

Society for Conservation GIS

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Conference Program

15th Annual SCGIS International Conference

July 19–22, 2012

Pacific Grove, California

Building Resilience

A Message from the Conference Committee

We have entered a century of transition and face challenges that no generation has seen before. Our own technologies and innovations are now threatening the planet on which we live. Discussing these threats is not the focus of this conference, however. Instead, we should think about the less tangible, though possibly more dangerous, threat—apathy. At no other time in history have we consumed so much of nature's resources while behaving as if somehow we are not part of nature ourselves. We have forgotten that natural systems sustain all life on earth, including human life. Before real progress can be made, we first must become acutely aware of our place in nature and foster a sense of joint adaptation to help nature along in places where we have interfered and hindered it in the past.

The theme for the 2012 conference is Building Resilience, which applies to both ourselves and to nature. We are here to learn about technologies that serve nature rather than destroy it. Instead of allowing technology to distance us from nature, we challenge ourselves to use technology to help rebuild the connection. Topics this year range from the use of remote-sensing technologies for conservation to communication and public understanding of science and how interdisciplinary cooperation can offer solutions to seemingly unyielding problems. In nature, adaptation means survival. We are here to learn from each other about the diverse ways we can adapt and make ourselves and our planet resilient to the threats we face.

Carolyn Hughes, The Nature Conservancy
Kurt Menke, Bird's Eye View GIS
2012 SCGIS Conference Committee Cochairs

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Registration Hours

Scripps

Thursday, July 19

7:00 PM–9:00 PM

Friday, July 20

8:00 AM–8:30 AM

10:00 AM–10:30 AM

3:30 PM–4:00 PM

Saturday, July 21

8:00 AM–9:00 AM

10:30 AM–11:00 AM

Recycle Badges

At the end of the conference, please return your name badge holder to Scripps.

Thank you for your cooperation.

Conference at a Glance

Thursday, July 19

9:00 AM–5:00 PM	Preconference Training Workshop 1: Working with Geodatabases and Geodatabase Topology Oak Shelter
	Preconference Training Workshop 2: Remote Sensing Kiln
	Preconference Training Workshop 3: Introduction to Marxan Training Curlew
1:00 PM–5:00 PM	Field Trip Monterey Aquarium
5:15 PM–6:00 PM	Ranger Roxanne’s Tour of Asilomar
6:00 PM–7:00 PM	Dinner Woodlands
7:00 PM–9:00 PM	Registration and Welcome Reception Scripps

Map Gallery Opening and Reception

Map products, posters, and multimedia map projects illustrating the achievements of the user community will be on display at the popular Map Gallery. Several special exhibits will include displays of unique and innovative uses of GIS from around the world.

The Map Gallery opens with a reception on Friday evening and will remain on display throughout the conference.

Friday, July 20

9:00 AM–10:30 AM	Opening Session Chapel
10:30 AM–11:00 AM	Break Scripps
11:00 AM–12:30 PM	Panel Discussion Chapel
	Paper Sessions Curlew, Toyon, and Kiln
	Technical Workshop Nautilus
12:30 PM–2:00 PM	Lunch Woodlands
2:00 PM–3:30 PM	Paper Sessions Chapel, Curlew, Toyon, and Kiln
	Technical Workshop Nautilus
3:30 PM–4:00 PM	Break Scripps
4:00 PM–5:30 PM	Panel Discussion Chapel
	Paper Sessions Curlew, Toyon, and Kiln
	Technical Workshop Nautilus
6:00 PM–7:00 PM	Dinner Woodlands
7:00 PM–9:00 PM	Map Gallery Opening and Reception Chapel

Conference at a Glance

Saturday, July 21

8:00 AM–9:00 AM	Breakfast
9:00 AM–10:30 AM	Paper Sessions Chapel, Triton, and Kiln
	Technical Workshops Toyon and Nautilus
10:30 AM–11:00 AM	Break Scripps
11:00 AM–12:30 PM	Paper Sessions Chapel, Triton, and Kiln
	Technical Workshops Toyon and Nautilus
12:30 PM–2:00 PM	Lunch Woodlands
2:00 PM–3:30 PM	Paper Sessions Chapel, Triton, Toyon, and Kiln
	Technical Workshops Nautilus
3:30 PM–4:00 PM	Break Scripps
4:00 PM–5:30 PM	Paper Sessions Chapel, Triton, and Toyon
	Technical Workshops Nautilus and Kiln
6:00 PM–7:00 PM	Dinner Woodlands
7:00 PM–10:00 PM	Auction and Wine Reception Chapel

Sunday, July 22

8:00 AM–9:00 AM	Breakfast
10:00 AM–NOON	Closing Session Chapel
11:30 AM	Box Lunch Pickup

Auction and Wine Reception

You are invited to an evening celebration to close the SCGIS Conference.

The theme for the evening will be Cultures, Communities, and Conservation. Get ready to dress up, celebrate our global heritages, and raise some money to support conservationists from around the world!

There will be a silent and live auction to share treasures and artwork from around the globe. Please bring an item from your culture, community, or country and prepare to bid on some wonderful and exotic trinkets. All donations are appreciated and cherished; no item is too big or too small.

Items for the auction can be delivered to the Chapel room during breaks and lunch on Friday, July 20, or between 6:00 PM and 7:00 PM. A volunteer will help you complete an item description form.

Share your work, your history, or your passion with other conservation colleagues.

All funds procured will be used to support the SCGIS International and Domestic Scholarship Program, providing travel assistance to fellow conservationists from around the globe.

Opening Session Schedule

Friday, July 20 | Chapel

- | | |
|-------------------|--|
| 9:00 AM–9:10 AM | Welcome, Introductions, and Thanks
<i>Carolyn Hughes</i>
<i>Conference Committee Cochair</i> |
| 9:10 AM–9:25 AM | Introduction of 2012 International Scholars
<i>Sasha Yumakaev, Esri Conservation Program Coordinator</i> |
| 9:25 AM–9:35 AM | Message from the President
<i>Rob Rose, SCGIS President</i> |
| 9:35 AM–10:20 AM | Keynote Presentation
<i>Amy Vedder, PhD</i> |
| 10:20 AM–10:30 AM | Announcements and Close
<i>Carolyn Hughes</i>
<i>Conference Committee Cochair</i> |

Keynote Speaker Bio



Amy Vedder, PhD

An expert in conservation and ecology, Dr. Vedder has worked for more than 30 years in dedication to wildlife and wildland conservation, applying ecological and social science to save biologically rich and threatened places. Most recently, she served as Senior Vice President for Conservation at The Wilderness Society (TWS) in Washington, DC, where she focused on protection and sound stewardship of America's wild lands—from wilderness to the sustainable use of wild resources. Prior to joining TWS, Vedder was senior advisor to the Rwandan Environment Management Authority, addressing environ-

mental issues and national parks. Formerly she served as Vice President and director of the Living Landscapes Program at the Wildlife Conservation Society (WCS), a strategic initiative geared toward balancing the needs of wildlife and people. She also directed the WCS Africa Program and was senior liaison to multilateral agency programs.

Amy Vedder is widely known for her pioneering studies of mountain gorillas in Rwanda during the late 1970s and as cofounder, with her husband Dr. Bill Weber, of the Mountain Gorilla Project. She is the coauthor of the critically acclaimed book *In the Kingdom of Gorillas* and is the subject of a National Academy of Sciences biography (written for middle-school students) titled "*Gorilla Mountain*." She has appeared in several wildlife films and is an acclaimed public speaker.

