



Introduction: Tackling the Environmental Challenges of the 21st Century

Our planet is changing rapidly, and we are seeing the impacts of human behavior and consumption on every corner of the globe. We are facing an *extinction crisis*, with 1 million species at risk of extinction (many of them within decades) unless action is taken to reverse the course that human activities have set (IPBES, [2019](#)). At the same time, new technologies and approaches have emerged that allow us to tackle these problems in revolutionary ways.

In this module, we gain an overview of what is driving the climate and extinction crises. We will explore the grand challenges of conservation -- the most difficult yet crucial problems in the space, which require coordinated action and innovative thinking -- as well as what we know so far about what works (or doesn't) in this field.

In order to begin tackling these complex environmental problems, we will apply tools that help us understand the *systems* around the problems. More than simply understanding the technical drivers of the problem, we need to understand the human and social factors involved, so that we have the foundations to create just and equitable solutions. This contextualized understanding helps us identify *leverage points* in the system -- places where we can design interventions that drive deep and lasting positive change.

By completing this module, you will:

1. Identify the drivers of complex environmental problems;
2. Define an environmental challenge to focus your efforts;
3. Analyze the system around a complex problem to gain insights and understand the role of human actors -- both how they influence the system and how the system influences them; and



4. Identify leverage points for change in the system around the problem, in order to start planning an intervention.

LESSON 1

[Understanding the Challenges We Face](#)

What are the drivers of the extinction crisis, and how severe are these problems?

LESSON 2

[Analyzing Complex Environmental Problems](#)

How do we understand complex environmental problems and figure out where to start in designing solutions?

Tags: Problem Mapping, Problem Analysis, Systems Thinking, Leverage Point, Environmental Challenges, Extinction Crisis

The materials in this module can be downloaded [here](#), and guidance on how to use this toolkit is [here](#).

Lesson 1

Understanding the Challenges We Face

What are the drivers of the extinction crisis, and how severe are these problems?

This introductory content sets the stage for why the problems we face are so urgent, and why it's not an option to use only the tools and approaches that have been traditionally used in environmental conservation. An overview of the drivers of environmental problems will give you a sense of the different problems and opportunities you might engage in, and set you up to select a topic to work on.

By completing this lesson, you will:

- Draw connections between the drivers of the extinction crisis and areas of opportunity to design just and equitable solutions;
- Identify your attitudes towards conservation, and explore how they might be different from others', in order to be a more self-aware collaborator and leader; and
- Define an environmental challenge that you'll focus on throughout this course, as well as the desired impact you aim to have by addressing it.

Pre-Reading

We'll start by framing the problems we face: what challenges are conservationists trying to address, and how serious are these problems?

- World Wide Fund (WWF) for Nature's [Living Planet Report](#) Chapter 2 (pages 52-72) offers a comprehensive review of the environmental crisis, highlighting the challenges, their causes, and potential solutions. WWF's Living Planet Index tracks biodiversity around the globe and helps to paint a picture of the environmental crisis.
- [A 2021 Horizon Scan of Emerging Global Biological Conservation Issues](#) summarizes innovative and emerging technologies, systems, and industries that might impact conservation, positively and/or negatively.

Consider some proposed approaches to addressing these problems, and nuanced considerations as we apply them:

- [Mongabay: What Works in Conservation?](#) (and the linked [Conservation Effectiveness site](#)) shares some themes of what makes conservation projects succeed, as well as failures that we can learn from.
- [Take Action for the Sustainable Development Goals](#) (SDGs) introduces the SDGs: 17 actionable

areas where all countries can seek to make improvements to tackle the intersectional issues of climate change, conservation, poverty, inequality, education, health, and economic growth.

