CITIZEN SCIENCE
TOOLKIT
LEAVE NO TRACE CENTER FOR OUTDOOR ETHICS

Leave No Trace™
Center for Outdoor Ethics | LNT.org

LEAVE NO TRACE
CITIZEN SCIENCE

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Citizen science is a popular movement that allows people from all walks of life to help advance scientific research and land management efforts by collecting and sharing data gathered in natural areas. Leave No Trace's citizen science program helps protect the natural world by building a community of people working together to monitor impacts caused by recreation.

The Leave No Trace Center for Outdoor Ethics has a long tradition of applying scientific research to support the protection of natural resources. Citizen science can help engage new audiences in support of data-driven decision making. Through a technology-based platform, Leave No Trace citizen scientists are able to observe and connect with natural areas while collecting pertinent information about impacts related to human activity.

The Center has developed this toolkit as a guide to implementing Leave No Trace citizen science programming in diverse natural areas. Groups interested in establishing their own citizen science programming are encouraged to seek consulting support from the Center. For questions or help with citizen science projects, use the Center's info@LNT.org email address and we will direct your inquiry to a staff member.

"Leave No Trace citizen science programming could be the perfect project to help us stretch the envelope of citizen involvement. I have been thinking about a project like this for many years, one that enlists the public in monitoring forests."

— Lisa McBride
National GIS Program Manager for the U.S. Forest Service

Online Resources

- To learn more about the Center's research-based approach to natural resource protection visit *LNT.org/research-resources*
- For the latest information about Leave No Trace's citizen science work, visit *LNT.org/our-work/citizen-science*
- The Center's technology partner for citizen science is a free-to-use, open-source website and app. Learn more by visiting *CitSci.org*

Impact Monitoring

Leave No Trace citizen science programs seek to accomplish two goals that are fundamental to natural area protection:

1

Inspire a lasting legacy of Leave No Trace ethics

2

Support land managers' data collection needs

This toolkit provides an outline to learn the methods and best practices of successful Leave No Trace-endorsed citizen science projects.

    How can a Leave No Trace citizen science project support land protection at your natural area? Keep reading for a hypothetical example demonstrating some of the many opportunities and potential outcomes of a Leave No Trace citizen science project.

Leave No Trace at Oceanview State Park

Oceanview State Park is a popular (though imaginary) destination just a few hours from a large metropolitan center. The two main beaches, North Beach and South Beach, attract roughly equal numbers of visitors each year for swimming, fishing and other oceanside activities.

Recently, the park staff noticed an uptick in recreation impacts related to surfcasting, a popular activity where visitors fish from the beach. Following busy weekends, staff have dealt with frequent incidents of discarded fishing line, bait buckets and other kinds of fishing equipment.

Oceanview resource managers, staff and community partners, seeking to address this issue, wondered: Could these recreation impacts be significantly reduced by installing new signs and other beachside messaging with fishing-specific guidance?

Working in partnership with the Friends of Oceanview Park, the park's resource managers and the Center for Outdoor Ethics, park staff designed a citizen science research project. On North Beach, new signs were installed featuring fishing-specific messages and images advising surfcasters on the importance of cleaning up their gear and the negative impacts caused by discarded fishing line. Site-specific Leave No Trace programming at North Beach further supported these messaging efforts. On South Beach, the existing signage — which was not specific to fishing impacts — was left in place.

The Friends of Oceanview Park recruited park visitors to participate in the planned citizen science monitoring effort. Over a six-month period, these volunteers regularly visited the North and South Beaches to observe and record impacts related to fishing. They used the CitSci.org app to collect information requested by park managers, including the amount of fishing gear left behind and related compliance issues. The goal of this data collection was to support the work of resource managers by supplying them with information on the efficacy of the installed activity-specific messaging.

At the conclusion of the six-month citizen science effort, Oceanview park staff, managers and the Friends of Oceanview Park gathered to review the data. The results were clear — impacts related to fishing on North Beach, where fishing-specific signs and Leave No Trace programming were implemented, were almost 60 percent less severe than the comparable impacts at South Beach. With the data in hand, park managers made a successful request to increase their budget to install and maintain signs and programming at both beaches. Better yet, nearby Sandy Point and Sea Spray State Parks have drawn on the citizen science data as well, supporting management decisions that are leading to even more reductions in recreation-related impacts.

Customizing Citizen Science Programs

Citizen science projects take many forms, from "BioBlitzes" that are designed to engage school children to rigorous research-grade data collection efforts undertaken by trained volunteers. Like the broader citizen science movement, Leave No Trace citizen science programs are each customized to a specific location in order to best meet its unique needs.

