



Conservation Technology Club DIY Kit



Note from the Conservation X Labs Team

Conservation successes thus far are incremental, while conservation problems are increasing exponentially. Exponential technologies, open innovation, and a for-profit entrepreneurship financial model can help scale and provide resources for exponential technologies and emerging science, but they have not yet been harnessed in the conservation field.

Enter conservation technology!

Conservation technology brings together people from all walks of life to solve problems related to - you guessed it - conservation. Conservation technology is a blanket term that covers fields ranging from computer vision to mammalogy, and everyone can participate. Coming up with innovative ways to conserve many of the aspects of the planet we live on is no small matter, which means that this needs to be no small movement. With your participation and help, we can improve conservation efforts in response to human induced extinction.

This guide outlines how to set up and run a Conservation Technology Club on your campus or community.

We want to inspire people who dare to disrupt conservation to improve it, who have dared mighty things by trying a path others have not chosen, and who have learned from failure and risk. If you like to experiment, make things, hack things, test things, and break things, this guide is for you!

Welcome to the Tribe.

Dare Mighty Things,

Your fellow conservation aficionados at CXL

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Bringing Conservation Technology to Life

What are some of the biggest challenges the world faces?

Most scientists today are in agreement that we are in the midst of a geological age induced by human activity - the Anthropocene. This epoch brings with it threats, including but not limited to:

- Pollution
- Species overexploitation
- Climate change
- Habitat loss and degradation

These themes are broad enough to allow many smaller problems to fall under their range, and are intrinsically linked to one another by virtue of being unnatural inhibitors to the health of this planet and its inhabitants.

What are some problems conservation technology as a field is aiming to fix?

- All of them! There is a lot of opportunity and room for creativity to help solve some of the greatest grand challenges of conservation.

Why is it necessary to bring technology into conservation?

- There are no silver bullet-like solutions for complex conservation problems. Complex problems need multidisciplinary teams to come up with effective and scalable solutions. Conservation technology aims to normalize and institutionalize collaborations between conservation scientists and experts from technological fields like engineering and computer programming.

- Technology is at the forefront of every effort to solve the most challenging problems the world faces today. Because conservation technology as a field works to solve these problems, technology is a necessary tool that opens the door to types of solutions never seen before in the field.
- As students interested in conservation technology, you have the opportunity to contribute to and make breakthroughs that could revolutionize the field or eradicate a problem in its entirety.

How can technology be integrated into conservation?

- Here are examples of conservation technology being implemented:
 - [In the sky](#)
 - [On the land](#)
 - [In the sea](#)

How to get started

Define Your Mission

Coming up with a mission statement can be helpful not only for communicating to external people what your goals are, but also to help define tasks and projects within your organization. To shape a clear, focused mission for your organization, here are some questions to ask yourself:

- What is our goal?
- How do we achieve it?
- What is our motivation?
- Who or what are we helping?

Form Partnerships

Assembling like-minded people can lend your organization the support it needs to achieve its mission. Consider talking to the following groups of people:

- Students - Whether they be your friends, classmates, or strangers, having students join your conservation technology student group is essential, for (hopefully!) obvious reasons.
- Professors - Having the advice and/or support of a professor can be an extremely useful resource because of the knowledge they have about their fields. They might also provide access to lab space, field sites, or makerspaces.
- Advisors (academic, career, etc) - These folks get to meet everyone, and so they may be able to connect you with like-minded people, or people who can offer expertise in one or more areas.
- Alumni - Alumni of your school may have valuable connections and experience that you can leverage to get resources for your club you otherwise would have missed out on. For example, alumni could connect students with internships relevant to your club, help fundraise, or be an invited as a speaker or mentor for your members and projects.
- Sponsors/Mentors - Having an external sponsor or mentor can prove invaluable to a club by connecting you to vital resources. Some sponsors or mentors may be able to give you ideas and/or funding for a project, or they could advise a team on questions about how to proceed.
- Makerspaces/Hackerspaces - A number of campuses and communities have makerspaces and hackerspaces where makers gather and share equipment.

Consult your Organization Checklist

Here's a checklist of things your organization will need. These aren't necessarily in order - all organizations evolve differently.

- Interested students and relevant roles for participants
- Professor/faculty member/staff member willing to serve as a mentor
- Funding
- Projects and activities
- Officers

Troubleshooting Sheet

Invariably, situations that you will have to troubleshoot will arise within your organization. Thankfully, you don't have to tackle them alone! Here are some ideas.