As we start to explore the systems driving environmental problems, it's crucial to consider questions of equality and environmental justice:

- [Environmental justice and the SDGs: from synergies to gaps and contradictions](#) explores how the SDGs failed to explicitly address issues of environmental justice, and focused on goals such as economic growth when they should have included other measures of success more in-tune with people's needs.
- [Implicit gender, racial biases may hinder effectiveness of conservation science, experts warn](#) and [I'm a black climate expert. Racism derails our efforts to save the planet](#) encourage us to consider how racism impacts our response to the climate and extinction crises. In order to effectively address environmental issues, we need to recognize the intersections of race and climate, and prioritize diverse voices and perspectives to build just, equitable solutions.

At the end of this lesson, you'll be asked to choose a challenge to work on throughout the course. Review [this problem bank](#) for inspiration, and to get a sense of how you might frame your chosen challenge.

Lesson Content

INTRODUCTORY POLL

[Poll: Our Biggest Environmental Challenges](#)

This class poll will help you move beyond a superficial understanding of the extinction crisis, and underscore just how urgent the issues are. For a deeper understanding of these problems, there are further resources in the [Explore More](#) section.

VIDEO

[Introduction: The Challenges We Face](#)

In this video, Conservation X Labs CEO Alex Dehgan introduces why we're here: conservation, as we know it, is not succeeding fast enough. In the face of these urgent and wickedly complex problems, a new approach is needed.

VISUAL & HANDOUT

[Overview: the Drivers of Extinction](#)

This quick reference offers a high-level summary of what is driving the extinction crisis. A printable hand-out with more detailed drivers is [here](#).

VIDEO

[Why we need to design collaborative, just, and inclusive environmental solutions](#)

Dr. Ayana Elizabeth Johnson is a climate change expert and marine biologist. In this thought-provoking interview, she discusses why everyone needs to care about environmental challenges, environmental justice, and what's at stake. (Watch 5:05 - 9:34)

VIDEO

[Blue Ventures](#): a systemic approach to environmental solutions

In response to these wickedly complex challenges, there are many organizations doing incredible and impactful work. Blue Ventures, a social enterprise using a market-based approach to conservation, carefully balances the topics we cover in this toolkit: systems thinking, human-centered design, new technology, and a strong business case.

*Reflect on Blue Ventures' approach: What makes it strong? In which situations do you think it would work best? What shortcomings might it have, or what doubts do you have about it? What problems **couldn't** be solved using this approach? Does it align with the tenets of environmental justice? Why or why not?*

MINDSET QUIZ

[The Future of Conservation Survey](#)

What kind of conservationist are you? This quiz will help you reflect on your values and conservation approach; compare your profile to the four 'positions' described [here](#).

Reflect on your and your peers' results: Are you surprised? If so, why? In what ways do your results reflect your values or your past experiences? Is compromise possible when working with teams or cultures that have conflicting conservation approaches? Is it better to work in a team with similar or different approaches?

ASSIGNMENT

[Choose your Challenge](#)

First, take some time to reflect and synthesize what you've learned and how it overlaps with your personal interests and skills. Then, choose a problem you want to focus on for the duration of this course.

Curious to learn more? There are additional resources for students, and alternative lesson content for educators, in the [Explore More](#) Section.

Lesson 2

Analyzing Complex Environmental Problems

How do we understand complex environmental problems and figure out where to start when designing solutions?

In the face of pressing environmental problems, it is natural to want to jump straight into action and focus on an immediate solution. But in order to design successful, equitable, and lasting interventions, we need to take a step back and get a deep and contextualized understanding of the problem.

Many environmental problems have several stakeholders and interacting social, political, economic, and ecological contexts. These are known as complex, systemic, or ‘wicked’ problems. To understand them, we use *Systems Thinking* -- an approach that considers the elements, interconnections, and function or goal of the parts within a complex system (Meadows, [2008](#)). In this lesson, we will use Systems Thinking to map and understand how systems function and interact, to identify leverage points and trade-offs, and ultimately, to plan and evaluate interventions.

To understand the drivers of complex environmental problems, you will:

- Analyze the complexity of a challenge to gain insights, understand the role and influence of human actors;
- Consider questions of justice and equity in systems, and how the power dynamics in a system influence equitable decision-making;
- Practice organizing, analyzing, and narrowing scope, and identify leverage points to understand potential ways to affect change in a system; and
- Get a sense of where to start with your chosen problem -- where in the system you want to focus.