Session Matrix

Friday, July 20

9:00 AM–10:30 AM	Opening Session Chapel				
10:30 AM–11:00 AM	Break Scripps				
11:00 AM–12:30 PM	Chapel	Curlew	Toyon	Nautilus	Kiln
	LandAdvisor and The Landscape Collaborative Panel Discussion	Planning for Wildlife	Building Resilience Panel Discussion	Technical Workshop	Conservation Remote Sensing
	The Landscape Collaborative: A Wiki-science Approach to Conservation GIS	Application of GIS for Buffering the Protected Area Buffer Zones*	GIS as a Catalyst for Conservation Action	Editing Tips and Tricks for ArcGIS 10	Evaluating Deforestation, Topsoil Erosion and Sedimentation in MaMa Bay, Madagascar from 2000 to 2010: A Remote Sensing Approach to Assess Human Impact on the Ecosystem
	LandAdvisor: A Living and Customizable Decision Support Framework and System	Human Activities That Threaten the Conservation of the Jaguar in the Buffer Zone of the Maya Biosphere Reserve, Petén*	Tools for Assessing Organizational Readiness for Developing a GIS Enterprise		Forest Remote Sensing, Tree Identification, and Tree Physiology
	Occupy the Gulf Islands	Using GIS for Evaluating Habitat Availability for Species Reintroduction: The Case of Jaguars in the Iberá Reserve in Argentina*	Using GIS as a Tool to Promote Sustainable Commodity Sourcing		Projecting Future Unplanned Deforestation for a REDD Feasibility Study in Cameroon
	Determining Priority Sites in Response to Reduced Conservation Funding	Community Wildlife Monitoring—A Case of NRT Community Conservancies in Northern Kenya*			
12:30 PM–2:00 PM	Lunch Woodlands				

2:00 PM–3:30 PM	Chapel	Curlew	Toyon	Nautilus	Kiln
	Regional Connectivity	Mapping Conservation Value	Ecological Resilience	Technical Workshop	Wildlife Remote Sensing
	The Staying Connected Initiative—Modeling and Mapping Wildlife Connectivity in the Northern Appalachians	A Land Resource Identification and Protection Plan for the Oberlin Project	Confronting Climatic Complexity: Fine-Scale Spatial Analyses for Resilience	Telling Stories with Maps	Using Remote Sensing and GIS to Extract and Model Critical Habitat for the Blanding's Turtle (<i>Emydoidea blandingii</i>) in Southern Ontario, Canada
	Staying Connected in the Northern Appalachians: From Regional Conservation Planning to Connectivity Modeling and on the Ground Conservation Action	Drafting a Conservation Blueprint for Labrador, Canada	Stream Temperature Sensitivity in Kelly Creek, Idaho		Spatiotemporal Patterns of Vegetation and Climate in Mongolia 1982–2010, and Implications for Gazelle Conservation
Bay Area Critical Linkages: Habitat Connectivity Planning for the Bay Area and Beyond	Developing a High Conservation Value Forest Network in Latvia Using GIS	Sustainable Forest Mosaics: Integrated Planning and Establishment of Common Protocols for Biodiversity Conservation and Forest Restoration*			
3:30 PM–4:00 PM	Break Scripps				

Session Matrix

Friday, July 20
(continued)

4:00 PM–5:30 PM	Chapel	Curlew	Toyon	Nautilus	Kiln
	Conservation Remote Sensing Panel Discussion	Corridor Design	Conservation GIS Online	Technical Workshop	Remote Sensing and GIS
	A Presentation on NASA's Biological Diversity and Ecological Forecasting Programs and a Panel Discussion on Conservation Remote Sensing	Amphibian Biodiversity and Corridor Ecology: A Case for Regional Planning	Using ArcGIS Explorer to Conduct Remote Fieldwork for Analysis of Landscape Integrity Models	Quantifying Current Ecological Condition for Your Conservation Project	Greenpeace Fire Fighting Work: Mapping, Analysis, Rapid Response*
		Macroecological Corridors in KwaZulu-Natal, South Africa*	Cloud-Enabling GIS for Conservational Collaboration		Methods to Capture and Use Indigenous Knowledge for Land-Use Planning and Management
		Assessing Wildlife Use in the Corridor Regions in the Endau Rompin Landscape, Johor, Malaysia*			
6:00 PM–7:00 PM	Dinner Woodlands				
7:00 PM–9:00 PM	Map Gallery and Wine Reception Chapel				

Session Matrix Saturday, July 21

9:00 AM–10:30 AM	Chapel	Triton	Toyon	Nautilus	Kiln
	Conservation Planning and Development	Wildlife Methods	Technical Workshop	Technical Workshop	Conservation Planning and Development
	Planning in California’s Rural Areas: A Geodesign Approach	Telemetry Tracking Tool Add-in for ArcGIS	Freshwater Conservation and the National Hydrographic Dataset	Understanding Projections for ArcGIS	FracTracker: Web-Based GIS for Communities Facing Natural Gas Development
	Facilitating Transparency and Collaboration in Conservation Planning for California Deserts	Effects of Landscape Covariates on the Distribution of Mammalian Carnivores on Former Fort Ord Army Base			Zanaga Mining Sensitivity Analysis
Using Scenario Modeling to Support Land Use Planning in Northern Ontario, Canada	Terrestrial Impacts of Marcellus Shale and the Development of an Index of Forest Habitat Change to Inform Conservation Planning				
10:30 AM–11:00 AM	Break Scripps				

Session Matrix

Saturday, July 21
(continued)

11:00 AM–12:30 PM	Chapel	Triton	Toyon	Nautilus	Kiln
	Conservation Planning for the Future	Bird Conservation	Technical Workshop	Technical Workshop	Cultural Landscape Analysis
	Incorporating Economic Models into Seasonal Pool Conservation Planning Using GIS	Study Breeding Habitat of Sarus Crane (<i>Grus antigone sharpii</i>) in Yok Don National Park, Dak Lak Province, Vietnam*	Protected Area Tools (PAT) for ArcGIS 10: Custom Tools that Support Protected Area Network Design	Working with Linear Referencing and Routes for Streams	A Landscape Space Syntax Analysis in Support of a World Heritage List Nomination
	A Map of the Human Footprint in the Conterminous United States	The Crowned Solitary Eagle in Argentina: Evaluation of Its Current Distribution Map*			Paleontology Probability Screening Tool Using CA Geology Data
	Applying Local Climate Projections to Conservation and Community Planning	Conserving the Lilian’s Lovebird in Liwonde National Park: A Look at Lovebirds Distribution, Water Availability and Poison Hunters*			Using GIS Predictive and Fetch Models to Increase the Efficiency and Effectiveness of Future Surveys for Possible Emerging Archaeological Sites along the Shore of Lake Mead Because of Dropping Water Levels
12:30 PM–2:00 PM	Lunch Woodlands				

2:00 PM–3:30 PM	Chapel	Triton	Toyon	Nautilus	Kiln
	Land Prioritization	Marine Wildlife	Ecological Methods and Tools I	Technical Workshop	Participatory Mapping
	Chesapeake Fish Passage Prioritization Web Map and Tool	Applying GIS Tools to Determine the Spatial-Temporal Resource Overlap between the Foraging Areas of Lactating South American Sea Lions (<i>Otaria flavescens</i>) and the Uruguayan Commercial Fisheries*	Forecasting Plant Invasions: Can We Predict Impact from Occurrence Data?	Ecosystem Monitoring Using Earth Observation Image Time Series	Participatory Mapping of Key Terrestrial Sites in the Transboundary Grenadine Islands
	The Development of GIS Tools to Aid Avian Site Evaluation	Involving Fishermen to Better Understand the Habitat Use of the Endangered Franciscana Dolphin in Uruguay: A New Hypothesis* Identification and Channel Characteristics of Cetacean Hot Spots in Waterways of the Eastern Sundarbans Mangrove Forest, Bangladesh*	Springs Distribution Inventory Design with Incomplete Data		Spatial Information Tools and Indigenous Participation in Sonora, México Participatory GIS in the Development of Wildlife Protected Areas Management Plans* Climate Change and the Local Communities from Lagamar Brazil—Applying IPCC Predictions and Providing a Geovisualization Framework*
3:30 PM–4:00 PM	Break Scripps				

Session Matrix

Saturday, July 21
(continued)