Club leadership and organization

Organize the club so that there is a core leadership team of officers to handle most of the logistics. The leadership should not be allowed to become swamped - as projects and events arise, draw on the membership to take charge and form subcommittees or task groups to work on different aspects of projects and events. Ownership of a project tends to motivate people to devote time and energy to see it to completion.

Communication is key

To ensure progress, it is necessary for the officers to communicate regularly with each other and with the rest of the club's participants. The leadership team should schedule regular meetings and add supplementary meetings as needed. Establish an online site and/or listserv to post announcements and other relevant information so that the membership can stay informed and up to date.

Recruiting and retaining members

Don't be afraid to reach out - ask people from different departments and majors if they are interested in joining the club, and if they are, ask them to advertise in their department. Stop by the administrative desks in different departments and buildings and ask them to send an email on your organization's behalf. Value organization members and make sure the organization stays dynamic, with enough projects and tasks for everybody to be actively interested in. Encourage members to come up with their own

ideas and take them seriously, let everyone lead projects or at least be given more responsibility from time to time.

Here are some examples of different activities and how multiple club members, beyond the officers, can become and stay engaged.

- *An outreach event:* Someone besides one of the officers takes the lead on making sure everybody and everything gets to the event, and in so doing becomes the outreach-er in chief, if only temporarily.
- *Building something for a project:* Someone with technical expertise leads the project and someone who wants to learn about that aspect of technical stuff helps them. That way you have two things: a buddy system, so nobody is soldering things alone in the middle of the night, and an unofficial training session of sorts, so if the project leader isn't present someone else learns the skill set and can pass it on. This is a good way to pick up skills that otherwise would not be taught to certain people (for example, teaching basic circuit design to an environmental science/business double major!)
- *A competition:* Each subdivision of people working on the project for a competition should focus on something distinct to make the best use of time. That being said, don't discourage conversations and idea exchange between teams!
- *Learning:* Encourage an atmosphere and culture where everyone teaches and learns from each other. This create a more welcoming environment that encourages new people to sign up, and levels the playing field by distributing responsibilities.
- *Networking:* Organize networking events with other campus groups and make contacts with people to explore other opportunities for your organization. Outside of other campus groups, find opportunities to leverage the experiences of members - someone may have worked or volunteered somewhere that could be helpful for your organization. For example, if you recently recruited someone who has experience installing green walls, see if you can work with that person to set

- up a green wall installation event for the entire organization. (You get to be around plants!) Another example is if someone interned somewhere that has an environmental focus, see if that organization is open to hiring more students.
- Resource Page: Whether it be relevant articles, a connections database, or project archives, this will be a good documentation area for current members to take full advantage of the organization. It can also serve as a recruitment tool - if people who want to join the club are worried that they lack relevant knowledge, pointing them to the resources page may change their minds.
 - Workspace: Try to get a permanent or semi-permanent space so your group has a work/meeting/learning space. Some groups will be more technically focused and require a laboratory or makerspace setting for every group's meetings. Others will only require a lab or makerspace periodically or not at all, so keep your individual organization's needs in mind.
 - Time: Everybody in a student organization is first and foremost a student - school can and should come before the organization. Breaking the organization up into subcommittees would help ease the burden for students, because everyone has their own set of tasks and responsibilities.
 - Funding: Applying for grants in order to make sure you can obtain the resources for all the projects you want to complete is extremely important. See the Financial resources section later in this guide for more ideas.
 - Leverage class requirements and club projects: Courses may require that students complete group or individual projects for credit. View these assignments as opportunities to expand on or adapt ideas or projects that you are already working on in the club.
 - External advisory board and/or project mentor: Having these for all/most projects and tasks can also be helpful, mostly in terms of resources. An external mentor can provide you with technical expertise that you would otherwise have lacked, and can point you in the right direction. They can also be a source of funding, of ideas, and of motivation, and possibly future opportunities for internships and/or jobs for members and alumni.

Financial Resources

External Grant Resources:

- [The Natural Resources Conservation Service offers Conservation Innovation Grants.](#)
- [The Society for Conservation Biology provides a list of resources related to grantwriting and a list of searchable databases.](#)
- [The National Geographic Society offers funding opportunities to transformative projects.](#)

University funding: Many universities provide some form of campus funding resources. Check with your school to see how they can help finance your projects and activities.

External mentors/sponsors: Seeking funded projects with external sponsors is a great way to expand your organization out of the scope of your university alone. Contact local conservation or environmental companies and labs in your area, and reach out to organizations within your community's network to look for funded opportunities.

