



# Master of Natural Resources Program (Online)

## NON-THESIS DEGREE CONSISTING OF 10 CLASSES (30 HRS)

- 5 required core classes
- 5 elective classes (chosen with guidance from Graduate Advisor)



## Required Core Classes

### CONSTRUCTING SUSTAINABILITY (3)

**instructor:** Courtney Kimmel ([cekimmel@vt.edu](mailto:cekimmel@vt.edu))

Donna Palumbo-Miele ([dpalumbo@vt.edu](mailto:dpalumbo@vt.edu))

This course examines the science, policy, and practice of sustainability and sustainable development in a global context. We will examine the history, current status, and future prospects of sustainability and sustainable development from economic, social, and ecological perspectives. In the past several decades, sustainability and sustainable development have gained status in political, scientific, business, religious, and cultural institutions and are now guiding principles that frame and shape public policy and private practice at multiple scales. While these concepts are well-established in many communities and cultures worldwide, they have only recently emerged as prominent features in the mainstream of contemporary popular culture throughout global society. This interdisciplinary course encourages students to consider how they can engage science, policy, professional, and civic institutions in constructing sustainability.

OFFERED: Fall, Spring, Summer-III

### GLOBAL ISSUES IN ENVIRONMENTAL SUSTAINABILITY (3)

**instructor:** Caleb O'Brien ([calebo@vt.edu](mailto:calebo@vt.edu))

The purpose of this course is to build competencies in sustainability professionals to think globally about sustainability challenges and their career, to situate their own professional work in a global context, to better understand sustainability situations and tools for examining them, and to practice team/collaborative project management and problem-solving skills. The course is organized into four broad areas of focus: the global Anthropocene, sustainability case analysis, leadership, and culture competencies. This course is designed to support a Global Study scheduled for the same semester.

OFFERED: Fall, Spring, and Summer-III

## LEADERSHIP COMMUNICATION FOR SUSTAINABILITY PROFESSIONALS (3)

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**instructor:** Kathy Miller Perkins ([kathmp5@vt.edu](mailto:kathmp5@vt.edu))  
Greg Dardis ([gregjdardis@vt.edu](mailto:gregjdardis@vt.edu))

Communication is a discipline that's important for every field and function, but it's particularly critical for sustainability professionals, who work with countless stakeholders across a variety of sectors. This course introduces the field of environmental communication, including historical contexts, public participation, media, risk communication, and conflict management. Students will explore their own communication strengths and opportunities through the lenses of personal awareness, interpersonal connection, building trust, influence and persuasion, framing a message, and creating a shared context and vision.

OFFERED: Fall, Spring, and Summer-III

## STRATEGIES FOR SUSTAINABILITY (3)

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**instructors:** Jennifer Lawrence ([jennlaw@vt.edu](mailto:jennlaw@vt.edu))  
Erin McCullough ([erinmac@vt.edu](mailto:erinmac@vt.edu))

Strategies for practicing sustainability professionals to influence sustainability outcomes; focus on social science approaches to influencing and explaining human behavior; review of key theories; applied projects focused on interventions to address sustainability challenges.

OFFERED: Fall, Spring, and Summer-III

## SUSTAINABILITY SYSTEMS (3)

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**instructor:** Daniel Marcucci ([marcucci@vt.edu](mailto:marcucci@vt.edu))  
April Evans ([aprilwe@vt.edu](mailto:aprilwe@vt.edu))

Systems thinking needed by sustainability professionals. Basic competencies, language, and confidence needed to engage with other experts in collaborative problem-solving processes for pressing global sustainability challenges. Focus on sustainability systems represented in the United Nations Sustainable Development Goals: water, climate, agriculture, energy, poverty, urbanization, global material flows, and biodiversity. System properties and other leverage points for influencing change. Collaborative problem-solving skills needed to work on multidisciplinary teams. Double loop learning, and reframing problems and questions.

