



# 2013 Annual Report

## Caribbean Landscape Conservation Cooperative

*Bridging Science and Action, Land and Sea*



The Caribbean Landscape Conservation Cooperative was initiated in 2011 and officially became the 22<sup>nd</sup> Landscape Conservation Cooperative in 2012. The CLCC is led by the US Forest Service International Institute of Tropical Forestry located in Río Piedras, Puerto Rico and located at their headquarters on the grounds of the University of Puerto Rico Botanical Garden. The CLCC operates with the generous support of the several federal, Commonwealth and Territorial Agencies, Nongovernmental Conservation Organizations, University partners, and private citizens interested in a healthy, equitable and sustainable future.

Our Current Partners. Join the Caribbean Landscape Conservation Cooperative.



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**Background.** The Caribbean Landscape Conservation Cooperative (CLCC) is an alliance of conservation partners with common landscape conservation goals. The CLCC domain includes primarily the terrestrial and marine components of Puerto Rico, the U.S. Virgin Islands, and Navassa Island (Fig. 1). Our collaborative conservation goals also include expanding our realm of influence to the wider international Caribbean in recognition that many of the natural resources we are tasked with conserving and the socio-political realms that influence them cross international island boundaries. Caribbean land and seascapes include a number of large and small islands, diverse cultures and a rich matrix of ecosystems. The tropical climate promotes high species diversity and the Caribbean is a global biodiversity hotspot. The Caribbean region shares many conservation issues with the continental U.S., including competing demands for open space, climate change and managing for future scenarios, vulnerable coastal and marine habitats, degraded lands and marine habitats in need of restoration, and threatened and endangered species. Population pressures are high, suitable open space is limited, and the diversity of habitats creates complexities for management. We recognize the connectivity with the greater Caribbean and the continental regions through shared species, habitats, and conservation opportunities and goals: and therefore, we work Caribbean-wide with partners as shared priorities and opportunities arise.



Figure 1. Puerto Rico and the US Virgin Islands

The purpose of the CLCC is to provide scientific expertise, develop tools to support conservation, share information resources, and to develop a regional framework to conduct conservation planning and management at several scales. These range from decisions on site management to understanding the implications of management actions regionally, nationally and

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globally. It is a platform for partners working to integrate information, perform regional assessments of species' conservation status, assess future scenarios, and collaborate in applied conservation science and education. The CLCC partners support land, marine and water conservation in a manner conducive to sustaining ecosystem services and promoting resilience to landscape-scale stressors.

The goal of the CLCC is assist the conservation community to develop, provide, communicate and make available the most up-to-date conservation science and conservation strategies to agencies, decision makers, organizations, researchers, and the general public in order to conserve, restore and sustain natural and cultural resources in the Caribbean now and into the future. A core objective of the CLCC is to foster a shared vision of landscape conservation which involves efforts to develop a common understanding of needs and priorities to achieve that vision, identify future impacts and mitigating strategies, and to increase collaboration to maximize resources. We work to attain these goals through the following five major activities:

- a. Science development in support of management.
- b. Partner coordination to leverage resources.
- c. Informing conservation actions.
- d. Monitor and evaluate both our environment and the results of our decisions and actions.
- e. A focus on communication and education.

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## **Executive summary**

The CLCC had a year of growth and accomplishments in 2013. We became fully staffed with a science coordinator coming on board in May of 2013. We ratified the CLCC charter in July. We began a transition to a permanent steering committee and brought in several new federal partners, nongovernmental organizations and new partnerships from the Government of the US Virgin Islands. We initiated our science strategic planning. We initiated important research projects including climate modeling, hydrologic modeling, and land cover change analyses. We developed a website and data management and delivery center, and we opened an important chapter in integrating human dimensions in the work of the CLCC.

The work of the CLCC was accomplished through daily effort by the staff and partners, weekly staff meetings, monthly Steering Committee conference calls, workshops on climate modeling, ecosystem governance, ecosystem based adaptation, and structured decision making, biannual stakeholder meetings in Puerto Rico and the US Virgin Islands, participation in national and international meetings on climate change, Caribbean forestry, bird conservation, and iguana conservation. We actively participated in regional work with the Southeast LCCs, the SE Conservation Adaptation Strategy, and the SE Climate Science Center. Additionally we worked with the Pacific Islands CCC, the Aleutian Islands LCC, and the Pacific Islands Climate Science Center on shared topics. We also participated with the National LCC in monthly conference calls among the Coordinators and science coordinators, participation on white papers, and participation in the startup of the National Council. The CLCC staff also made progress on shared goals through interaction with partners in the Forest Service Forest Planning Process, development of the USDA Subsidiary Hub for Caribbean Climate Change and Working Lands, work with the Puerto Rico Climate Change Council, support for the San Juan Bay Estuary Program, and other partners.

