., "dead zones"), aesthetic issues, and taste and odor concerns. Such blooms can cause disease or death in fish, wildlife, and pets, and present a risk to human health as well. Although many factors influence HAB formation, anthropogenic nutrient inputs and climate change are frequently key factors. Nationwide, HABs have been implicated in human and animal illness and death in at least 43 states. On July 7, 2020, the National Park Service (NPS) and the State of Utah issued a public health advisory for parts of the North Fork of the Virgin River, both within and outside Zion National Park, following the death of a dog due to exposure to cyanotoxins. Sampling revealed cyanotoxins at levels greatly exceeding the Utah Department of Water Quality and Utah Department of Health (DWQ/DOH) danger advisory threshold. The advisory warned the public to avoid contact with the waters of the North Fork of the Virgin River, which includes the popular area known as The Narrows, until further notice due to the presence of cyanotoxins. Zion National Park Service (NPS) and the Utah Division of Water Quality (DWQ) have been working to monitor cyanobacteria in the North Fork of the Virgin River since the HAB event in July 2020. However, little is known about how benthic cyanobacteria are distributed in river networks, or how environmental conditions affect their distribution. More frequent monitoring and sampling during the 2021 summer season will provide much needed information about the occurrence and ongoing risks from benthic cyanobacteria in the recreational waters of Zion National Park. The goal of this 2021 Scientists in Park (SIP) proposal is to implement a HAB monitoring program to detect and monitor benthic cyanobacteria and other water quality constituents over the 2021 summer season (12 weeks). The geographic focus of this project will be the Virgin Wild and Scenic River, which includes a total of 169.3 miles of the Virgin River and its tributaries, mostly located within Zion National Park. The SIP Intern will help with all aspects of the HAB water quality monitoring program during the summer of 2021. This includes calibrating equipment, preparing sampling materials and supplies, collecting samples in the field and shipping samples to a laboratory for analysis, and performing quality assurance and data management. The SIP Intern will also assist in data analysis and the development of figures, maps, and tables for reports.

The Ocean and Coastal Resources Branch (OCRB) has identified HABs as one of seven priority issues facing both marine and freshwater environments in the National Park Service (NPS) system. In order to improve NPS's capacity to detect and respond to HABs, and to safeguard drinking water, aquatic resources and recreational uses of water in parks, the OCRB has implemented a series of HAB-related pilot projects that include compiling information on existing HAB monitoring efforts, compiling species-specific guidelines on HAB risk (e.g., abundance or toxin concentrations), conducting pilot HAB testing and assessments in parks, developing rapid

assessment protocols, and developing HAB Best Management Practices or guidance. The focus of OCRB's efforts has primarily been coastal parks, however two river parks are included in the pilot HAB testing and assessment projects in 2021: the Buffalo National River and the St. Croix National Scenic Riverway. This 2021 SIP proposal seeks to expand the pilot HAB testing during the summer of 2021 to include the Virgin Wild and Scenic River in Zion National Park. The inclusion of the Virgin Wild and Scenic River as a pilot HAB testing location will help Zion National Park prepare for and address HAB sampling needs in the summer of 2021 and will expand the HAB pilot testing program to include more river parks. Zion National Park will benefit greatly from the expertise and experience of the community of practice that has been established for coastal parks. As a participant in this larger project, sampling protocols that are being used in other parks will be adapted to the Virgin River environment, water quality samples will be sent to the same laboratory for analysis, and results will be incorporated into a service-wide database. In addition, Zion National Park will have access to HAB toxin test kits and other supplies and assistance in the event of a HAB occurrence.

This position is offered through the National Park Service's Scientists in Parks Program in partnership with Ecological Society of America.

Work Products: The goal of this 2021 SIP project is to implement a pilot HAB testing project in Zion National Park during the summer of 2021. Project deliverables include 1) the establishment of baseline cyanotoxin levels in the Virgin Wild and Scenic River watershed, 2) a description of the spatial and temporal patterns of cyanotoxin levels over the course of the summer, and 3) a fact sheet (or similar public outreach/communication) that describes the HAB summer monitoring project on the Virgin River and its tributaries.

NATURAL & PHYSICAL WORK ENVIRONMENT

Zion National Park is located in southwestern Utah near the small town of Springdale, where the Colorado Plateau, Great Basin, and Mojave Desert provinces meet. Ranging in elevation from 3,666 ft. to 8,726 ft., the park encompasses a diverse population of plant and animal life. It is characterized by high plateaus, narrow, deep sandstone canyons, and striking rock towers and mesas. Zion Canyon is the largest and most visited canyon in the park. The North Fork of the Virgin River, one of several reaches of the nationally significant Virgin Wild and Scenic River, carves a spectacular gorge, with canyon walls rising 2,000 – 3,000 feet above the canyon floor. The location is remote. The work environment will include both office and field work. Accessing the river and its tributaries can be challenging and requires driving on rough roads and hiking long distances over rough terrain. Flash flooding in canyons can occur during and following summer thunderstorms. The summers are hot and dry, and winters are mild. Temperatures between May and October range from 70 to 105 degrees F during the day and 45 to 75 degrees F at night. Summer temperatures during the day in July and August are often over 100 degrees F. On the canyon rims and higher parts of the plateau, summer temperatures are more moderate. The park is a three hour drive north of Las Vegas, NV and 4 1/2 hours south of Salt Lake City, UT. Park headquarters and the housing areas are adjacent to the gateway community of Springdale (population 450) with groceries, gas, library, and clinic.

QUALIFICATIONS

Desired qualifications include the following: currently pursuing or recently completed a Master's degree in Environmental Sciences, Hydrology, Biology, Ecology or related fields with an understanding of basic water quality principles. Experience in water quality sampling methods, water chemistry and laboratory analysis. Working knowledge of Microsoft Excel and general computer skills. Strong oral and written communication skills, good organizational skills, and ability to work independently.

The applicant must be a U.S. citizen or U.S. National between the ages of 18 and 30 years old inclusive, or veterans up to age 35. Prior to starting this position, a government security background clearance will be required.

VEHICLE AND DRIVER LICENSE REQUIREMENTS

Applicant must have a valid drivers license and a good driving record. A personal vehicle is RECOMMENDED but not required for this position.
HOUSING
Park housing is available and will be provided at no cost to the participant. Housing consists of a room in a dorm or house, with shared bath and kitchen facilities. The SIP Intern will need to bring bedding and a small assortment of kitchen utensils and bath items. The number of roommates varies depending upon the actual housing assignment. Pets are not permitted.
INTERNSHIP START/END DATES
Start Date: 5/23/2021 Eleven weeks of the internship will be in the park. A mandatory Professional Development Workshop will be held in Washington, D.C. from August 1 – 5, 2021.