OFFERED: Fall, Spring, and Summer-III

## Elective Classes

### STUDY ABROAD (3)

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**instructor:** Global Study Faculty

Students interested in traveling on more than the required one Global Study and in emphasizing international experiential learning during their time in the program will have the opportunity to do so. Study Abroad is a 3-credit elective that students could take after completing the required core course, Global Issues in Environmental Sustainability. The course consists of one additional international experience and can be taken up to two times, for up to 6 total credits. Study Abroad students are added to the Global Issues course in order to participate with the rest of the class, but since they have taken the course before, they will work with the instructor to establish a new leadership role in the class, such as leading student discussions and helping to identify location-relevant readings. Study Abroad is a 3-credit course, so students still pay tuition for 3 credits of graduate coursework plus a fee of \$3,650 and international airfare for each additional trip.

OFFERED: Fall, Spring, and Summer-III

# Biodiversity and Ecosystems

## ADAPTIVE MANAGEMENT (3)

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**instructor:** Heather Eves ([heves@vt.edu](mailto:heves@vt.edu))

Conservation organizations must ensure that their efforts are strategic, systematic, results-oriented, and effective. This course provides students with skills and knowledge to assess and plan conservation projects that can be adaptively managed and monitored for effective biodiversity and human wellbeing outcomes. The foundation for the course is the Open Standards for the Practice of Conservation—a guidance planning tool used globally by thousands of practitioners and countless government, non-government, and donor organizations in concert with the Miradi open-source modeling software. Students in this course work together to assess and plan two conservation case studies. The management plans developed include essential components for effective conservation: vision, scope, biodiversity targets, viability assessment of targets, goals, stakeholder analysis, direct threats, threat assessment, situation analysis, strategies, strategy prioritization, theory of change, objectives, indicators, and monitoring plans. Teams have the option to work on projects related to their own environmental work, volunteer opportunities, and existing field projects. All participants in the course will be eligible to complete Certification of Steps 1 (Assess) and 2 (Plan) for the Conservation Standards.

OFFERED: Spring

## BIODIVERSITY POLICY (3)

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**instructor:** Desiree Di Mauro ([ddimauro@vt.edu](mailto:ddimauro@vt.edu))

Conservation biologists warn that we are in the midst of a great “extinction crisis,” with millions of species threatened due to habitat destruction, climate change, and other anthropogenic factors. This course focuses on examining how we are (and should be) constructing legal regimes and effective political institutions to conserve Earth’s endangered forms of life across multiple levels (ecosystem, landscape, species, population, and genetic diversity). We will examine U.S. legal and political responses to biodiversity loss, with a focus on the Endangered Species Act, as well as the role of international law, especially treaty regimes. We will look at how law is(n’t) succeeding in preserving life on Earth, and pay particular attention to the most effective legal practices to conserve biodiversity.

OFFERED: Summer-III

## BIODIVERSITY STEWARDSHIP (3)

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**instructor:** James Egenrieder ([jime@vt.edu](mailto:jime@vt.edu))

This course builds on the principles of biodiversity science across the many components of stewardship. Participants will each identify a study area (local site or area, a county, or larger region) that provides the context for investigating, documenting, analyzing, and promoting biodiversity. Accordingly, students’ projects and course products are highly variable and reflect a wide variety of professional, academic, and personal interests. Skills developed in this course can be immediately applied to real-world needs, and some participants may design their projects and products to address an existing need.

OFFERED: Summer-III

## CONSERVATION ECOLOGY (3)

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**instructor:** Desiree Di Mauro ([ddimauro@vt.edu](mailto:ddimauro@vt.edu))

Megan Draheim ([mdraheim@vt.edu](mailto:mdraheim@vt.edu))

Katheryn Patterson ([kwpattn@vt.edu](mailto:kwpattn@vt.edu))

Human activities are having a cumulative effect on the natural systems upon which life depends. Future land management impacts will likely entail unprecedented change in environmental conditions. Conservation ecology provides insights into the many benefits and services that nature offers, and explores strategies to sustain ecological integrity and plan landscapes for human use. It is an emerging interdisciplinary approach to harmonizing the interactions between people and nature at ecosystem scales.