4:00 PM–5:30 PM	Chapel	Triton	Toyon	Nautilus	Kiln
	Mapping Hot Spots	Marine Planning	Ecological Methods and Tools II	Technical Workshop	Technical Workshop
	A Decision Support Tool for Wildlife Conservation in the National Petroleum Reserve—Alaska	The Caribbean Marine Biological Corridor: Incorporating Ocean Currents into MPA Network Planning	Madagascar Biodiversity Data for Conservation Planning and Management: The REBIOMA Project	Land Change Modeling and Its Implications for Biodiversity	Professional Tools for Raster Analysis
	Development of the Coastal Wetland and Tributary Decision Support Tool Web Map	A GIS Road Map for Sea Level Rise Vulnerability and Adaptation along the Hudson River Estuary	Mitigating Biofuels Impact in the Tropics		
	Using the Power of GIS to Identify Endemic Hot Spots in Arizona				
6:00 PM–7:00 PM	Dinner Woodlands				
7:00 PM–10:00 PM	Auction and Reception Chapel				

Session Descriptions Friday, July 20

11:00 AM–12:30 PM

Panel Discussion

LandAdvisor and The Landscape Collaborative

Room: Chapel

The Landscape Collaborative: A Wiki-science Approach to Conservation GIS

Presenter(s): John Gallo, The Wilderness Society, and Randal Greene, Feaver's Lane Enterprises

The Internet is revolutionizing the way society shares knowledge and works together. How can this transformation be leveraged to help the conservation movement? One way is to inject the principles of wikinomics (sharing, peering, being open, and being global) into the way that we do GIS projects. The Landscape Collaborative (TLC) has been created to these ends. The near-term mission of TLC is to provide a virtual laboratory for scientists and practitioners to develop and share tools, knowledge and skills regarding ecologically sustainable landscape planning and management. A few talented teams have begun to implement new tools and projects using the site. Three of these teams will be presenting next. All tools are released using the General Public License 3.0. This means that the models and scripts are open access; improvements by anyone on the models, scripts, and framework are open access too. At its core, TLC is all about working together as a society to maintain our home.

LandAdvisor: A Living and Customizable Decision Support Framework and System

Presenter(s): John Gallo, The Wilderness Society

In a world that is becoming increasingly dynamic and uncertain due to climate change and other stressors, it is important to have decision support systems that are living, flexible, and integrated. This is especially true for adaptive land-use planning and management of natural resources. Significant improvements have been made to LandAdvisor (previously termed BioVision). LandAdvisor is a customizable spatial decision support system (SDSS) that combines principles of landscape ecology and conservation planning and is available as an ArcGIS toolbox of open-access ModelBuilder and Python scripts. It uses multicriteria and multiobjective decision analysis to provide a transparent framework. An optimization engine is

used to identify portfolios of sites for conservation. There is a least-cost corridor algorithm programmed into the optimization engine, as well as a contiguity analysis. The current algorithm automatically models the corridors between every pair of reserves, prioritizes among them, and uses a new algorithm for decreasing processing time. Representation is met using the continuous benefit function approach and/or conservation targets/thresholds. Consensus-based approaches to setting some weights become a means for stakeholder collaboration. Assumptions are made transparent and tested, thereby providing an assumption sensitivity analysis. The SDSS is designed to update as new data, criteria, or values arise, thereby allowing real-time adaptation.

Occupy the Gulf Islands

Presenter(s): Mark Van Bakel, Islands Trust of British Columbia

During the 1960s, draft-dodgers flocked to the Gulf Islands in the Strait of Georgia, which to this day retains its reputation as a hippie haven. This "occupation" of the islands was soon followed by the establishment in 1974 of the Islands Trust, a unique form of local government, directed by the Islands Trust Act "To preserve and protect" the unique culture and environment for the benefit of the residents of the Gulf Islands and British Columbia. In September 2010 the Islands Trust Fund, the conservancy organization of the Islands Trust, initiated the development of a spatial decision support system (SDSS) designed to aid in making the tough decisions required to conserve the rich biodiversity of the Gulf Islands amidst an ever-growing diversity of threats. The SDSS, known as LandAdvisor, uses a multiple-criteria decision analysis (MCDA) coupled with geographical information systems (GIS) to assess habitat composition, connectivity, and contiguity, in order to identify conservation priorities. Preliminary results suggest that, while there are some limitations, this methodological approach offers useful insights into conservation planning. Key findings imply that current planning frameworks and conservation goals used previously by the Islands Trust Fund and by many other government and nonprofit organizations are insufficient to protect the highest priority habitats within the Gulf Islands. The use of this SDSS is a step towards better meeting the conservation planning needs of the Islands Trust Area.

Session Descriptions

Friday, July 20
(continued)

Determining Priority Sites in Response to Reduced Conservation Funding

Presenter(s): Tom Robinson, Sonoma County Agricultural Preservation and Open Space District

In 1990, the Sonoma County Agricultural Preservation and Open Space District was created by voters to preserve the unique biodiversity, scenic, and agricultural values of Sonoma County. In 1990, about 92% of the county lacked protection; today, 82% remains unprotected. Funded by a ¼% sales tax that generates approximately \$15M annually and lasts until 2031, the District purchases land and conservation easements on properties containing overlapping open space values (e.g., scenic, biotic, agricultural). A bond repayment and reduced tax revenue due to the nationwide economic downturn has raised the need to develop a spatial decision support system to transparently identify a network of conservation areas for the expenditure of the remaining tax revenue. To identify the network, we chose LandAdvisor, an ArcGIS ModelBuilder software-based decision support tool. LandAdvisor uses a flexible multicriteria overlay approach to arrive at overall site values. In addition to biodiversity criteria, such as habitat representation, connectivity, and contiguity, the multicriteria overlay approach allows the addition of abiotic criteria, such as scenic, recreational, and agricultural resources. LandAdvisor calculates return on investment (ROI) based on multiple conservation management scenarios (fee, easement, no action) and a given budget amount. Preliminary results suggest LandAdvisor will be invaluable for use as a decision support tool during an upcoming stakeholder-driven countywide conservation plan and in substantiating site-scale conservation values to potential grant funders.

11:00 AM–12:30 PM

Paper Sessions

Planning for Wildlife

Room: Curlew

Application of GIS for Buffering the Protected Area Buffer Zones

*Presenter(s): Bhuwan Dhakal, Action for Conservation and Sustainability, Nepal**

Buffer Zone Management underlies the philosophy of social capital to gain its ground in long-term conservation. But the integrity of the buffer zone has been in question because of its failure to fulfill the dual need of protecting the core zone along with fulfilling the demand of people living in the periphery. This paper tries to describe how GIS could be applied for differentiating the priorities within the buffer zone so that effective programs can be launched within different zones. This paper is based on the study carried out in Kolhuwa buffer zone VDC of Chitwan National Park and found that the buffer zone concept can only be successful if the priorities within the zone can be differentiated in such a way that communities living within the proximities of national parks can be given more incentives than those living in the remote areas. The study found that 42.78% of the fuelwood extraction was from the national park in which more than 75% of households extracting the fuelwood were within 750 m of the National park.

Human Activities That Threaten the Conservation of the Jaguar in the Buffer Zone of the Maya Biosphere Reserve, Petén

*Presenter(s): Manuel Lepe, Wildlife Conservation Society, Guatemala**

The Maya Biosphere Reserve in Petén, Guatemala, has a buffer zone in order to prevent human activities which are conducted within the reserve forest fragmentation handling Maya. During the last 20 years, the function of the buffer zone has become more important due to the increase in the number of farms devoted to livestock and agriculture in the Petén. This has been caused by the movement of the livestock industry from the south of Guatemala to the Petén which happened in the early nineties.

The jaguar (*Panthera onca*) is a species that is at the top of the food chain in natural species of the Maya Biosphere Reserve

(umbrella species) and requires large amounts of territory to obtain resources for survival. In recent years the decline of natural prey of the jaguar and the deforestation from forest fires have made it necessary for the jaguar to leave the reservation in order to get their food from cattle farms in the buffer zone.

Currently the conflict between livestock and the jaguar in the buffer zone of the Maya Biosphere Reserve is the main threat to the survival of the jaguar. The objective of this presentation is to design a map showing the areas of greatest threat as human activities in relation to the conservation of the jaguar. Data was collected in regards to predation events on cattle farms, and to know the geographic locations of livestock production would serve as the basis for landscape design for the survival of endangered jaguar.