Three key highlights include continued and growing support of stakeholders, working to deliver dynamically downscaled climate projections at a 2 km resolution and integrating end user input in the climate modeling process, and formally integrating human dimensions and best social

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science practices not as a goal in conservation decision support, but also in all aspects of gathering and summarizing information from stakeholders to develop shared priorities and vision. At the end of 2012 we had our first all hands stakeholder meeting in San Juan Puerto Rico. The interim steering committee met the first day and all hands on the second. Over 100 people participated and demonstrated enthusiasm and support for the goals of the CLCC. In May 2013 we had a similar meeting in St. Croix, USVI – a direct outcome of concerns expressed by USVI residents that they needed more opportunities for input. This meeting attracted over 60 new stakeholders committed to support the CLCC. A second annual meeting in San Juan (December 2013) increased participation by 50% and served as a kick off for our strategic science planning.

What follows is our organizational chart, a list of current staff and steering committee, a timeline, a summary of activities for 2013, a summary of research projects and findings, and goals for 2014.

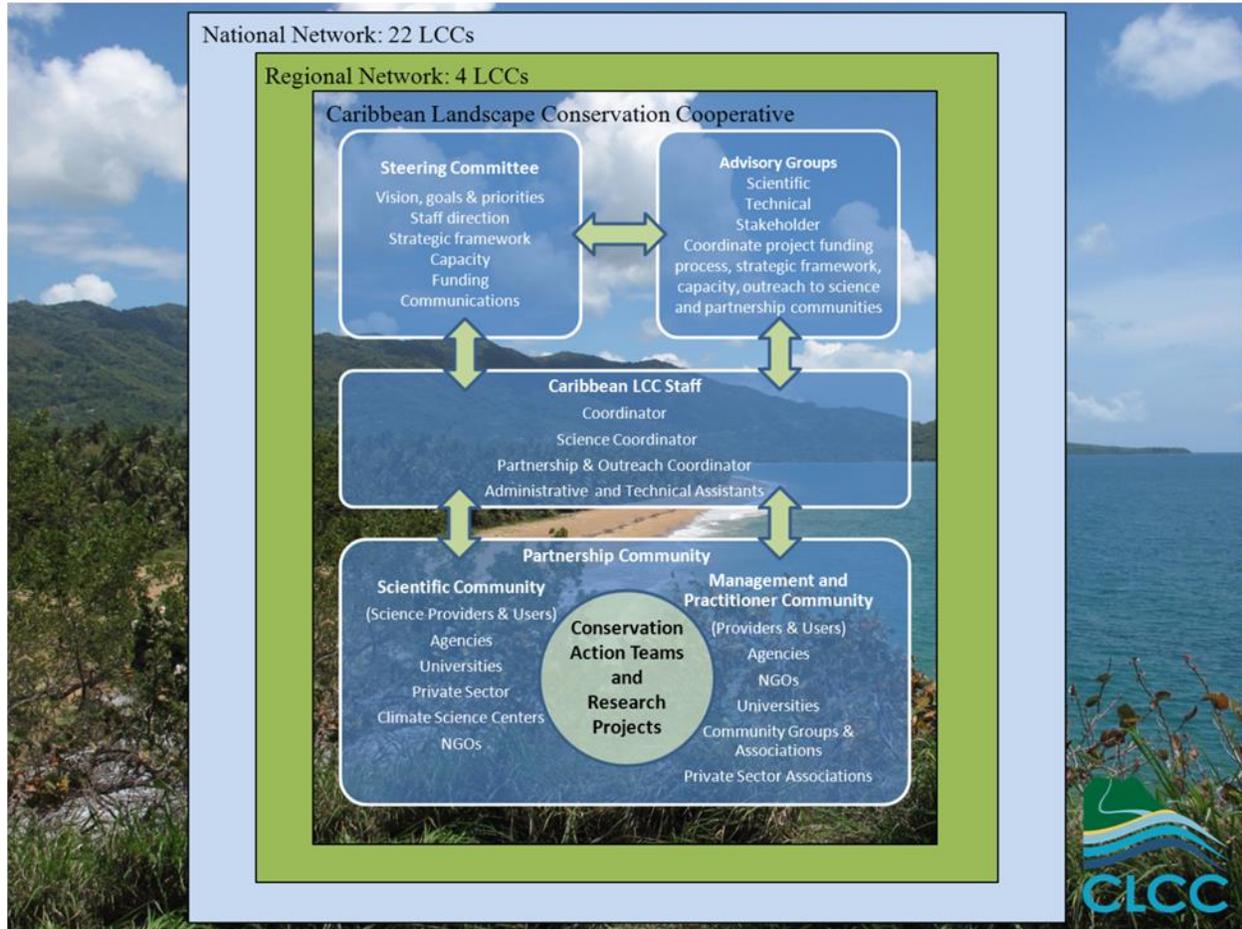
Sincerely,

**William A. Gould**

CLCC Coordinator

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## **The Caribbean Landscape Conservation Cooperative Timeline**

- February 2011- A workshop titled: *Caribbean Strategic Habitat Conservation/Landscape Conservation Cooperative: Building a Common Foundation* was conducted in San Juan, P.R. This workshop was attended by representatives of several local and federal agencies and set the initial steps to shape the CLCC and what it should look like.
  