OFFERED: Fall, Spring, Summer-III

## HUMAN-WILDLIFE CONFLICTS (3)

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**instructor:** Megan Draheim ([mdraheim@vt.edu](mailto:mdraheim@vt.edu))

Katheryn Patterson ([kwpattn@vt.edu](mailto:kwpattn@vt.edu))

Human-wildlife conflict resolution is a rapidly growing area within the wildlife sciences that draws upon the need for multi-disciplinary approaches to resolve complex issues associated with human domination of ecosystems. The problems people have with wild animals, and the problems wild animals have with people, require the use of cooperative, collaborative, and innovative approaches if they are to be resolved in ways that maximize both social and ecological benefits. This course draws upon some of the emerging issues associated with human-wildlife conflicts, and through the use of case histories and examples explores the theory and practice of conflict resolution, as well as the practical ethics needed to navigate contemporary wildlife management.

OFFERED: Spring

## URBAN WILDLIFE (3)

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**instructor:** Jonathan Richardson ([jrichardson4@vt.edu](mailto:jrichardson4@vt.edu))

Eight out of ten Americans now live in cities or towns of 50,000 people or more, and 50% of the world’s human population now lives in urban areas. While it’s a common assumption that cities are inhospitable to non-human animal life, we have ample evidence to indicate that not only do some wildlife species survive in urban areas—they can thrive. One positive outcome is that people can directly enjoy and appreciate wildlife close to home, adding to their quality of life and connection to the natural world. A negative consequence is that conflicts between people and wildlife are on the rise. Urbanization has created new challenges for a variety of natural resource professionals, and most have little or no special training in this area. This course is organized into five learning units: urban landscapes, urban ecosystems, urban habitats and hazards, sociopolitical issues, and special management considerations.

OFFERED: Fall

# Cities and Urban Systems

## ENVIRONMENTAL CONFLICT MANAGEMENT (3)

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**instructor:** Kathy Miller Perkins ([kathmp5@vt.edu](mailto:kathmp5@vt.edu))

An exploration of the history, current trends, processes, and methods related to the study and application of environmental conflict resolution and cooperation. Students will investigate the dynamic and complex world of environmental disputes, as well as approaches to resolving them.

OFFERED: Spring (Starting 2026)

## INFRASTRUCTURE FOR RESILIENCE (3)

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**instructor:** Courtney Kimmel ([cekimmel@vt.edu](mailto:cekimmel@vt.edu))

Ranging from site-scale strategies, such as green roofs for managing stormwater, to regional networks of riparian corridors, infrastructure planning and design offers opportunities and challenges for planners, policy and decision makers, scientists and researchers, landowners, and taxpayers across the urban–rural gradient. This course explores the broader contexts which have given rise to green infrastructure planning and design, both in the U.S. and internationally; identifies and examines different critical scales for conceptualizing green infrastructure and practical strategies being employed at each scale; and compares policy goals and programs supporting green infrastructure in the U.S.

OFFERED: Fall

## URBAN ECOLOGY (3)

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**instructor:** Courtney Kimmel ([cekimmel@vt.edu](mailto:cekimmel@vt.edu))

Approximately 50% of the world's people are now classified as urban, and they are motivated by a desire to create healthy human ecosystems and sustainability communities in which to live, work, and play. Are cities sustainable environments? What are civic stakeholders, local communities, and global society doing to ensure that urban and urbanizing landscapes are healthy and desirable places to live?

OFFERED: Summer-III

## URBAN WATER SYSTEMS (3)

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**instructor:** Daniel Marcucci ([marcucci@vt.edu](mailto:marcucci@vt.edu))

Water is the lifeblood of cities. Freshwater, wastewater, and environmental water systems each provide vital services, and each can cause profound problems. Citizens and industry require freshwater to live and function. Without adequate wastewater management cities quickly become unhealthy, fetid places. Imbalances in environmental water can cause degradation, drought, and fire or, conversely, catastrophic flooding. This course examines urban water systems as an integrated management challenge. Case studies drawn from cities in North American and global regions experiencing rapid urbanization are used to identify emerging problems and prescribe best practices.