Using GIS for Evaluating Habitat Availability for Species Reintroduction: The Case of the Jaguars in the Iberá Reserve in Argentina

Presenter(s): Carlos De Angelo, Research Center of the Atlantic Forest (CeIBA); Subtropical Biology Institute (IBS)

The jaguar (*Panthera onca*) is the largest felid of the American Continent but it became extinct from most of the southern South America, including most of Argentina. The Iberá Reserve is a large protected area of 1.3 million hectares in the Northeast of Argentina, which protect the largest wetland of the country. In this area, jaguars were common until the 20th century when humans start eliminating this species and its prey from the entire region, and the last jaguar was killed around 1950. In the last decades, a reduction of human pressures in combination with increasing efforts of governmental and private conservation actions favored the recovery of many species of Iberá and triggered the discussion about the possibility of reintroducing jaguars. One of the main aspects for this species reintroduction is the evaluation of habitat availability, but considering in this analysis the possible conflicts and human pressures that still persist in the area. With this aim we developed GIS layers and combined them in a multi-criteria analysis for predicting the availability of habitat for jaguars in Iberá. We used the information available about jaguars in other regions to construct two models: the habitat condition model (including landscape characteristics, vegetation and prey distribution) and a human pressure model (including distance to human infrastructures, human accessibility, abundance of cattle, among others). We combined these models using a two-dimensional approach. This approach allowed us to differentiate 250,000 ha of potential core areas for jaguar reintroduction

(with good habitat and low human pressures) and the potential sink areas and barriers for the species (with poor habitat and high human pressures). Additionally, these combination of models identified those potentially conflictive areas that jaguars may select because their good habitat conditions but with high risk because human pressures (very important for future management), and those areas with poor habitat conditions but low human pressures that could be useful as buffer areas or corridors (>400,000 ha). Extrapolating the known density of jaguar in other regions, our results suggest that the Iberá Reserve has available habitat to sustain a population of between 25 to 150 jaguars, with an average of ~70 individuals living in core areas with good habitat and low human pressures.

Community Wildlife Monitoring—A Case of NRT Community Conservancies in Northern Kenya

*Presenter(s): Dominic Lesimirdana, Northern Rangelands Trust, Kenya**

The Northern Rangelands Trust (NRT) has developed a simple and effective wildlife monitoring system to detect changes in trends and abundance of wildlife and their threats in community conservancies of Northern Kenya. The system, CoMMS (Conservancy Management Monitoring System), draws on experiences from other wildlife monitoring systems in use, has been tailor made to suit the capacity and situation of community conservancies, and is designed to meet the information needs of conservancy managers.

Ecological monitoring is commonly scientific and complex, often requiring scientific expertise in its design, implementation and analysis. Such systems, while providing important information on trends in biodiversity, have little community input or ownership. There are commonly delays from technicians in providing feedback to project staff and communities who may have little intuitive understanding of the resultant information. In the case of community conservancies, NRT's aim is to move away from externally led, 'scientific' monitoring and to develop monitoring systems in collaboration with conservancies which can be maintained entirely at a conservancy level and sustained in the long term.

CoMMS has been introduced to 16 community conservancies and is at various stages of implementation. Approximately 300 conservancy rangers are gathering data on a daily basis over 14,000 km² of northern Kenya in many areas where previously there was no information. This data is providing information to conservancy management, government and

* Denotes international scholar presentation

Session Descriptions Friday, July 20

(continued)

conservation organizations on the distribution and threats to wildlife in these areas. Data gathered over the long term will provide information on trends in wildlife within the conservancies which will be used to assess the success of conservancies in wildlife conservation. The principles used in the development of CoMMS ensure it has ownership by the conservancy, is sustainable and likely to be continued in the long term with minimal oversight by NRT.

11:00 AM–12:30 PM

Panel Discussion

Building Resilience

Room: Toyon

GIS as a Catalyst for Conservation Action

Presenter(s): Janice Thompson, The Wilderness Society

Conservation GIS professionals strive to produce accurate, credible scientific and graphic products that will effect change in the conservation arena. Given limited resources in the conservation community, it is worthwhile reviewing factors that make GIS work as an effective catalyst for conservation action. Four factors (with examples) will be presented that are common to successfully applied conservation GIS work. First is the development of new information for conservation stakeholders. This may be as simple as pulling together two strategic pieces of information never before displayed together on a map or the results of a complex spatial analysis. The second is to present results in the simplest and most useful means possible for the target audience. Ideally, the results highlight an unexpected fact or idea and/or fill an immediate need of the audience to facilitate their taking action. The third element is the integration of GIS work with other elements of the broader conservation effort. This means planning the GIS analysis, product development and final rollout with colleagues before starting the GIS work. This will ensure that the spatial analysis and maps take full advantage of the science and policy of the particular conservation issue and yield well-crafted products to be effectively used in advocacy campaigns with local stakeholders, media, politicians or other target audiences. The fourth element is building relationships with the consumers of your GIS results. It takes time for organizations and GIS professionals to establish connections, build trust, build credibility and, ideally, be invited to contribute technical expertise.

Tools for Assessing Organizational Readiness for Developing a GIS Enterprise

Presenter(s): Doreen Whitley, National Audubon Society

This presentation outlines the process, lessons learned, and tools developed for assessing organization readiness for developing and implementing a GIS enterprise. The discussion is primarily suited for decentralized not-for-profit conservation organizations. These organizations are unique because traditionally the noncorporate structure may present a challenge for implementing a GIS enterprise. Learn how the National Audubon Society challenged themselves to do so and developed tools and best practices for completing organizational assessments, leveraging current desktop GIS users to support an enterprise; integrate ArcGIS Online; and manage license deployment, support and training. Get answers to questions such as, do I need an enterprise? How do I assess my organization's capacity? How do I break down silos? Where do I house GIS in my organization?

Using GIS as a Tool to Promote Sustainable Commodity Sourcing

Presenter(s): Prashant Hedao, University of California, Davis

The world population today stands at 7 billion and is expected to reach 9 billion by the year 2050. Population growth in combination with increased per-capita consumption levels will further strain human and ecological systems. Interest in developing appropriate measures that maximize conservation and agricultural production is reflected in contemporary discussions over "land-sharing" and "land-sparing" practices, agro-ecological intensification and land use optimization.

If agriculture continues along a path of industrialization and corporate consolidation, then large multinational food corporations will wield increased influence over agricultural production practices in the coming decades. Food industry partners hope to leverage and encourage more sustainable cropping, processing, shipping, and transportation practices. Sustainable production practices will also need to improve farmer livelihoods through increased profit sharing and sustainable intensification, including impacts on land use, water availability and quality, and public health. The wide array of issues and data sources that inform sustainable sourcing makes it imperative for actors such as corporations to make systematic use of geo-spatial metrics to assess conditions, determine tradeoffs and track progress and performance.

GIS provides a platform through which corporate and other

actors may examine social, ecological, climatic, and economic aspects of global commodity production to identify priority concerns and opportunities. We have collected a suite of spatial data layers that shed light on different aspects of commodity production and that meet specified minimum inclusion criteria, including being more informative to implementing more sustainable sourcing practices and being acceptable to important stakeholders. We will describe our layer selection methodology and metadata management protocols, present our preliminary GIS analysis, and define some of the limits and applications of this approach. Data layers used are at national and global scales.

11:00 AM–12:30 PM

Technical Workshop

Editing Tips and Tricks for ArcGIS 10

Room: Nautilus

Presenter(s): John Schaeffer, Juniper GIS

This presentation will briefly review some editing basics, including hot-keys, snapping, and other tricks that improve productivity; demonstrate seldom used tools and techniques that provide additional editing power; and then show some advanced editing tools. Time will also be spent with table edits and using VBA and other tricks for editing tables. We will also cover nongeodatabase topology editing and ways to create and maintain coincident geometry outside of the Geodatabase and without having to have an ArcEditor license.