Pre-Reading

First, we’ll start with a primer on Systems Thinking. What is it, and why is it needed?

- [What is a System?](#) - this simple, climate-focused introduction shows how systems thinking can allow you to re-imagine the potential solution set for your problem.
- [Tools for Systems Thinkers: The 6 Fundamental Concepts of Systems Thinking](#) covers the key mindsets we’ll employ throughout this lesson.
- WWF’s [The Art of Systems Change](#) outlines fundamental tenets of systems thinking in environmental conservation, the behavior of complex systems, and guidelines for systems practice.

- [Complexity of Coupled Human and Natural Systems](#) explains concepts and phenomena inherent in any social ecological system, through case studies of a few example systems.
- [Systems thinking for planning and evaluating conservation interventions](#) shares concrete examples of how systems thinking tools can shift conservationists' approach to problem-solving.

To prepare for the in-class Decision Role Play, please read the following items and be prepared to discuss, build arguments, and propose decisions based on what you have learned.

- [The Ames Anomaly: How 'A Small Town with a Pretty Big Idea' Came to Have the Only Resource Recovery Plant in the Country](#)
- [Long-range Air Transport of Dioxin from North American Sources to Ecologically Vulnerable Receptors in Nunavut, Arctic Canada](#)
- Through this activity, we'll start to explore the connection between Systems Thinking and Environmental Justice; watch [Environmental justice, explained](#) for a brief background.

Once you've started to understand the complexity of a system, how do you choose where in the system you'll target your solutions, in order to drive change? We'll draw inspiration from Donella Meadows' classic [Leverage Points: Places to Intervene in a System](#).

Lesson Content

<p>VISUAL AID Primer: What is Systems Thinking?</p>	<p>We'll start with the basics of the Systems Thinking mindset: when is it needed, and how is it different from other approaches?</p>
<p>VIDEO A Systems Thinking Framework for Conservation</p>	<p>Dr. Jeni Cross shares why systems thinking is essential in conservation work, and what it can do to create just, equitable solutions with outsized impact. (Watch 1:00-4:30)</p>
<p>VIDEO Systems thinking: a cautionary tale (cats in Borneo)</p>	<p>Why is it so important to think in systems? This short video shows an example of the complex systems dynamics that can surface when we try to intervene with a seemingly simple technical solution.</p>
<p>VISUAL AID & HANDOUT What's at Stake: When Systems Interventions Fail</p>	<p>Here, we set the stakes for conservationists by sharing some examples of failed conservation interventions which could have been avoided by a better understanding of the system at hand. There is also a printable handout here.</p>
<p>ACTIVITY: DECISION ROLE PLAY Local Garbage in a Global Controversy</p>	<p>This simulation will put you in the shoes of stakeholders in an environmental decision to help you understand power structures and internalize the reality of how these decisions are made. It'll give you hands-on experience with the role of injustice, history, political systems, and the balance of power in systems analysis.</p>

The activity materials and directions are accessible via the [link](#) and we advise educators to condense the time allotted for speeches into one class period.

Afterwards, discuss: Which parts of the system was your team most focused on? What kind of change were you advocating for, preventing, or ignoring? How can environmental injustice be accounted for in global systems? After hearing all the arguments and proposals, do any additional solutions come to mind? Did the process include all the voices needed to make a just decision?

VISUAL AID

[Tools for Systems Analysis](#)

There are many tools for making sense of complex systems. This is an overview of the primary ones we'll use in this lesson, plus some additional frameworks that you might explore.

ACTIVITY

[The Iceberg Model](#)

This activity pushes you to investigate the patterns, systems, and values that drive an issue, to dig beyond the surface-level symptoms and find the real causes of a problem.