- May 2011 - Initial CLCC Interim Steering Committee (ISC) formation.
  
- 2011-2012 - Five workshops/open house meetings took place around Puerto Rico and the U.S. Virgin Islands to inform people about the CLCC and to gather information on what people might like to see in such a Cooperative.
  
- November 2012 - First stakeholder meeting took place in San Juan - a joint meeting with USFWS surrogate species workshop. A meeting of the ISC was also conducted this same day to primarily discuss Steering Committee composition and roles. A decision was made to form a Tiger Team with members of the ISC to develop recommendations on:
  - Long term Steering Committee size and membership, key perspectives needed for a Caribbean conservation discussion, recommend organizations and perspectives, processes and criteria for inviting new members, and role of NGOs.
  - Becoming a Caribbean LCC (vs. a PR/VI LCC).
  - Identifying a vision for a Caribbean conservation landscape of the future.
  - How partners could work collaboratively to do conservation better.
  - Developing messages to partners that stress CLCC should not be viewed as a research/funding opportunity.
  
- March 2013 - Meeting with SustainaMetrix, a social enterprise created in 2008 that provides guidance and facilitates innovation and clarity to the pioneers of the sustainability movement.

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SustainaMetrix will assist the CLCC to assemble the foundation of an ecosystem governance knowledge base.

- May 2013 - Second stakeholder meeting took place in St. Croix, USVI. A meeting of the ISC was also conducted this same day with the main objectives of approving the proposed charter for the CLCC and finalizing the composition of the CLCC Steering Committee, both tasks assigned to the Tiger Team. There were no objections to the charter, but no voting took place to approve this document. The ISC agreed on a policy of one organization (or agency) one vote. The ISC also agreed on a voting membership composition of 8 federal agencies, 4 local Puerto Rico government representatives, 4 U.S. Virgin Islands government representatives, and 4 nongovernmental organizations.
- May 2013 – Dr. Brent Murry was hired by the USFWS as the CLCC Science Coordinator. First year task of Science Coordinator will be to develop a science plan as a component of the CLCC strategic plan.
- July 21st, 2013 - The ISC voted to adopt the [CLCC charter](#).
- December 2013 – 2013 Annual Meeting to Develop the CLCC’s Strategic Conservation Framework: *Identifying Priorities and Setting a Course for Cooperative Conservation of our Lands and Seas*.

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## **Summary of activities:**

### **Late 2012:**

November 1: First Annual CLCC all hands Meeting in San Juan, P.R.

November 13-17: National LCC meeting in Louisiana, Lafayette, Coordinator and Partnership Coordinator participation.

December 1: The Caribbean LCC had its first [Quarterly Connections Newsletter](#). The bilingual (Spanish and English) newsletter was sent to all of our current partners and interested people.

December 3: William Gould, presentation to the IGERT program graduate students at the University of Puerto Rico, Rio Piedras Campus.

-[Annual Report for Year 2012](#) was made available in our website.

### **First quarter 2013:**

February: CLCC Partnership and Outreach Coordinator attended the SE CSC meeting *Sea level rise and vulnerability assessment and climate change adaptation* in Raleigh, North Carolina.

#### *Outcomes:*

- Presentation of CLCC interests and capacity
- Successfully promoted the CLCC having meaningful inclusion in DOI CSC Sea level rise vulnerability assessment projects
- Connected with renowned scientists Nathaniel Plant and Robert Thieler. They are interested in extending the work they have done on coastal hazards for the continental US to the Caribbean region.

February 28: Latino Climate Action Network attended by William Gould and Kasey Jacobs, presented a poster about the CLCC.

March 1: Kasey Jacobs, William Gould, Steering Committee member Pedro Ríos and CLCC partners led a field trip to northeastern Puerto Rico and El Yunque National Forest with the Puerto Rico Climate Change Council for the 2013 Latino Climate Action Network.

March 4: Sustainamatrix members Glenn Page, Jeselyn Calderón and Audrey Swanenberg met with CLCC staff and Interim Steering Committee members at the USFS International

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Institute of Tropical Forestry, San Juan, Puerto Rico. Sustainamatrix, based in Baltimore, Maryland, was contracted to work on human dimensions issues for the CLCC.

*Outcomes:*

- Kasey Jacobs will lead efforts, contractor Karen Solá (in charge of creating the compendium of conservation organization for PR and USVI) and Jesely Calderón (Sustainamatrix) will be working together to get the most out of partners, create an interview process and avoid redundancy and duplication of efforts as we look to document “who is doing what” in conservation in the Caribbean.
- Additional social scientists have been invited to collaborate in the creation of interviewing strategies.