11:00 AM–12:30 PM

Paper Session

Conservation Remote Sensing

Room: Kiln

Evaluating Deforestation, Topsoil Erosion and Sedimentation in MaMaBay, Madagascar from 2000 to 2010: A Remote Sensing Approach to Assess Human Impact on the Ecosystem

Presenter(s): Jing Wang, Clark University

MaMaBay in northeastern Madagascar preserves 1% of the Earth's biodiversity in its three components, the Antongil

Bay, Makira Natural Park and Masoala National Park. This area is prone to anthropogenic influences, particularly in the form of deforestation for agricultural purposes and logging. This deforestation leads to significant topsoil erosion, which produces sedimentation in the bay itself. By analyzing satellite imagery from Landsat 7 ETM, Moderate Resolution Imaging Spectroradiometer (MODIS) and the Shuttle Radar Topography Mission (SRTM), as well as ancillary data such as Food and Agricultural Organization Soil Maps, the dynamics of this watershed were explored from 2000 to 2010 in a low-cost methodology to determine the extent of degradation. The result can be adopted to evaluate land cover change, prioritize conservation area, and improve policy.

Forest Remote Sensing, Tree Identification, and Tree Physiology

Presenter(s): Charles Levitan, Sierra Nevada College

Tree species have distinct spectral reflectances that may be used to generally distinguish forests of different types. These reflectance spectra also probably play an important role in the growth and survival of the trees. Trees use PAR (photosynthetically active radiation) to grow. Other longer wavelength radiation may either present a heat-load burden, leading to excess evapotranspiration or temporary dormancy. In cold weather the non-PAR light may warm the plant to enable photosynthesis at a time that water is abundant as melting snowpack or foliar absorption.

We have modeled heat absorbance and the role of needle geometry in heat retention and heat shedding by several conifers in the Ophir Creek/Third Creek, North Lake Tahoe watersheds. Mountain hemlocks in particular have distinct spectral signatures that may be appropriate for a strategy of reducing solar heat loading while maximizing PAR absorbance. Using newer sensors (Worldview-2) that sample spectra where this tree's spectral signature differs from that of other trees (yellow, red edge), we will delineate locations of these trees and estimate whether they are in microenvironments that would be conducive to that strategy.

Projecting Future Unplanned Deforestation for a REDD Feasibility Study in Cameroon

Presenter(s): Dr. Robert Rose, Wildlife Conservation Society

Forests play a critical role in the ongoing negotiations and global efforts on mitigating climate change. Forests stocks hold carbon and sequester more carbon when they grow and can thus mitigate climate change while deforestation

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(continued)

contributes heavily to the emission of greenhouse gases. Avoided deforestation was presented as a cost efficient way to curb greenhouse gas emissions, and in 2007 the concept of Reducing Emissions from Deforestation and forest Degradation (REDD) was integrated into the Bali action plan for fighting global climate change.

In partnership with the Cameroonian government, the Wildlife Conservation Society (WCS) developed a pilot landscape-level approach to REDD in the Takamanda-Mone landscape. The area was selected because of its biodiversity conservation benefits, but also because it was a microcosm of the drivers of deforestation and degradation that face Cameroonian forests in the area and presented an excellent site for evaluating and implementing a landscape-level approach to REDD. The goal of this project was to develop a model of deforestation to be used to project a future scenario of unplanned deforestation for the Takamanda-Mone, Cameroon landscape. Using ENVI tools to derive the land use and land cover change analysis and the IDRISI Land Change Modeler, we developed the models of deforestation based on a historic deforestation analysis combined with the local drivers of deforestation. From the land change model, we projected deforestation, at five year intervals to 2030, in order to estimate the amount of unplanned deforestation that would potentially occur in the absence of any conservation activities focusing on avoiding deforestation. These models allow us to assess the potential carbon credits available for sale on a voluntary carbon market and assess the feasibility of a REDD project to raise conservation funds in the Takamanda-Mone Landscape.

the impacts of habitat fragmentation and climate change by maintaining and restoring landscape connections across the Northern Appalachians region. The Initiative is focused on 7 key linkage areas in 4 U.S. states and 2 Canadian provinces. The first step in maintaining and restoring landscape connections in these linkage areas is to try and map where we think wildlife species are most likely to be living and moving around. In this presentation, I will give a brief introduction to the mapping and modeling goals of this project and then dig into a few of the modeling approaches we attempted, including CircuitScape, Least-cost path, and Resistant Kernel. I will highlight some of the assumptions, limitations, and pitfalls of each of these approaches and why one must be cautious when interpreting results, especially in a landscape that is still relatively intact.

Staying Connected in the Northern Appalachians: From Regional Conservation Planning to Connectivity Modeling and on the Ground Conservation Action

Presenter(s): Gillian Woolmer, WCS Canada

Ensuring that the forests of the Northern Appalachian/Acadian Ecoregion remain intact and connected is a priority for conservationists in this transboundary region that extends from New York to Nova Scotia. In 2010, following extensive regional conservation planning under the umbrella of the conservation consortium Two Countries, One Forest, the Staying Connected Initiative (SCI) was born. The Staying Connected Initiative is a partnership of twenty public and private entities focused on maintaining and restoring seven linkage areas identified as critical for safeguarding wide-ranging and forest-dwelling wildlife such as bear, moose, lynx, marten and bobcat from the impacts of habitat fragmentation and climate change. Regional connectivity models have been completed using CircuitScape and the Resistant Kernel method, while linkage area connectivity models have been performed using CircuitScape, FunConn and CorridorDesign. Staying Connected is also working on the ground helping communities choose actions that will sustain wildlife and local community values such as hunting, fishing, and other outdoor recreation uses by utilizing values mapping as an engagement and prioritization tool. With local engagement and collaborative partnerships the Staying Connected Initiative is taking practical steps towards local implementation of a regional conservation vision. This presentation will provide an overview of the Staying Connected to date, data products and the values mapping approach.

2:00 PM–3:30 PM

Paper Sessions

Regional Connectivity

Room: Chapel

The Staying Connected Initiative—Modeling and Mapping Wildlife Connectivity in the Northern Appalachians

Presenter(s): Daniel Coker, The Nature Conservancy

Staying Connected in the Northern Appalachians is an initiative to help safeguard wide-ranging and forest-dwelling wildlife such as bear, moose, lynx, marten and bobcat from

Bay Area Critical Linkages: Habitat Connectivity Planning for the Bay Area and Beyond

Presenter(s): Emily Garding, SC Wildlands

The Bay Area Critical Linkages Project will identify a network of conservation lands to ensure functional habitat connectivity across a large landscape. This wildland network will serve as the backbone of a regional conservation strategy. Using GIS-based methods, we are developing 14 linkage designs to maintain landscape-level ecosystem processes including movements of such wide-ranging species as mountain lion and badger. The linkage conservation plan generated by this project is based on geospatial methods including modeling habitat suitability, habitat patches and cores, and potential wildlife corridors. This approach delineates the best potential movement routes between targeted areas but also addresses whether suitable habitat occurs in large enough patches to support viable populations and whether those patches are close enough together to allow for interpatch dispersal. Ours is a highly collaborative interagency effort that involves scientists, wildlife and transportation agencies, and other implementers from the start. The resultant plan will give our partners the tools they need to immediately impact land use and acquisition decisions, prioritize lands for conservation, and preserve a functional network of wildlands.

2:00 PM–3:30 PM

Paper Sessions

Mapping Conservation Value

Room: Curlew

A Land Resource Identification and Protection Plan for the Oberlin Project

Presenter(s): Paul Boehnlein, Western Reserve Land Conservancy

The Oberlin Project is a joint effort of the City of Oberlin, Oberlin College, and private and institutional partners to improve the resilience, prosperity, and sustainability of the Northern Ohio community. The Oberlin Project's aim is to revitalize the local economy; eliminate carbon emissions; restore local agriculture, food supply and forestry; and create a new, sustainable base for economic and community development. The City and College have signed on to become one of 16 Clinton Foundation Climate Positive Development Program cities (one of only two in the United States).

Western Reserve Land Conservancy, a nonprofit organization that has preserved approximately 30,000 acres in northern Ohio, is using its expertise in GIS, planning, land protection and public funding to create the Resource Identification & Protection Plan for The Oberlin Project. Over the life of the project, the Land Conservancy anticipates preserving approximately 20,000 acres.