MAP EXAMPLES

System Map Examples:
[Food System Map](#) and
[Saving Water for Nature Map](#)

System maps help us start to visualize and understand the complexity of wicked problems.

Take some time to explore these maps and consider: what types of elements are captured within each of these maps (e.g. living/nonliving, types of stakeholders, resources, ideas, and structures)? Do you notice anything unexpected, any patterns or trends?

ACTIVITY

[Interactive Causal Loop Visualization](#)

This simulator allows you to experience causal loops in action. As you add in more elements, complex dynamics quickly emerge.

After experimenting with the simulation, go back to the System Map Examples from above. What causal loops can you spot in these examples, and what implications would this have if you intervened at different points in the system?

VISUAL AID

[Identifying Leverage Points in Systems](#)

Once we've mapped a system, how do we decide where to intervene? Donella Meadows' framing of Leverage Points helps us assess the different places we might intervene in a system, and balance the level of impact and difficulty we'd see at each.

ASSIGNMENT

[Map Your System](#)

Challenge your assumptions about your topic, and better understand the system around your chosen challenge, by creating a systems map. Then, you'll choose a spot in the system where you think an intervention could have outsized impact.

Curious to learn more? There are additional resources for students, and alternative lesson content for educators, in the [Explore More](#) Section.

Explore More

Lesson 1

For those not coming from an Environmental Science background, here are a few readings that will build a deeper understanding of environmental problems and thought leadership in the environmental space:

- The Intergovernmental Panel on Climate Change (IPCC): [Summary for Policymakers: Global Warming of 1.5°C](#)
- [The causes of land-use and land-cover change: moving beyond the myths](#)
- [Convention on Biological Diversity](#) Website
- Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES): [Summary for policymakers of the global assessment report on biodiversity and ecosystem services](#)
- [The biodiversity of species and their rates of extinction, distribution, and protection](#)
- United Nations (UN) Environment's [Global Environment Outlook 6](#)
- WWF: [Environmental Threats](#) Website
- The Nature Conservancy (TNC)'s [Conservation Training](#) program has beautifully designed, in-depth lessons on specific conservation issues, designed for conservation practitioners
- [The global conservation movement is diverse but not divided](#)

Some resources discussing what we know about potential solutions, failures, and the future of conservation:

- [Project Drawdown](#) assesses solutions to the climate crisis that are available to us, and offers an excellent series of short video lessons: [Climate Solutions 101](#)
- Mongabay: [5 Reasons Why Many Conservation Efforts Fail](#)
- [Top 10 Conservation successes and failures](#)
- Podcast: [Learning from environmental conservation's successes and failures](#)

[The State of Diversity in Environmental Organizations](#) discusses the need for diverse voices in the conservation space.

Finally, [How to be a Conservationist](#) shares tips on finding your place within the conservation field and defining the impact you want to have through the lens of the question, “How can I make the biggest difference for conservation?”

Lesson 1: Extra Resources for Educators

- [The Biggest Environmental Problems Of 2020](#) is a shorter article that could be used in lieu of the WWF report.
- [Google Timelapse](#) (introduction [here](#)) could make an interactive and hands-on activity for students to explore change in landscapes, with a selection of well-explained cases that capture changes in different ecosystems.
- The [Clifton Strengths](#) assessment is not free, but offers the ability to see the whole class' strengths mapped out, and automatically place students into teams that complement or balance each other.
- [CATME Team-Maker](#) allows educators to create student teams based on a set of selectable criteria.
- If you anticipate that teams might have trouble choosing a challenge to work on, these workshop structures are designed to help students identify problems they're passionate about:
 - [The Minimum Viable Change Toolkit](#)
 - The [Conrad Design Method](#) (video guidance [here](#))

Lesson 2

Resources for Systems Analysis & Mapping:

- [Whole Systems Design: Introduction to Life Cycle Thinking](#) offers some practical examples of how this approach is used in designing interventions
- [Resilience Thinking](#) (Review [here](#), Introduction [here](#))
- [A Leverage Points Perspective on Sustainability](#)
- [Conservation Standards](#) is a Systems Thinking framework used within the conservation field
- Guides for mapping systems:
 - [A step-by-step guide to system mapping](#)
 - [Student Guide to Mapping a System](#)
- [Miradi](#) is an adaptive management software built for the conservation field; it allows you to create systems and situation diagrams.
- Further reading on Causal Loops:
 - [Causal Loop Construction: The Basics](#)
 - [Feedback Loops: How Nature Gets its Rhythms](#)
 - [Fishery Causal Loop Diagrams](#): provides an in-depth example in fisheries.