March 13: Staff hosted a CLCC information table on an IGERT retreat activity at the University of Puerto Rico.

**Second quarter 2013:**

Lia Nicholson, a summer intern from the Yale School of Forestry, developed and implemented a survey for outreach to potential international partners in the Caribbean region.

April 13: The CLCC hosted an informational table, along with other major conservation organizations and agencies, at the Leatherback sea turtle festival in Luquillo Puerto. We distributed informational materials about the Cooperative and gave out temporary tattoos made by a local artist specifically for the CLCC.

New members have joined our ISC including: Joel Tutein from the National Park Service in the USVI, Evelyn Huertas from the EPA, and Rafael Rodríguez from the USGS.

An event Planning Team was created for the May 23rd annual stakeholder meeting in St. Croix, USVI. The team is composed of CLCC staff and several partners, with strong participation from USVI partners:

- Zandy Hill-Starr, NPS
- Dave Goldstein, NPS
- Sean Krigger, VI SHPO
- Paul Cherkeroff/Jason Budsan, VICS
- Nick Drayton, UVI/EPSCor
- Lisamarie Carrubba, NOAA
- JP Oriol, DPNR/CZM-CLCC Vice Chair

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May 15: The Caribbean LCC hires a new Science Coordinator; Brent Murry began working in late May as a FWS Science Administrator in the SE Regional office of the FWS and the CLCC Science Coordinator. Dr. Murry is stationed at the International Institute of Tropical Forestry-FS, Rio Piedras and is an Adjunct Scientist with the Institute.

May 23-24: Spring Steering Committee and stakeholder meeting at the University of the Virgin Islands on St. Croix in the USVI. This will be an annual spring event to complement our fall stakeholder meeting in San Juan, Puerto Rico. Over 90 members from Federal, Puerto Rican, and Virgin Island agencies and organization participated. Participants had the chance to meet and interact during a half-day Interim Steering Committee meeting, a one-day full meeting and field trips following the event.

CLCC staff attended meetings with San Juan Bay Estuary Program, Acoustic Monitoring Network, the Coalition for the Northeast Ecological Corridor, Latino Climate Action Network and other informal meetings with potential partners to promote CLCC and have preliminary conversations on science and action priorities and needs of potential partners.

June 4: Kasey Jacobs did a presentation in St. Thomas, U.S. Virgin Islands at the USVI Climate Change Ecosystem-based Adaptation Workshop: Allowing for Resilient Ecosystems. She discussed with participants potential ways to collaborate.

**Third quarter 2013:**

The [CLCC has a new charter](#) that has been approved by the Interim Steering Committee and is now posted on the DOI Sharepoint Site and CLCC website.

Lia Nicholson, CLCC summer intern from Yale University's School of Forestry and Environmental Studies, finished the first part of an ecosystem governance international project of conservation organizations within the Caribbean Region. The project is titled Developing a Compendium of Conservation Coalitions in the Caribbean for the CLCC: Connecting the Dots. The information gathered in a survey is now available in the [Caribbean LCC website's data portal](#) (under Ecosystem Governance).

We expanded the reach of the CLCC's social media and multi-media platforms. The CLCC flickr page has photos of the March Climate Expedition to Puerto Rico's Climate Change-Threatened Places and has received 700 views. The number of Twitter followers increased from 447 on June 1<sup>st</sup> to 499 on July 31<sup>st</sup>.

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July 27-31: Lia Nicholson presented the preliminary results of her project at the [Society for the Conservation and Study of Caribbean Birds \(SCSCB\)](#) in St George's, Grenada during the week of July 27-July 31, 2013. In the conference she gave an oral presentation titled "Connecting the Dots: Understanding the state of Caribbean-regional knowledge and capacity for action conservation".

August 4-9: Kasey Jacobs attended and gave an oral presentation about the CLCC organization at the Caribbean Forester's Association Meeting in Boca Chica, Dominican Republic from August 4-9, 2013.

A planning team formed by Brent Murry, Susan Silander, Marixa Maldonado, and Kasey Jacobs to the lead in planning for the December 12 all hands meeting of the CLCC.

**Fourth quarter:**

October 20-22: Marixa Maldonado represented the CLCC in the Green Infrastructure Summit sponsored by the EPA, the Syracuse Financial Center and the University of Syracuse in New York, Oct 20-22<sup>nd</sup>. During this activity the EPA distributed their agency agenda for the upcoming year. The EPA partnering with the Syracuse Financial Center are sponsoring the PR and USVI recycling partnership programs.

November 11-17: Kasey Jacobs traveled to St Croix, USVI to meet with CLCC partners on the Strategic Conservation Framework & Place-Based NGO process and to participate in the Caribbean Regional Ocean Partnership/Regional Planning Board and Coral Reef Task Force meetings.