To prioritize land protection, the Land Conservancy is analyzing land use in terms of four key aspects; Natural Areas, which are characterized by hydrologic, landform and plant community values and modeled for conservation value using a probabilistic Bayesian Belief Network (BBN) informed by expert opinion; Working Lands, which are characterized by agricultural and sustainable forestry values and also modeled using a BBN approach; Solar, Wind, and Bio Energy potential, each analyzed using GIS methods to represent opportunities for clean energy land use applications; and Economics, representing potential opportunities for economic development in the Working Land and Energy spaces based on the spatial distribution of current resources.

The Resource Identification & Protection Plan is intended to serve as a road map for the Land Conservancy as it works to permanently protect land that will preserve the project area's significant farm, natural resource, recreational and energy assets. The initial planning phase of the plan is currently under way, and the resource protection phase will follow over the proceeding 10 years.

Drafting a Conservation Blueprint for Labrador, Canada

Presenter(s): Lindsay Notzl, Nature Conservancy of Canada

Labrador, Canada is a vast land of forest and shore, of taiga and coast. At 294,330 km², "The Big Land" is larger than the rest of Atlantic Canada combined. Its Torngat Mountains boast the highest peaks east of the Rockies, and its ecosystems are among the most intact remaining in the world. Sparsely populated, Labrador presents conservation opportunities long foregone across much of North America. However, the region is poised to undergo rapid change over coming decades, as hydro projects, roads, mines and other developments intensify. In 2009, the Nature Conservancy of Canada (NCC) embarked on a large-scale planning project to map areas of high conservation value throughout Labrador. Along the way, many of the ideas underpinning traditional conservation planning approaches have been challenged. This presentation will outline cutting-edge concepts and GIS techniques used to assess

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high value areas and highlight areas where NCC recommends future conservation efforts be focused.

Developing a High Conservation Value Forest Network in Latvia Using GIS

Presenter(s): Elmars Peterhofs, JSC "LATVIJAS VALSTS MEZI" ("Latvian State Forests")

Identification of environmental and social values is becoming an increasingly important part of forest management. This study aimed to identify potential High Conservation Values and their concentration sites in managed forest areas. Potential High Conservation Value Forests were selected by using GIS and by analyzing forest inventory data. Forest areas were ranked using various criteria, including concentration of nature values, potential biodiversity and concentration of naturally growing forest stands. Through this ranking, the most valuable forest areas were identified and selected. Ensuring regular spatial distribution of potential High Conservation Value Forests was an important part of developing the network. The final step was harmonization of nature protection and economic interests, taking into account ongoing forest management plans, forest infrastructure development, and maintenance plans.

2:00 PM–3:30 PM

Paper Session

Ecological Resilience

Room: Toyon

Confronting Climatic Complexity: Fine-Scale Spatial Analyses for Resilience

Presenter(s): Stuart Weiss, Creekside Center for Earth Observation

The San Francisco Bay Area is a region of immense climatic complexity spanning a hierarchy of macroclimate, mesoclimate, topoclimate, and microclimate. Climate change is a macroclimatic phenomenon driven by changes in atmospheric circulation and is captured by ensembles of downscaled Global Circulation Models. Mesoclimates are dominated by coastal exposure modified by mountain barriers, creating summer Tmax gradients from 15° to 35°C and winter rainfall gradients from 300 to 2000 mm, and are represented by 800 m scale interpolated climate surfaces. Topoclimates include effects of

insolation, cold-air pooling, wind exposure, and soil water balance and are captured at 270 m scales (and below) through the Basin Characterization Model and terrain modeling. This climatic complexity supports high biodiversity and provides first-order buffering against macroclimate change because species ranges can shift short distances (<1-10 km) across topoclimates and mesoclimates to track suitable climate spaces under any climate change scenario. We have developed multivariate metrics of climatic complexity including integrated water balance that can assess the resiliency of a Conservation Lands Network to species losses. This combination of process-based and statistical models provides a powerful tool for assessing climate change impacts at regional and local scales.

Stream Temperature Sensitivity in Kelly Creek, Idaho

Presenter(s): Stephen Gillis, University of Idaho

Climate change scenarios project a 2.5-4.5 degree Celsius warming across the Pacific Northwest over the next century resulting in acute responses in small mountain watershed stream temperatures. While climate change impact assessments have primarily focused on macroscale watersheds, the resilience of small mountain watersheds to climate change has not been well quantified. We assess the sensitivity of stream temperature in relation to daily summer air temperature and spring snowpack to quantify change within Kelly Creek, a small watershed in the Clearwater basin of North Central Idaho. Westslope Cutthroat Trout are native to Kelly Creek and are an indicator species, vulnerable to changes in stream temperature, that rely on cold, clean water for survival. We hypothesized that daily summer stream temperature is sensitive to air temperature and spring snowpack. This hypothesis was tested using hydrometeorological (air temperature, precipitation, snow water equivalent) and observed stream temperature data from 38 reaches within Kelly Creek in the years of 1996-2008 using linear regression modeling. Initial results indicate that summer stream temperature sensitivity varies, and individual reaches respond uniquely to hydrology and summer air temperature. With climate change projections suggesting warming summer air temperature and decreased snowpack, these results suggest higher summer stream temperatures in Kelly Creek, potentially affecting the Westslope Cutthroat Trout populations. Results of this work can help determine the potential impacts to similar small watersheds under climate change scenarios and provide information and guidance for adaptation to public and private stakeholders.

Sustainable Forest Mosaics: Integrated Planning and Establishment of Common Protocols for Biodiversity Conservation and Forest Restoration

*Presenter(s): Sabrina Costa da Silva, Instituto BioAtlântica, Brazil**

The sustainable forest mosaics (SFM) concept recognizes the multiple roles tropical forests serve around the world. Tropical forests are critical for the global climate, helping mitigate climate change by absorbing and storing CO₂ while generating oxygen. They protect watersheds, prevent erosion and soil degradation, cycle water and nutrients, supply nontimber forest products, and serve as habitat for the majority of the world's known species. Tropical forest areas are also home to substantial forest plantations, which supply an ever-growing portion of the world's demand for paper, personal goods, and inexpensive wood products. The SMF concept views forests as a "puzzle" of different land uses, working at a landscape scale to plan productive activities while protecting the forest ecosystems and the services they provide.

The Sustainable Forest Mosaics Initiative has the goal of increasing the effectiveness of conservation and biodiversity efforts in the forest mosaics that combine remaining native and planted forests. This unique Initiative encompasses three different scales, local, regional, and global. This design builds on ongoing work in one region of Brazil while seeking to expand this successful model to the rest of the Atlantic Forest and other regions of the world where plantation forests have a large footprint in landscapes. The Initiative takes a science-based landscape approach, seeking to guarantee results in an area large enough to benefit a range of species and ecosystems.

The Forest Mosaics initiative was launched in 2007 by Kimberly-Clark, Conservation International, The Nature Conservancy and the Instituto BioAtlântica. Three leading pulp and paper companies soon joined the effort (Veracel Celulose, Aracruz Celulose, and Suzano Papel e Celulose), and several additional partners have since formally joined the Initiative and are working to achieve common objectives.

A huge work was developed using GIS tools to assist in this challenge, first to define the places where the monitoring stations must be chosen and to set a timeline for areas prioritizing to restore at the regions that companies operate.

A clear and unbiased view of biodiversity changes in the region covered by the monitoring stations was possible by choosing monitoring stations at locations that represent all the types of vegetation and topographies in the region. Also relevant was

the establishment of stations along similar types of vegetation and topographies on opposite sides of the geographic barriers existing at the area.

The restoration actions will be concentrated in carefully chosen locations, where a positive impact, as large as possible, is expected to restore the connections needed to maintain the gene flow and to promote biodiversity maintenance. Thereby, the prioritization strategies were delineated in the sense of enabling to choose the locations where the restoration and conservation actions will have the greatest positive impact on the landscape and biodiversity structure. In order to define a methodology to define the anchor areas for conservation and restoration, it considered the fact that it is very important to optimize the use of available resources—that will always be limited—in order to generate the greatest possible benefits to the natural ecosystems. This methodology proposes more refined criteria for prioritizing restoration actions in Permanent Preservation Areas (PPA), Legal Reserves (LR) and other types of areas and the criteria to prioritize the areas to restore were established, so that the actions are initiated by the areas that will connect more vegetation fragments when the restoration is complete and so that the greatest restoration benefits are achieved in the first phases of the projects.