Fundraisers: Another way to both ensure financial resources and engage with the local community is by having a fundraiser. Fundraising is one thing most student organizations have in common, and there are many different approaches and venues in which they can take place. Some common examples include:

- Food sales - one of the most tried-and-true forms of fundraising for student organizations. Think about how you could make a conservation technology-themed food sale!
- Restaurant fundraisers - many restaurants are willing to give some of their profits to an organization through a fundraiser held at their location. Speak with local eateries in your area to see if any would be willing to host your organization.
- Recycling - Possibly one of the best ideas for fundraising that exists. It is possible to get paid to recycle by collecting the following items:

- Ink Cartridges - [Recycle place](#) collects ink cartridges, and once you register your organization, they can provide you with guidelines.
- [Terracycle](#) allows you to send them your waste and receive credits, which can then be redeemed for monetary rewards. While an individual contribution won't pack much of a punch, getting an entire organization or class to participate will allow the compensation to add up quickly.
- Crowdfunding sites are another way to get projects funded, especially if you have a distinct mission.
- Reach out to the community on the Digital Makerspace for more ideas!

Ideation and Hacking

Ideation for Conservation Technology

Start by thinking about the conservation problem you want to use technology to solve. Ideation for conservation technology should strive to bring together knowledge from multiple fields and apply that knowledge to solving conservation problems in nontraditional ways. Focus on implementing ideas outside of their comfort zone - ask yourself questions like "How can laser research be applied to the rainforest?" or "is there a way I can identify unknown species in the field using something that has been 3D printed?" Use your thoughts to create a need statement, which is a statement that defines what problem you are solving.

Hacking for Conservation Technology

Make sure you have a need statement before you begin hacking anything! Here are some general guidelines for hacking/having a hackathon in the conservation technology space:

- *Strengthen the hacking community.* Make sure that people from different fields meet each other so there can be an exchange of ideas.

- *Don't let competition get in the way of ideation.* Sometimes ideas that cannot be implemented in a short amount of time can still prove to be extremely valuable. Give people time and space to work on some of these ideas outside of a hackathon setting.
- *Be welcoming to newcomers.* Conservation technology is not only a new field, it is a vital field to the fate of the planet and its inhabitants, and so can use as many members as possible. Make people new to the field feel welcome by reiterating that hackathons are an opportunity to learn.
- *Provide learning opportunities.* Don't hesitate to involve people because they lack the skills and knowledge necessary to make projects a reality, teach them! New participants might need some guidance on how to get started with a project and what to work on - pairing them with a more experienced mentor can be helpful.

Organizational Resources sheet

Time is an extremely important resource - remember that as a student organization in a university, classes are the first priority. Keep this in mind and schedule far in advance. Other than time, here are some valuable resources related to event planning, conservation, and technology.

Resources for Organizing Events: Event organizers have to consider everything from user experience to deliverables. Here are some resources to help figure out how to put together an outreach event, a game night, a hackathon, or any other organization-wide event:

- <https://hackathon.guide/>
- Make for the Planet in a Box

Technical Resources: There are many resources available for rapid prototyping, including but not limited to:

- [3D printing](#)
- [Computers/microcontrollers](#)

- [Sensors](#)
- Circuit materials, [conventional](#) or [otherwise](#)

Conservation Resources: To get a better understanding of the conservation technology landscape, here are some websites to check out:

- <https://www.wildlabs.net/>
- <https://www.worldwildlife.org/>
- Stories on the Digital Makerspace

Conservation Tech Examples: Inspiration for conservation!

- Digital makerspace stories and cool projects (like the camera trap challenge!)
- <https://www.youtube.com/watch?v=rwV0RgmE5WA>
- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4623870/>

The Conservation X Labs Digital Makerspace Platform is a valuable resource for conservation technology projects. It allows you to participate in projects and have discussions and get ideas and expertise in everything from hardware prototyping to molecular biology and optical physics. Do you want to start your own chapter but aren't in a university? The Digital Makerspace is open to you! This document is hosted on the wiki on the DMS, you are encouraged to update and contribute to it as well as participate in discussions and projects on the digital makerspace.

So You're Not a Scientist or Engineer - What Can You Do?

Conservation technology is a relatively new field, so not many people are aware of what it entails or how it works. Expertise is needed from a variety of fields, including, but not limited to:

- Photography/Filmmaking

- Archaeology
- Anthropology
- History
- Visual art
- Language
- Journalism/Communications
- Music
- Education
- Business/Finance

Unique perspectives are necessary to solve conservation problems. If you are not a STEM student or professional, you do not have to pre-define a role for yourself - offer your skillset to conservation challenges that you are interested in and see what's possible. To get some ideas of how non-scientific fields can contribute to conservation and the world's most pressing problems, check out [National Geographic's emerging explorer list](#).