Resources that explore the overlap between Systems Change & Environmental Justice:

- [Wicked conflict: Using wicked problem thinking for holistic management of conservation conflict](#)
- [In Chile, Indigenous Management of Coastal Areas Improves Marine Conservation](#): a real world example of environmental justice in action and successful Indigenous conservation
- [A spatial overview of the global importance of Indigenous lands for conservation](#): This article highlights the vast amount of remaining biodiversity within Indigenous lands and emphasizes the importance of including and centering Indigenous communities in this work.
- [Greening the Ghetto](#): Majora Carter speaks to her environmental justice efforts in the South Bronx
- [“Pollution is segregated” says the father of Environmental Justice](#): Robert Bullard speaks about the creation of an environmental equity framework and his work since the 1970s
- [The Economic Injustice of Plastic](#)
- [The 17 principles of EJ](#) laid out at the 1991 People of Color Environmental Leadership Summit
- [Cornered by Protected Areas](#): A collection of case studies detailing the injustices and other impacts of Fortress Conservation, wherein people are excluded from areas to protect the natural resources, even if they’ve always been there.

Community-based monitoring resources:

- [From hope to crisis and back again? A critical history of the global CBNRM narrative.](#)
- [Adaptive Management and Social Learning in Collaborative and Community-Based Monitoring: a Study of Five Community-Based Forestry Organizations in the Western USA](#)

Lesson 2: Extra Resources for Educators

- [Systems Change Education](#) has a number of resources for educators, such as the Impact Gaps Canvas. There are also great activities available in [The Climate Change Playbook: 22 Systems Thinking Games for More Effective Communication about Climate Change](#).
- Alternate teaching materials:
 - A more complex example of systems change gone wrong: [Palm Oil Was Supposed to Help Save the Planet. Instead It Unleashed a Catastrophe](#). For more advanced students (e.g. upper-level graduate), this is a nuanced case which could be analyzed in lieu of the more straightforward examples in the slides. It underscores the importance of understanding the thresholds and uncertainty in systems through a “green” intervention gone horribly wrong.
 - Alternate options for the role play include:
 - This collection of [Environmental Justice Case Studies](#)
 - The recent Environmental Justice failure in [Flint](#).
 - [This activity around land use in Tambopata, Peru](#)

- As a simpler alternative to the Iceberg Model, the [5 Why's Activity](#) helps students practice digging beyond the superficial, for shorter classes or less experienced audiences.
- [Soure: Social-ecological traps hinder rural development in Southwestern Madagascar](#) is a more complex example of Causal Loops in conservation. For advanced students, this could be a pre-reading with an in-depth conversation about leverage points for intervention.

General Resources

In this module, we started to explore Environmental Justice, and it's a theme that we'll continue to explore throughout the modules of this toolkit.

- [Environmental Justice / Environmental racism](#) is a compilation of resources, managed by the energy justice network, on the topics of environmental justice and racism.
- [Environmental Justice: The EPA](#)

Conservation Innovation in Practice: resources, organizations, and inspiration:

- [Hult Prize: Bold Business for A Better Planet](#) offers several tangible examples of innovation to drive environmental change.
- Explore Conservation X Labs' [Current Challenges](#)
- Here are just a few of the many conservation organizations that have an explicit focus on Systems practice:
 - [Climate Interactive](#)
 - [Future of Fish](#)
 - [Rare.org](#)
 - [Blue Ventures](#)