Whether a BioBlitz or highly coordinated effort, all Leave No Trace citizen science projects should aim to achieve the program's larger goals of inspiring a lasting legacy of Leave No Trace ethics and supporting land managers' data collection needs. To these ends, a successful Leave No Trace citizen science project should accomplish the following five objectives:

1
Engage visitors in experiences that connect them to nature
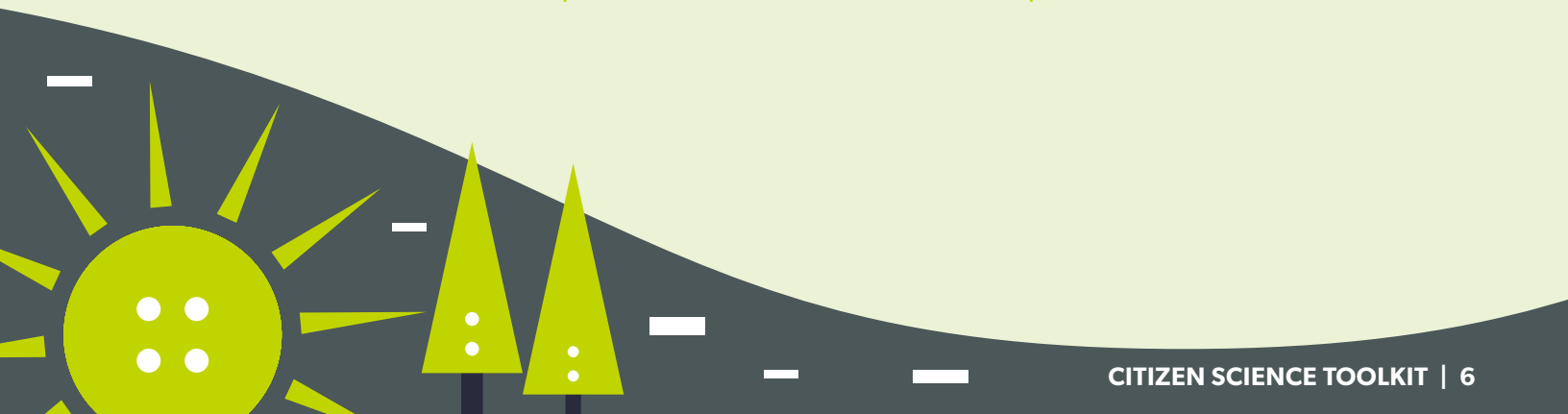
2
Facilitate the learning and practice of Leave No Trace ethics

3
Focus on monitoring impacts created by recreation

4
Support existing data collection efforts (if any exist)

5
Partner with resource management and/ or researchers in a collaborative fashion

In 2018, the Center launched its citizen science program with pilot projects in the Kasha-Katuwe Tent Rocks National Monument (New Mexico) and Maroon Bells-Snowmass Wilderness (Colorado). In both locations, citizen science programming reflected the specific needs and opportunities of each area while addressing the five objectives listed previously.

In Kasha-Katuwe, a National Monument managed by the Bureau of Land Management, recreational visitation experienced rapid growth. Monument staff was interested in learning how visitors experience the area and the types of recreation-related impacts they observed. Questions posed to citizen scientists supplemented the data currently being collected by the monument's staff. Participants noted conditions in a range of locations, from parking lots and trailheads to more remote locations.

At Maroon Bells-Snowmass, which is managed by the Forest Service, overnight visitation often exceeded the capacity of the designated campsites. The wilderness and recreation managers were interested in learning about recreational knowledge and attitude preferences of overnight backcountry visitors. Rangers distributed surveys to backpackers to collect data that supplements the biophysical and managerial condition monitoring data already being collected by seasonal field staff. The application of citizen science proved to be useful for learning how visitors plan their visit to wilderness areas and understanding what factors helped them select campsites in a high-use travel corridor.

Elements of a Successful Leave No Trace Citizen Science Project

A successful Leave No Trace citizen science project will leverage Leave No Trace programming to ensure a data collection approach that supports resource management. While there are many factors that will contribute to achieving this goal, the four topics below are likely to have a significant influence on the project's long-term success.

1

Identify relevant resource management concers

Data collected through the Leave No Trace citizen science program should support informed decision-making. Resource managers overseeing for recreation impacts are likely to be in need of information spanning diverse topics, from visitor impacts (e.g. trash counts, campsite conditions and indications of trail use) to natural conditions (e.g. bird counts and habitat assessments). Citizen science presents opportunities to support data collection across these topics.