2:00 PM–3:30 PM

Technical Workshop

Room: Nautilus

Telling Stories with Maps

Presenter(s): David Asbury, Esri

This workshop will show you how to combine your spatial data with narrative elements and multimedia content to tell your story. We'll show you how to use web maps, templates, and other resources to leverage your data, excite your colleagues, inform the public, and spread the word about the important work you do.

* Denotes international scholar presentation

Session Descriptions

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2:00 PM–3:30 PM

Paper Session

Wildlife Remote Sensing

Room: Kiln

Using Remote Sensing and GIS to Extract and Model Critical Habitat for the Blanding's Turtle (*Emydoidea blandingii*) in Southern Ontario, Canada

Presenter(s): Amy Mui, University of Toronto

The overall objective of this research is to determine if suitable habitat for the threatened Blanding's turtle (*Emydoidea blandingii*) can be accurately modeled and mapped using remote sensing imagery and GIS data and techniques. Successful models of habitat suitability have been developed in a variety of ecosystems, however the extreme temporal and spatial variation of wetlands pose a unique challenge in the field of remote sensing and species distribution modeling.

This preliminary study will determine if meaningful environmental variables can be accurately extracted from high resolution remotely sensed data. High spatial resolution imagery is necessary to accurately model the various shapes and sizes of inland wetlands as well as the heterogeneity that is present within these ecosystems. Locational data from Blanding's turtle populations residing in urban, rural and natural habitats will be used to identify preferred habitat.

With this critical baseline information, further questions can be investigated regarding analysis of habitat connectivity, identifying areas where uncensused populations may exist, locating key wetlands in need of greater protection and the application of further modeling techniques to identify hot spots of road mortality by mapping paths taken by adult females during annual nesting migrations. Without suitable habitat which includes wetland complexes, upland forests, permanent pools of water and suitable terrestrial nesting habitats, the long-term persistence of the Blanding's turtle cannot be guaranteed. The ultimate goal of this research is to provide sound scientific evidence for the conservation, protection, and improvement of Ontario's freshwater wetlands and their adjacent habitats.

Spatiotemporal Patterns of Vegetation and Climate in Mongolia 1982–2010, and Implications for Gazelle Conservation

Presenter(s): Nick Cuba, Clark University

The Mongolian Gazelle has experienced a population decline of as high as 95% and a range reduction of 60% from historic levels due to pressures from poaching, mining, and expansion of livestock cultivation since the opening of Mongolia's trade borders in the early 1990s. Identification of critical Gazelle habitat area, based on grass availability and migration corridors, is needed for effective conservation efforts. This paper constructs a Gazelle habitat suitability map for three provinces in eastern Mongolia using a 26-year time series of monthly 8 km NDVI data from the AVHRR sensor that captures spatio-temporal variability and trends in grass productivity (GP). GP is related to remotely sensed time series of local and global precipitation (TRMM) and temperature (MODIS) using linear regression to reveal the climate conditions associated with prime grazing lands. Significant relationships are observed between GP and temperature ($r = 0.76$) and precipitation ($r = 0.71$). Large, contiguous tracts of highly suitable grassland in the east of the study area, in close proximity to existing protected areas, suggest that future conservation efforts can substantially expand the extent of, and connectivity between, protected areas of Gazelle habitat.

4:00 PM–5:30 PM

Panel Discussion

Conservation Remote Sensing

Room: Chapel

A Presentation on NASA's Biological Diversity and Ecological Forecasting Programs and a Panel Discussion on Conservation Remote Sensing

Session Organizers: Robert Rose, WCS; Allison Leidner, NASA; Cassandra Nunez, NASA; and John Musinsky, Conservation International

The National Aeronautics and Space Administration (NASA) is a research and development agency that has promoted "the expansion of human knowledge of the Earth" since its formation in 1958. In the last decade, NASA has supported ~\$15 billion of research and technology developments that have advanced our understanding of the atmosphere, cryosphere,

oceans, carbon cycle, and ecosystems via remotely sensed airborne and satellite observations. The NASA Biodiversity and Ecological Forecasting programs fund numerous projects with academic, nonprofit, for-profit, and other U.S. federal agencies. These projects enhance our fundamental understanding of biodiversity patterns and processes and develop tools that inform policy and management decisions. Here, we provide an overview of the Biodiversity and Ecological Forecasting Programs, highlight several projects with direct conservation applications, and discuss future program directions.

This panel discussion will provide SCGIS members an opportunity to reflect on the impact of remote sensing on conservation and the future outlook for conservation remote sensing applications. We also hope to discuss the revitalization of a conservation remote sensing working group that pulls together remote sensing scientists from conservation non-governmental organizations (NGOs), government agencies, and academic institutions. Reviving and reinvigorating this multi-organizational working group will facilitate the exchange of ideas among remote sensing scientists and conservation practitioners. Furthermore, better communication will position remote sensing researchers to benefit from NGOs' wealth of field knowledge and data and provide opportunities for NGOs to work with researchers to secure support for collaborative, conservation-relevant projects.

4:00 PM–5:30 PM

Paper Session

Corridor Design

Room: Curlew

Amphibian Biodiversity and Corridor Ecology: A Case for Regional Planning

*Presenter(s): Thomas Wilson, University of Tennessee, Chattanooga**

Amphibians are the most underrepresented species in habitat fragmentation studies even though habitat alteration is the most likely cause of their decline. This study is the first to use green-printing, circuit theory and corridor models to characterize and map habitat connectivity for two species of mole salamander (Spotted salamander [*A. maculatum*] and Marbled salamander [*A. opacum*]) near an industrial park in Hamilton

County, Tennessee. Since 2007, I assessed this growing ecological problem by studying a community of pond-breeding salamanders in a suite of wetlands proximate to an industrial park. I collected data on life history and community structure and then used landscape and habitat variables to map and predict corridor suitability in an effort to minimize the effects of development. Data suggest that the stability of the current community may be imperiled and that future species will be at risk given the current state of habitat fragmentation and loss. Research findings such as these should be communicated to elected officials, regional planning agencies, and the development community at large in order to make sound conservation and management strategies.

Macroecological Corridors in KwaZulu-Natal, South Africa

*Presenter(s): Deborah Jewitt, Ezemvelo KZN Wildlife (EKZNW), South Africa**

Global change, especially land use and climate change, is a major threat to biodiversity the world over. Currently 50% of KwaZulu-Natal (KZN), a province of South Africa, has already been irreversibly transformed (as determined by the 2005 KZN land cover map), mainly by urban expansion, agriculture and timber plantations. KZN is a biologically diverse province due in part to a large altitudinal gradient (0–3000m), varied topography and geology and the convergence of tropical and temperate elements from the north and south respectively. KZN falls within the internationally recognized biodiversity hot spot known as the Maputaland-Pondoland-Albany hot spot. Given the predicted climate change scenarios for the province, a system of macroecological corridors were developed for the province based on least cost paths to facilitate altitudinal and latitudinal (evolutionary) movements of species. This is seen as the most cost-effective mechanism to mitigate against climate change impacts for species. The method used for the development of this product are highlighted as well as the way in which the corridors are incorporated into our planning products and strategies.

Assessing Wildlife Use in the Corridor Regions in the Endau Rompin Landscape, Johor, Malaysia

*Presenter(s): Low Chee Pheng, Wildlife Conservation Society, Malaysia**

Loss of connectivity through bottlenecks in the Endau Rompin Landscape is a significant threat. Fragmentation through land conversion of the habitat affects wildlife movement and propa-

* Denotes international scholar presentation

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(continued)

gation and will potentially increase rates of human wildlife conflict at villages located in the corridor regions. The State Government of Johor is committed to establish 5000 hectares of latex timber clone plantations (i.e., rubber plantations) and the suggested area for conversion located at the critical corridor region. In this project, we collect data of wildlife use in different habitats in the corridor region (e.g., burnt forest, degraded forest, native forest, grass and bushes, natural swamp, abandoned farms, etc.). Combining the wildlife use data and land cover data that will be completed by June 2012, we hope to be able to establish a map of potential wildlife use in the corridor region, determine important core regions that shall not be converted to plantations, and suggest other locations for such land conversion. The information will also be used to help convince the State Government and Federal Government that land conversion to large-scale monocultures will be detrimental to wildlife using these areas and will reduce connectivity for the Central Forest Spine of Malaysia.