OFFERED: Summer-III

## URBAN WILDLIFE (3)

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**instructor:** Jonathan Richardson ([jrichardson4@vt.edu](mailto:jrichardson4@vt.edu))

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OFFERED: Fall

# Climate Change

## CLIMATE ADAPTATION & MITIGATION (3)

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**instructor:** Paul Wagner ([pwagner@vt.edu](mailto:pwagner@vt.edu))

This course enables students to develop adaptation plans at varying geographic and temporal scales built around an understanding of the key components of vulnerability: the sensitivity, exposure, and adaptive capacity of natural and human systems. These key drivers of climate vulnerability will be used, along with socio-political and policy analysis, to develop adaptation plans that are informed by science, policy, and societal considerations. Throughout the course, we will tackle the importance of characterizing and incorporating uncertainty (epistemic, stochastic, and response uncertainty). We will also examine our understanding of the limits of adaptation and how adaptation opportunities will be constrained under various climate change scenarios.

OFFERED: Fall

## CLIMATE CHANGE POLICY (3)

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**instructor:** Adam Kalkstein ([climate@vt.edu](mailto:climate@vt.edu))

This course focuses on institutional responses to climate change at the international, national, and sub-national levels, including the United Nations Framework Convention on Climate Change, the Kyoto Protocol, and U.S. climate policymaking under the Clean Air Act and state and regional initiatives. Both mitigation and adaptation approaches will be addressed, as well as climate geoengineering.

OFFERED: Summer-III

## CLIMATE CHANGE SCIENCE (3)

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**instructor:** Adam Kalkstein ([climate@vt.edu](mailto:climate@vt.edu))

As average global temperatures continue to rise, it is imperative to not only understand the science behind climate change, but also its potential ramifications and impacts. This course explores the why, how, and when behind climate change. Contemporary readings are used to spark discussion and debate surrounding the potential implications of climate change. The course culminates in a "Congressional Briefing" for which students synthesize their knowledge and propose a political solution.

OFFERED: Spring

## RISK AND RATIONALITY IN GLOBAL SUSTAINABILITY (3)

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**instructor:** Paul Wagner ([pwagner@vt.edu](mailto:pwagner@vt.edu))

Students in this course will explore how risk is defined, perceived, and addressed in different contexts and by different people, and the scientific and ethical dimensions of risk assessment and management in decision-making under uncertainty—a capability critical for global sustainability professionals whose daily work involves confronting challenges of understanding, identifying, and communicating risks across cultures. The course will also introduce foundational concepts in probability and their relationship to risk assessment, as well as common errors of reasoning under conditions of uncertainty and strategies for avoiding them. Students will become familiar with psychological and linguistic factors that affect human decision-making and will have the opportunity to critically analyze risk-based decision-making as it applies to current issues such as public health, alternative energy, and environmental conservation.

OFFERED: Spring

# Environmental Policy

## BIODIVERSITY POLICY (3)

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**instructor:** Desiree Di Mauro ([ddimauro@vt.edu](mailto:ddimauro@vt.edu))

Conservation biologists warn that we are in the midst of a great "extinction crisis," with millions of species threatened due to habitat destruction, climate change, and other anthropogenic factors. This course focuses on examining how we are (and should be) constructing legal regimes and effective political institutions to conserve Earth's endangered forms of life across multiple levels (ecosystem, landscape, species, population, and genetic diversity). We will examine U.S. legal and political responses to biodiversity loss, with a focus on the Endangered Species Act, as well as the role of international law, especially treaty regimes. We will look at how law is(n't) succeeding in preserving life on Earth, and pay particular attention to the most effective legal practices to conserve biodiversity.

OFFERED: Summer-III

## ENERGY POLICY (3)

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**instructor:** Erin McCullough ([erinmac@vt.edu](mailto:erinmac@vt.edu))

Ron Meyers ([rbmeyers@vt.edu](mailto:rbmeyers@vt.edu))

An interdisciplinary exploration of energy policy, energy technologies, federal regulatory processes, and global contexts. Students will build proficiency in structured policy analysis, stakeholder engagement, international governance, and regulatory procedures related to energy technologies. The course emphasizes the intersections of energy with national security, climate policy, energy justice, and sustainable development. Students will critically analyze real-world scenarios involving siting, permitting, and energy infrastructure transitions.