For example, a natural area that struggles with people camping in places where it's not allowed might enlist citizen scientists to record information like location of campfire rings, trampling or other evidence of camping activities. Those data points might be augmented by including additional observations related to natural resources. For
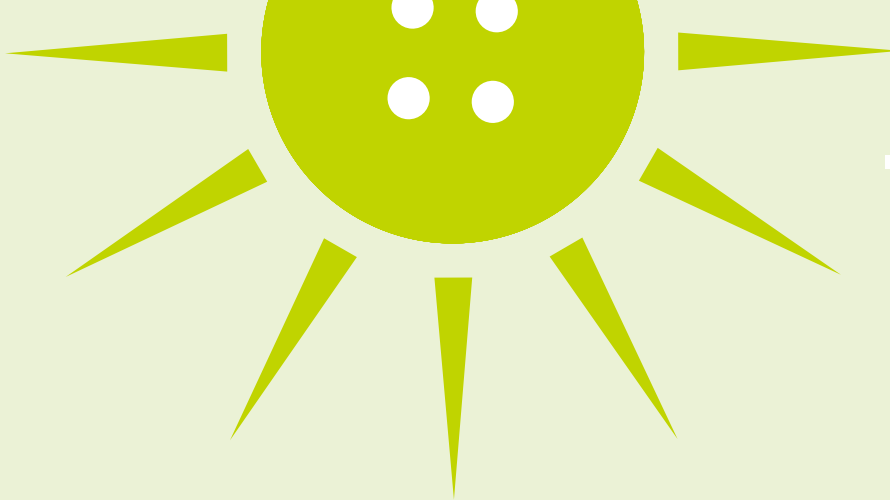
Elements of a Successful Leave No Trace Citizen Science Project *(continued)*

example, are trees being harmed by camping activities like firewood collection or improper disposal of waste?

Citizen science observations should be additive to existing data collection efforts. If, for example, a park is already collecting data on the location of new campfire rings after heavy holiday weekend visitation, a citizen science program could support those efforts by completing the same information-gathering methods conducted continuously throughout the season. In that way, citizen science helps increase the amount of data that the resource managers have to analyze, without creating new datasets that could be unrelated to the issues that the managers are most interested in studying.

The results of a needs assessment should be considered within the context of supporting resource managers' informed decision-making. Work with managers to understand how citizen science could fill identified data gaps to directly influence resource or recreation management decisions. Ask: How can citizen science address this resource or research question to meet the relevant needs of managers and the community?

As the name suggests, citizen science is completed by non-scientists. Citizen science programs need to be structured to be inclusive of the various levels of knowledge and experience of volunteers. A data collection protocol, and the language used within it, must be accessible and understandable so volunteers may successfully complete the data collection. If the natural area you are interested in receives large numbers of non-native English speakers, consider offering citizen science programming in other languages, and be mindful of using technical terms when simpler language could suffice.

2

Facilitate buy-in from stakeholders

Building and managing a successful citizen science project will involve the coordinated effort of many stakeholders, from those implementing and managing the program, to resource managers, staff members and community volunteers. Stakeholders will be invested in the success of the project, and they will likely have specific goals they are hoping to achieve through the program.

Citizen science project leaders should strive to engage relevant individuals and groups in project conception to help facilitate this investment and ensure such goals are met. Ask: Which individuals or organizations will be involved in completing the project? What are required or appropriate ways to engage them in building and managing the program? How will volunteers learn about the outcomes of the data collection efforts?

Elements of a Successful Leave No Trace Citizen Science Project *(continued)*

It is particularly important to work closely with resource managers as these stakeholders will be implementing management decisions based on the data collected. Early on, be sure to understand their expectations or standards on topics such as data quality to ensure they can use the collected data in their work. For example, in a given park a manager may require a minimum number of samples collected or a minimum number of sampling periods in order to use the data to support management. It's good to know these kinds of expectations from the get-go so the collected data can be used as intended.

Work with stakeholders to understand if there are restrictions on collecting specific data and/or what authorizations will be required to complete the data collection. For example, establishing a data collection program in a sensitive wildlife area may require adhering to strict rules that will need to be communicated to volunteers before they collect data.

Implement straightforward strategies and logistics for staff who will be supporting the program. Consider training staff on the project and their specific roles and responsibilities. Work with staff to ensure project logistics (e.g. handing out and collecting paper data sheets) are possible within the context and constraints of existing programming and capacity.

3

Lay a foundation for long-term impact monitoring

For data collection to most effectively contribute to natural area protection, a Leave No Trace citizen science program is best undertaken over a long-term time frame — typically several months at a minimum. Monitoring recreation impacts often requires commitment to a multi-season project as data must be collected over longer time frames to reveal trends and responses to mitigation efforts. Keeping the long game in mind when building a Leave No Trace citizen science project gives context to guide decision-making for data collection and program management.