November 19-20: The CLCC hosted a two day workshop on dynamically down-scaled climate data. The workshop brought climate modelers and output users together to discuss most appropriate variables and time steps to produce in the modeling work.

Science Coordinator, Brent Murry, attended the IUCN Iguana Specialist Group conference in Jamaica during the month of November.

Science coordinator, Brent Murry participated in a week-long international FWS symposium on endangered species held at the hotel Verdanza in San Juan, Puerto Rico. The representation of the Caribbean LCC was critical outreach to potential future international partners. There were representatives from 16 island nations, the US, and European countries having interests in the Caribbean. A decision was made to create an international Iguana Steering

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Community as a CLCC working group. This group is envisioned to work first on endemic iguana conservation, but over time expand its scope to broader taxa and conservation issues.

Kasey Jacobs represented the CLCC in the International Conference in Jamaica during the month of November where she gave a presentation about the benefits of collaborative conservation.

December 10: The CLCC hosted a full day meeting with all the Interim Steering Committee members, including new members from USGS, the Army Corp of Engineers, the Nature Conservancy and the Para la Naturaleza (formerly the Conservation Trust of Puerto Rico).

December 11: The CLCC annual all hands meeting was held at the Hotel Verdanza in San Juan, Puerto Rico. Invitational travelers included 13 participants from the USVI and keynote speaker Stanton Enomoto from the Pacific Islands CCC. We initiated a new poster presentation session the evening prior to the meeting at a prominent local business. The emphasis of the meeting consisted of three 1 hour workshops where the participants (including > 20 remote on-line participants) prioritized goals for each of the CLCC Theme areas. The results of which form the basis of the first step of the CLCC Science Plan. The top three priorities identified for each Theme are listed in Appendix I. The Winter Quarterly Newsletter will have more detailed information and outcomes from this activity.

December 13: The CLCC hosted a half day field trip (attended by approximately 30 participants) to the Piñones Forest and the San Juan Bay Estuary Area where participants had the opportunity to learn more about the current collaborative efforts of conservation in these protected areas. Presentations by Dr. Yogani Govender of Para La Naturaleza, and other partners, were offered during the field trip.

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## **Research Projects**

### **-Vegetation dynamics related to climate and land use in Puerto Rico and the US Virgin Islands**

- **Project Status:** In-progress
- **Geographic Scope:** Puerto Rico and the US Virgin Islands
- **Principle Investigator(s):** Postdoctoral researcher Azad Henareh (NCSU/IITF) works with IITF Research Ecologist William Gould and NCSU professor Jaime Collazo. The research is housed in the IITF GIS and Remote Sensing Laboratory.
- **Sponsor(s):** This project is supported by the US Geological Survey, North Carolina State University (NCSU) and the US Forest Service International Institute of Tropical Forestry (IITF).
- **Goals:** Two studies are the main components of the project:
  - **Spatial factors of land cover transition in Puerto Rico**

The transition between land cover types is dependent upon landscape spatial arrangement. Land cover maps for 1951, 1977-78, 1991-2, and 2000 are available from the previous studies. We are developing a land cover from 2010 aerial photography. For each transition type at each time step we calculate all topographic, climatic, hydrologic, management, and other spatially referenced themes. We are using binomial logistic regression to calculate the probability of each transition based on the main underlying factors, and we check whether the spatial factors with significant effects change through time. The transition probabilities based on spatial arrangement will be a new source of information for all spatially explicit landscape modeling of the area.

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- **State and transition simulation modeling of vegetation dynamics**

We will use the calculated transition probabilities from our first step as inputs for simulations in a state and transition model. The model will be created in Path tool which uses state-and-transition models to simulate the future vegetation conditions on a landscape. The model in Path environment will be connected to TELSA tool which is used to process the GIS data and do the simulations in a spatially explicit environment. We will validate the model projections for accuracy. Our simulations will be used along with results from climate change, hydrology, and urban modeling being done by the NCSU team to help in assessing future scenarios, spatial planning, and resource management in light of climate change.

### **-Ecosystem Governance Knowledge Base**

- **Project Status:** In-progress. Expected completion September 2013
- **Geographic Scope:** Puerto Rico and the US Virgin Islands
- **Principle Investigator(s):** SustainaMetrix is a social enterprise located in a business incubator at Johns Hopkins University that focuses on building capacity for the ecosystem approach. They offer a wide range of training, planning, evaluation and facilitation services and specialize in complex and dynamic social-ecological systems. They excel in situation analysis and have a range of conceptual options to best fit the challenge and engage the appropriate stakeholders. For example, one framework applies a sequence of “essential actions” that define the processes by which an ecosystem-based initiative is organized. This is best captured by the five step management cycle that organizes the many actions (and the different contributions of the sciences) to steps of issue identification and analysis, planning, negotiation of the necessary authority and funding to implement a plan of action, program implementation and an evaluation of the effort and its impacts. Their work has shown that a well-designed and well-executed management process still may not produce the desired outcomes. This has led to development of the Orders of Outcomes framework. This simplifying framework disaggregates the ultimate goal of sustainable forms of development into a sequence of

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more tangible outcomes. They also build capacity for high quality collaboration to work more effectively across sectors, cultures, disciplines and scales.