OFFERED: Spring (Starting 2026)

## NATURAL RESOURCES MANAGEMENT AND POLICY (3)

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**instructor:** Brian Frazer ([bmfrazier@vt.edu](mailto:bmfrazier@vt.edu))

Focus on natural resources management and policy, laws and regulations, including environmental conservation and sustainable development in the public and private sectors. Topics include economics, transboundary resource management, governance, public relations, stakeholder engagement, renewable and nonrenewable resources such as energy, water, and wildlife.

OFFERED: Spring (Starting 2026)

## CLIMATE CHANGE POLICY (3)

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**instructor:** Adam Kalkstein ([climate@vt.edu](mailto:climate@vt.edu))

This course focuses on institutional responses to climate change at the international, national, and sub-national levels, including the United Nations Framework Convention on Climate Change, the Kyoto Protocol, and U.S. climate policymaking under the Clean Air Act and state and regional initiatives. Both mitigation and adaptation approaches will be addressed, as well as climate geoengineering.

OFFERED: Summer-III

# Sustainable Business

## FOOD POLICY & SUSTAINABILITY (3)

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**instructor:** Jennifer Jones ([jenjones@vt.edu](mailto:jenjones@vt.edu))

This course explores the structure of a globalized food landscape, with a focus on public and private decision-makers from government and industry to relief and development organizations. Students analyze the economic, ecological, and social dimensions of food and farming policy on contemporary urban and rural issues, such as climate change, land use and livelihoods, biotechnology, national security and political instability, trade and subsidies, and human health.

OFFERED: Fall

## WATER & MARINE POLICY (3)

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**instructor:** Jason Papacosma

Water and marine policy spans a wide range of management applications. In this context, “policy” begins with setting goals and objectives that connect to the laws and regulations established to support these aims. There are commonalities across the globe despite differences based on geography, scale, climate, economics, politics, and other factors. The tension between data-driven science and the compromises inherent in policymaking is also a critical dynamic for all environmental professionals to understand, especially as the Earth’s changing climate is increasingly front and center in virtually all environmental policymaking conversations. This course will use case studies to explore specific aspects of water and marine policy, allowing opportunities for comparing and contrasting policies, laws, and regulations, the factors influencing them, and the outcomes.

OFFERED: Spring

# Environmental Security

## ENVIRONMENTAL SECURITY FUNDAMENTALS (3)

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**instructor:** Erin McCullough ([erinmac@vt.edu](mailto:erinmac@vt.edu))

Students will explore sustainability through the lens of environmental security, focusing on how unaddressed vulnerabilities can escalate into serious threats. Both classical and contemporary security theories will be applied to assess and mitigate risks posed by natural hazards and environmental degradation. The course also emphasizes strategies for communicating sustainability topics to security audiences through alignment of common interests.

OFFERED: Fall (Starting 2025)

## BUSINESS SUSTAINABILITY APPLICATIONS (3)

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**instructor:** Kevin Rabinovitch ([kevinrab@vt.edu](mailto:kevinrab@vt.edu))

Business and corporate sustainability theory and best practices for environmental sustainability professionals. Business motivations for sustainability. Corporate social responsibility and sustainability programs and practices. Markets and demand for green goods and sustainable brands. Global trends in markets and demographics. Supply chain management for climate and other sustainability challenges. Sustainable dimensions of investing, reporting, employee recruitment and retention, insurance, and risk management. Circular economy policy and theory.

OFFERED: Spring

## CIRCULAR ECONOMY (3)

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**instructor:** Rachel Goldstein ([grachel@vt.edu](mailto:grachel@vt.edu))

What is a circular economy? It is a vision of an economic system that looks beyond the conventional linear model of take–make–waste to a future that is restorative and regenerative of resources. A circular economy requires decoupling economic activity from the consumption of finite resources in order to eliminate waste, improve efficiencies, and reduce risks. In addition, a circular economy seeks to redefine growth by focusing on building natural, social, and economic capital.

OFFERED: Fall

## SUSTAINABILITY ACCOUNTING & REPORTING (3)

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**instructor:** Robert Sarikas ([zeke21@vt.edu](mailto:zeke21@vt.edu))

This course offers a comprehensive overview of the accounting, evaluation, compliance, and reporting systems and practices needed by sustainability professionals. Topics include: governance by disclosure through accountability and transparency; climate, water, and human rights; labels, certification, standards, and roundtables; reporting for businesses and government organizations; international and sectoral differences in sustainability reporting platforms and practices.