Along these lines, set realistic goals for the first season of data collection and consider various levels of success from engaging visitors in a meaningful outdoor experience (which can occur in a single day) to collecting data that informs management decisions (which may require pulling off a multi-year project). Long term projects require long-term investments in people and place. In the short term, look for small yet valuable wins like providing visitors new opportunities to connect with and support your natural area.

That said, short-term data collection efforts through Leave No Trace citizen science can be very valuable, and may set the stage for longer-term efforts.

4

Evaluate project results and inform volunteers

It is important to devise metrics that evaluate the success of each Leave No Trace citizen science project over time. Include metrics related to participant impacts (knowledge, skills, attitudes, behaviors) as well as resource improvements. Finally, once the data has been interpreted by researchers, or has been put to use by land managers to inform decisions, project leaders should be sure to share those outcomes with volunteers to the greatest extent possible.

Elements of a Successful Leave No Trace Citizen Science Project *(summary)*

1

Identify relevant resource management concers

2

Facilitate buy-in from stakeholders

3

Lay a foundation for long-term impact monitoring

4

Evaluate project results and inform volunteers

DATA COLLECTION
and an Introduction to
CITSCI.ORG

The Leave No Trace citizen science program provides participating locations with a robust, technology-based citizen science platform for data collection. CitSci.org is an open source, free-to-use service, for building citizen science projects.

Through CtiSci's platform, participating locations can offer volunteers a smartphone app option for data collection. Think of the app like a paper datasheet: fully customizable to provide instruction and guide the volunteer through protocols while also serving as the form for recording collected data. On CitSci.org, project managers can easily view, manage, manipulate and analyze the data collected.

To build your customized data collection platform, start on CitSci.org's homepage. First "Sign Up" to create an account, then select "Create a Project." CitSci will then guide you through the few required simple steps to establish your project.

One important consideration for using the CitSci app for data collection is the accessibility of cell service or WiFi at your location. While the app can be used offline, volunteers will need cell service and/or access of WiFi to download the app, create an account, join projects and select datasheets for use offline. Volunteers may require a paper datasheet if they are unable to download the app or if they don't have access to a smartphone. Plus, it's always a good idea to have paper data sheets on hand as a backup.

TIP:
Check out CitSci's library of webinars for helpful information as you build and manage your Leave No Trace citizen science project.

ENGAGING
Citizen Science
VOLUNTEERS

Leave No Trace's citizen science program leverages a location's site-specific programming, education, outreach and community building efforts to increase capacity for the area's managers while offering a meaningful experience for visitors to connect with the land in contribution to the area's long-term protection. Through this experience, visitors should leave with increased awareness of best Leave No Trace practices, a glimpse into the kinds of information used by recreation planners that influence site capacity determination, and an investment in decision-making outcomes. Consequently, thoughtful volunteer engagement is a critical component to achieving program goals.

One particularly important step in volunteer engagement is related to communication, specifically communicating the purpose and value of the volunteer's work. This messaging should occur both in recruiting (e.g. "Will you join us as a volunteer to help protect the precious resources of this park?") and throughout the volunteer's engagement (e.g. "How was your experience collecting this data and are you confident that it will be put to good use?"). Ultimately, this helps to connect the visitor with the goal, initially providing the visitor with a reason to participate, then giving meaning and depth to the experience that may leave the visitor with a lasting investment in the area's long-term protection.

Working with volunteers on any citizen science project presents both opportunities and challenges. One challenge can be navigating privacy when working with youth participants. We recommend working with your human resource colleagues for advice on ensuring legal compliance with youth participants. Depending on the research or resource question your visitors will be investigating, another possible challenge may be managing the sensitivities of asking volunteers to monitor human-caused impacts.

Consider how volunteers monitoring human-caused impacts may interact with other visitors who are not participating in the project in positive or negative ways. For example, citizen scientists tasked with recording off-trail hiking could be confronted with a fellow visitor who is upset, feeling they are being watched or monitored. Instruct volunteers to focus on recording impacts to natural areas without determining who is causing the impacts, and ask them to share this approach with anyone who feels concerned.

When nine out of ten people in the outdoors are uninformed about their impacts, thoughtfully engaging citizen science volunteers presents profound opportunities for ensuring long-term protection for natural areas. Leave No Trace citizen science programming can help you implement a customized impact-monitoring project to inspire a lasting legacy of resource protection in visitors, staff and community partners at your location.

"Monitoring natural areas through citizen science gives individuals and communities the opportunity to expand their stewardship of places that they care about deeply."

— **Dana Watts**
Executive Director, Leave No Trace Center for Outdoor Ethics

Sponsors of Leave No Trace citizen science include:

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