- **Sponsor(s):** This project is supported by U.S. Fish & Wildlife Service's Southeast Region (Region 4), National Fish and Wildlife Foundation and Caribbean Landscape Conservation Cooperative.
- **Project Cost:** \$64,000
- **Goals:** A team from SustainaMetrix, Glenn Page and Audrey Swanenberg, will be assisting the CLCC and partners in the development of an inventory of conservation based actions, collaborative structures and sources of governance at multiple scales to serve as a basis for an ecosystem governance knowledge base.
- There are four main components to this work:
  - First, the team will engage with principal participating organizations of the CLCC and conduct interviews with steering committee members regarding their organization's structure, priority areas of focus, priority issues they are addressing, goals and objectives, core capacity, range of conservation activities on Puerto Rico and USVI, as well as their involvement in other forms of conservation-based collaborative structures. Distill key findings, our distilled findings/analysis.
  - Second, the team will define specific attributes of the intended collaboration within the CLCC so that its existence, development, quantity, quality and effects can be measured, observed and documented. The team will be using the Collaboration Evaluation and Improvement Framework (CEIF).
  - Third, the team will examine three examples of ecosystem-based governance (Guánica Watershed Restoration, St. Croix East End Marine Park and the CLCC) to model a process to inventory and map collaborative structures in place, their goals and objectives, current activities, and other potential sources of governance. The team will be using The Analysis of Governance Response to Ecosystem Change developed by Olsen, Page and Ochoa, 2009.
  - Fourth, the team will make a series of recommendations to the CLCC for the development of an expanded ecosystem governance knowledge base, use of the

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knowledge base to define and refine goals, to sequence and prioritize actions, and to evaluate progress of the CLCC along the way.

- The goal of the project is to build adaptive capacity, increase learning by doing, and increase the overall quality of the collaborative process of the CLCC.

**-Systems' Response to Climate Change Projections and Species-distribution Models in the Caribbean.**

- **Project Status:** On-going; expected completion date is June 2014.
- **Geographic Scope:** Puerto Rico and the U.S. Virgin Islands
- **Principle Investigator(s):** Jaime A. Collazo, William Gould, Lauren Hay, Jennifer Costanza, Azad Henareh Khalyani, and Ashley Van Beusekom.
- **Sponsor(s):** U.S. Geological Survey, U.S. Fish and Wildlife Service, U.S. Forest Service and Caribbean LCC.
- **Project Cost:** \$229,666
- **Research question(s) and approach:** We propose to use downscaled climate data to: 1) model climate-change related effects on water quantity and water temperature across the island, 2) simulate future spatial patterns of urban growth across the island according to recent growth urbanization trends, and 3) model vegetation dynamics to project future land covers for Puerto Rico and the USVI.
- **Goals:** This work will be used to project biotic and abiotic responses of tropical island ecosystems to climate change and urbanization.

**- Assessing climate-sensitive ecosystems in the southeastern U.S.**

- **Project Status:** On-going; expected completion date is September 2013.
- **Geographic Scope:** Puerto Rico and the U.S. Virgin Islands
- **Principle Investigator(s):** Jaime A. Collazo, Jennifer Costanza, and William Gould
- **Sponsor(s):** USGS Southeast Climate Center, Caribbean LCC
- **Project Cost:** \$50,000
- **Research question(s) and approach:** We are assessing the three components of vulnerability: exposure, sensitivity, and adaptive capacity of selected ecosystems in

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Puerto Rico and the U.S. Virgin Islands. Ecosystems were selected based on feedback from local LCCs.

- **Goals:** The result will be a comprehensive assessment of potential climate change impacts to selected ecosystems, an explicit outline of how to assess other ecosystems of interest in Puerto Rico and U.S. Virgin Islands, and a list of recommended management, conservation, and monitoring strategies.

**-Developing multi-model ensemble projections of ecologically relevant climate variables for Puerto Rico and the US Caribbean.**