OFFERED: Spring

## SUSTAINABLE PURCHASING & SUPPLY CHAINS (3)

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**instructor:** Donna Palumbo-Miele ([dpalumbo@vt.edu](mailto:dpalumbo@vt.edu))

Around the world, individuals and communities are experimenting with satisfying their needs more sustainably across key lifestyle domains, including food, transportation, housing, consumer goods, and leisure. Likewise, businesses are managing their supply chains to improve resource efficiency and reduce risk. How do these individual initiatives and campaigns scale-up and contribute to more sustainable systems of production and consumption at regional and global scales? Who are the key stakeholders, and what are the strategies they are using to achieve sustainable development goals?

OFFERED: Summer-III

# Water and Marine Systems

## COASTAL & MARINE MANAGEMENT (3)

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**instructor:** Daniel Marcucci ([marcucci@vt.edu](mailto:marcucci@vt.edu))

Approximately 3 billion people, or half of the world's population, live within 200 kilometers of a coastline, and that figure is projected to increase dramatically by 2025. Coastal areas represent complex socio-ecological systems that provide valuable ecosystem services to people and the planet. Coastal management is concerned with protecting, conserving, and managing coasts and coastal resources, and requires an interdisciplinary approach to understanding and negotiating often-competing interests.

OFFERED: Spring

## URBAN WATER SYSTEMS (3)

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**instructor:** Daniel Marcucci ([marcucci@vt.edu](mailto:marcucci@vt.edu))

Water is the lifeblood of cities. Freshwater, wastewater, and environmental water systems each provide vital services, and each can cause profound problems. Citizens and industry require freshwater to live and function. Without adequate wastewater management cities quickly become unhealthy, fetid places. Imbalances in environmental water can cause degradation, drought, and fire or, conversely, catastrophic flooding. This course examines urban water systems as an integrated management challenge. Case studies drawn from cities in North American and global regions experiencing rapid urbanization are used to identify emerging problems and prescribe best practices.

OFFERED: Summer-III

## WATER CONFLICT & MANAGEMENT (3)

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**instructor:** Desiree Di Mauro ([ddimauro@vt.edu](mailto:ddimauro@vt.edu))

Water is a vital resource to Earth's 7 billion humans. Only 3% of the Earth's water is potable, and it is not evenly distributed. Some countries have easy access, while others have too little or too much. In this course, we'll study the management of water resources in the U.S., Bangladesh and Kiribati, the Tigris-Euphrates Basin, and Brazil. Students will be introduced to the basic issues surrounding water management, and then case studies will be used to investigate examples of water management and conflict around the world.

OFFERED: Fall

## WATER & MARINE POLICY (3)

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**instructor:** Jason Papacosma ([jpapacosma@vt.edu](mailto:jpapacosma@vt.edu))

Water and marine policy spans a wide range of management applications. In this context, "policy" begins with setting goals and objectives that connect to the laws and regulations established to support these aims. There are commonalities across the globe despite differences based on geography, scale, climate, economics, politics, and other factors. The tension between data-driven science and the compromises inherent in policymaking is also a critical dynamic for all environmental professionals to understand, especially as the Earth's changing climate is increasingly front and center in virtually all environmental policymaking conversations. This course will use case studies to explore specific aspects of water and marine policy, allowing opportunities for comparing and contrasting policies, laws, and regulations, the factors influencing them, and the outcomes.

OFFERED: Spring

## WATERSHED STEWARDSHIP (3)

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**instructor:** James Egenrieder ([jime@vt.edu](mailto:jime@vt.edu))

This course was developed with an interdisciplinary focus covering: watershed identification and mapping; watershed characteristics and evaluation; stormwater engineering; stream corridor restoration; water quality monitoring; native plants and animals; exotic and invasive species; public education; volunteer coordination and training; roles and activities for teachers and students; and advocacy training.

OFFERED: Fall

**Personalized Plans of Study:** We are delighted to work with students to customize plans of study to help them achieve their academic and professional goals, by participating in Independent Study projects or additional Global Study experiences. Interested students can ask about these options during their Plan of Study advising call.