- **Project Status:** On-going
- **Geographic Scope:** Puerto Rico and the U.S. Virgin Islands
- **Principle Investigator(s):** Adam Terando, Ryan Boyles, Jared Bowden, Jaime Collazo, William Gould, Vasu Misra, and Lydia Stefanova.
- **Sponsor(s):** USGS Southeast Climate Science Center, Caribbean LCC
- **Project Cost:** \$527,708
- **Research question(s) and approach:** We propose: 1) Engage in ongoing dialogue with ecologists, hydrologists, and conservation biologists, eliciting expert knowledge to focus resources on the most valuable types of information that will aid decision-making, 2) simulate precipitation response to the anthropogenic forcings (both local and global) at a scale that resolves key physical processes, such as convection, across Puerto Rico, 3) characterize the uncertainty in the projections by nesting up to two regional climate models (RCMs) within a minimum of two and up to four general circulation models (GCMs), that simulate the climate response to the anthropogenic forcing based on a ‘business-as-usual’ emission scenario (known as RCP8.5), and 4) develop projections of ecologically-relevant climate variables that will most directly influence the distribution and persistence of wildlife species, namely, ectotherms (e.g., reptiles, amphibians). Such variables include, in addition to precipitation, projected changes in cloud-base heights, surface air temperature, relative humidity, and evapotranspiration.
- **Goals:** The resulting simulations will fill a critical need for climate change information in Puerto Rico and the broader U.S. Caribbean by enabling future estimates of likely deviations from known ranges of species’ thermal/moisture optima. Our proposed work

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further scientific understanding of local responses to global climate change and lays the foundation for a decision analytic approach to climate adaptation in the Caribbean LCC.

**-Development and dissemination of a high-resolution national climate change dataset.**

- **Project Status:** Near completion; data for Puerto Rico is in the process of being reviewed and submitted to complete the project. Expected completion date is June 2014.
- **Geographic Scope:** United States and U.S. Caribbean
- **Principle Investigator(s):** Jaime Collazo, Nathaniel Booth, Lauren Hay, Katharine Hayhoe, and Adam Terando
- **Sponsor(s):** This project is supported by the U.S. Geological Survey and U.S. Fish and Wildlife Service.
- **Project Cost:** \$276,834
- **Research question(s) and approach:** The project had three objectives: 1) develop a database of up-to-date and state-of-the-art downscaled climate projections for the continental U.S., using a range of plausible future greenhouse gas emission scenarios, 2) conduct workshops to solicit input about climate-related data needs and to discuss best practices for accessing and using downscaled climate projections and other landscape change datasets, and 3) make downscaled climate and other landscape change projections available as an enterprise-level web-based source. Users will be able to freely access the data via an interactive, easily manageable interface, in formats which are familiar to ecosystem and impact modelers.
- **Goals:** The Geo Data Portal (GDP) will provide public access to high-resolution climate change projections in Puerto Rico, and eventually, the U.S. Virgin Islands. The Geo Data Portal (GDP) is now available for public use at <http://cida.usgs.gov/gdp/> and a prototype of the companion portal that calculates various projections of climate thresholds and extremes is available at <http://cida.usgs.gov/climate/derivative/>

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**-Strategic habitat conservation in Puerto Rico**

- **Project Status:** On-going
- **Geographic Scope:** Puerto Rico
- **Principle Investigator(s):** Jaime A. Collazo, Stephen J. Dinsmore, James F. Saracco, and Jose Cruz Burgos
- **Sponsor(s):** Puerto Rico Department of Natural and Environmental Resources
- **Project Cost:** \$294,395
- **Research question(s) and approach:** The goal of this project is to design a biological corridor for resident avian species between Guánica and Susua State Forest Reserves in southwestern Puerto Rico. The project emphasizes the estimation of patch colonization and extinction rates in agricultural, urban, and forested matrices, and the permeability of the urban matrix.
- **Goals:** A spatially-explicit conservation design plan to facilitate movement of birds through habitat matrices, and ultimately, between Susua and Guánica Reserves to foster species persistence in the region. The strategy recognizes that the landscape is under multiple land uses, including low density urban development. The conservation design is centered along the Rio Loco watershed, joining ongoing conservation efforts in the watershed by USDA-NRCS and NOAA.

**Goals for 2014**

- Specify and more clearly explain the roles of each one of the partners involved to have a more operational idea of how everyone fits in the CLCC.
- Engaging non-conservation community stakeholders.
- More engagement with the conservation community's Human and Social Dimensions specialists to incorporate social science and evidence-based processes into our internal governance structure and facilitation methods. Already the work we do in this area is different than other LCCs and conservation partnerships. Integrating established

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practices into our framework, governance, science plan, and facilitation we are more likely to effectively bridge science and action.

- Based on the success of our first intern we would like to create new intern positions to assist with a number of different tasks. We look forward to having interns all year long, this is beneficial both ways since they will be helping the CLCC but also will be gaining significant professional experience. (Ideas: communications interns for website, social media and graphic design; Geospatial intern for geospatial/data portal)
- New photos for our communications. A photography contest via facebook or flickr to create a place in the internet where people could upload conservation-themed photos and to expand the CLCC's photo library for our products and materials like the annual report.
- New group tools to replace the current website community tools. Need to research GoogleGroups or GriffinGroups.
- The staff, steering committee and conservation community would benefit from a collective understanding of what we mean when we use the terms "shared vision" and "conservation planning". Early 2014 we will be working on our presentations and other communications tools to move us to that end in addition to the meetings and workshops we will host throughout 2014 to establish our shared vision and science plan. We expect our science plan to be absolutely outcome based, fully implementable and success should be measurable.
- Better connecting CLCC work to decision making and implementation. Our number one goal is deploying sound science for sound decision making. Implementation via this science-action bridge is a key goal for 2014!

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**Appendix I.** Shared conservation priorities identified by CLCC Theme area by participants at our December 2013 Stakeholder meeting in San Juan, PR.

### Wildlife Theme



Puerto Rican Parrot (*Amazona vittata*)  
Credit: Tom MacKenzie

- Develop species habitat decision tools to help mitigate the impacts of habitat fragmentation, climate change, and associated stressors - expand research into the effects of climate change related stressors on organism life history cycles and population viability.
- Expand and integrate existing federal, state, academic, and citizen invasive species monitoring networks and policies; identify and eliminate pathways for introduction of new exotic species; prevent the spread of existing invasive species; and eliminate/control invasive species especially within priority habitats.
- Move toward more holistic ecosystem or community management to ensure that fishery and wildlife manage works to maintain ecologically balanced populations among functional groups especially in light of anticipated land cover and climate changes and associated stressors.

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### Land/seascapes Theme



St Croix Buck Island  
Credit: Gary Potts

- Develop marine, estuary, and terrestrial monitoring networks to collect sea level rise, ocean acidification, and climate change data to support early warning modeling, and establish a spatially integrated long-term data series for the Caribbean
- Evaluate the resiliency and vulnerability of different habitat types considering future urban expansion, climate change, and habitat connectivity

Identify areas locally, regionally, and internationally to create ecologically-connected networks of terrestrial, freshwater, coastal, and marine conservation areas that are likely to be resilient to climate change and support wide range of biota

### Conservation and Society Theme (table I.)



San Juan from above  
Credit: ethorson

- Increase public education about climate change and principles of mitigation and adaptation
- Address point and non-point source pollution
- Implement education programs for tourists (local and visiting) and especially the tourism sector (e.g. guides, service providers) on their impact to natural resources (e.g. snorkeling and corals)

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### Conservation and Society Theme (table II.)

- Integrate climate and other future stressors and scenarios into forward thinking species, land, and water management plans
- Conduct research to more fully understand the socio-ecological impacts of climate change
- Develop a landscape perspective for permitting agencies to use to permit for new development

### Cultural Resources



Christiansted Historic Site, St. Croix, USVI  
Credit: NOAA Photo Library

- Increase climate change awareness and capacity of natural resource managers and other decision makers / enhance their professional abilities to design, implement, and evaluate adaptation programs
- Public education for climate change and principles of adaptation
- Engage people with natural and cultural conservation programs, particularly who are disconnected with their natural surrounding such as urban populations

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### Working Lands and Agriculture



Rum distillery ruins, St Croix USVI  
Credit: Wikimedia Commons

- Develop future land use scenarios throughout the Caribbean addressing sustainable economic development and maintenance of ecological function in lieu of anticipated future stressors
- Reduce land erosion and land-based pollution entering lagoons and other coastal habitats from working lands
- Establish fisheries management reference points throughout the Caribbean

### Monitoring



NOAA's Coral Kingdom Collection  
Credit: Dr. Anthony R. Picciolo

- Support, coordinate, and develop integrated inventory, monitoring, observation, and information systems at multiple scales (Caribbean wide and continental) to detect and describe climate impacts on biota, human-natural coupled systems (social-environment-economic); develop and implement a Caribbean-wide Recreational Fisheries Data collection system and establish fisheries reference points throughout the Caribbean; establish a network of sentinel (long-term continuous monitoring and research) sites within protected lands and seas

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- Develop standardized approaches to modeling and monitoring techniques to facilitate the linkage of existing monitoring efforts to climate models and ecological/biological response models and develop standard methods and a comprehensive repository for water quality data throughout the region

Develop monitoring and research programs to better understand the diversity of unique ecology/geology throughout the region (e.g. bioluminescent bays, karst caves, etc.); develop and support on-going monitoring and research programs for threatened and endangered species and taxonomic groups of special interest (e.g. coral reef fishes, neotropical migrant birds, bats, etc.) and their habitats in lieu of anticipated future stressors; develop and support on-going monitoring and research programs addressing changing land cover and land use patterns across the region; and monitor the spread and dynamics of existing invasive species and develop a standard monitoring protocol for early detect of future invasive species on land and in seas.

### Data management



Rain Forest of El Yunque, Puerto Rico  
Credit: Alessandro Cai

- Develop and make available high resolution climate modeling information to support forecast modeling and adaptation planning
- Develop a centralized data access portal, protocols for data sharing, and a repository for meta-data including standardized protocols
- Develop and make available biogeographical data on species populations, ranges and migrations, habitat availability and connectivity, and climate projections