4:00 PM–5:30 PM

Paper Session

Conservation GIS Online

Room: Toyon

Using ArcGIS Explorer to Conduct Remote Fieldwork for Analysis of Landscape Integrity Models

Presenter(s): Michael Houts, Kansas Applied Remote Sensing Program

Recent developments in the availability and functionality of online mapping applications may make field assessments of landscape condition more efficient and prove a valuable tool for conducting sampling over large or remote regions. In a recent effort initiated by the Western Governors Association's Wildlife Council to map Landscape Integrity across 17 states in the western U.S., three different approaches to identify intact landscapes were evaluated. The Human Footprint, Landscape Condition, and Human Modification metrics all used similar datasets but the methods of application and the results varied. Collecting field data to assess the three modeling approaches seemed a daunting task when time, personnel, and accessibility were all extremely limited. After a series of ideas deemed unacceptable due to inconsistent GIS software and/or skill sets

between regional biologists, it became clear that an online GIS mapping application could provide equal accessibility without users needing much GIS experience or software. GIS personnel created a set of 1,560 random sample points stratified across the Western United States, then buffered the points to create 18 acre polygons to serve as the sampling frame. An ArcGIS Explorer project was created in which the sample points and polygons were displayed over high resolution Bing aerial imagery along with ancillary data to help users orient themselves. To accompany the ArcGIS Explorer project, an online survey form was created where users could select the sample plot ID and then answer a series of questions about the landscape condition and level of human impact within the 18 acre polygon. Most users found the assessment easy and efficient after a brief adjustment to the "remote fieldwork" structure. Survey results from sample locations were easily collected and then used, along with other independent sample data, to assess which landscape model worked best to assess human impact on the landscapes across the west.

Cloud-Enabling GIS for Conservational Collaboration

Presenter(s): Steven Eglinton, Iracambi

As more and more higher-level GIS capabilities move to the Web, or 'the Cloud' as it is increasingly being called possibilities for a seamless, integrated boundless GIS collaboration environment become a reality for all. One group that can especially benefit from ever-decreasing setup, infrastructure and maintenance costs are Non-Government Organizations (NGOs), where every saving really counts.

One such NGO with a GIS strategy to become fully 'Cloud-Enabled' is Amigos de Iracambi—a Brazilian registered non-profit whose mission is to work with the community to make the conservation of the forest more attractive than its destruction. Volunteered GIS makes all of their GIS capability.

Data management and skills continuity are always a challenge at 'Iracambi'. Following, in this talk I will discuss the recent steps to create, and now implement, a GIS strategy to fully leverage Cloud-Based GIS.

4:00 PM–5:30 PM

Technical Workshop

Room: Nautilus

Quantifying Current Ecological Conditions for Your Conservation Project

Presenter(s): Kori Blankenship and Sarah Hagen, The Nature Conservancy

Assessing the ecological condition of a landscape is an important but often difficult step in conservation planning. Limited by time, tools, data and methods, condition assessments often get short shrift. In this session we will introduce a set of user-friendly, free tools and data that can be used to calculate ecological conditions. Ecological Condition (vegetation condition class) is a landscape scale measure of the difference between current vegetation structure and composition and a reference condition. In this session students will learn about the metric through participation in a hands-on GIS exercise. Tools for updating the data will be introduced and case studies will demonstrate the utility of ecological condition in real life conservation planning activities.

4:00 PM–5:30 PM

Paper Session

Remote Sensing and GIS

Room: Kiln

Greenpeace Fire Fighting Work: Mapping, Analysis, Rapid Response

*Presenter(s): Anna Komarova, Greenpeace, Russia**

In 2011 official data about burned area was more than 5 times diminished (our data-only forest burned area is more than 8.2 mln ha). But state officials lie and conceal the information about fires. It leads to great suffering for people and for valuable natural areas and to increasing of fires. The mission of Greenpeace is to stop official lying and to make them really act.

GIS Unit of Greenpeace Russia works in the next directions: rapid response and mapping for fire expedition, mapping burned area and analysis of fire dynamics and prediction the next fire disasters.

The scheme of rapid response is based on FIRMS (Fire Information for Resource Management System). We present the principles of effectively using FIRMS in Russia for extinguishing different types of fires on natural areas.

The mapping of burned area is based on Landsat and Modis data. We present the result map of 2011 and methodology of mapping.

Fire analysis (researches on fire dynamics and prediction the next fire disasters) is based on different types of data. We present result maps and methodology of preparing for three products: Threats of Forest Fires in 2011, Frequency of burning areas in Central Yakutia and Relations between roads and fire breeding points in the Northern part of European Russia.

Methods to Capture and Use Indigenous Knowledge for Land-Use Planning and Management

Trevor Wiens, Apropos Information Systems

Using Indigenous Knowledge (IK) in land use planning, management, or modeling is difficult for a variety of reasons including data access, completeness, privacy, and representation. Spatially explicit planning or simulation tools (e.g., Marxan, SELES) use GIS area layers of planning units as their base. Treating IK as observational data in this same planning unit framework can be used to effectively address both representational and privacy issues. Lack of standards for IK research and emphasis on printed reports has hindered the development of living repositories of IK data. Living repositories can provide ready access and also be used to effectively plan future data gathering efforts and in turn create reasonably complete and representative IK data sets. Trevor presents his experiences with these issues and a solution he has developed for Indigenous Communities to effectively capture and use their IK.

* Denotes international scholar presentation

Session Descriptions Saturday, July 21

9:00 AM–10:30 AM

Paper Sessions

Conservation Planning and Development

Room: Chapel

Planning in California's Rural Areas: A Geodesign Approach

Presenter(s): Karen Beardsley, University of California, Davis

California is the most populous state in the USA. When most people think California, images of Los Angeles, Hollywood or San Francisco come to mind, with tall buildings, busy streets and dense population. The truth is, however, that about 80% of California's land is considered rural. And at the same time, only 17% of our population lives in these rural areas. How do these rural jurisdictions plan for their future?

Land use planning in California is done at the local level rather than the state or national level. Decisions happen city by city, county by county, usually on Tuesday evenings at city council meetings across the state. At the Information Center for the Environment at the University of California (ICE-UCD), we have helped rural counties in California to apply a GeoDesign approach to localized planning in their jurisdictions. These methods, including successes and challenges, will be presented in this talk.

Facilitating Transparency and Collaboration in Conservation Planning for California Deserts

Presenter(s): Mike Howard, Dudek

The Desert Renewable Energy Conservation Plan (DRECP) is a multiagency Natural Community Conservation Plan and Habitat Conservation Plan (NCCP/HCP) aimed at conserving biological diversity and streamlining utility-scale renewable energy and transmission development in the California deserts. The DRECP Plan Area includes all or a portion of seven California counties of the Mojave and Sonoran deserts and spans over 22.5 million acres. The DRECP will provide a critical mechanism for meeting the State's renewable energy goals, and development and approval of the DRECP is considered a top priority by the California Energy Commission, the Bureau of Land Management, and the wildlife agencies. Development of the conservation strategy for the DRECP included establishing uniform environmental variable layers for the Plan Area, including land cover, soil parent material, landform, elevation,

slope, aspect, hydrology, wetlands, watershed, and ecoregion. These environmental variables were used to develop expert-based species suitable habitat models for 77 plant and animal species.

Dudek deployed several enterprise GIS technologies to assimilate and process over 500 data layers for the California deserts. Dudek also implemented a web-based project portal to promote transparency and collaboration between the project team, client and stakeholder groups. Due to the size and nature of the datasets involved with this multicounty project, Dudek used Esri's ArcSDE 10 technology with Microsoft's SQL Server database to deploy a project-based ArcSDE geodatabase specifically for processing of multiple runs of expert species models for the 77 species. Authoring of expert models by over a dozen biologists from multiple firms was enabled via the Microsoft SharePoint web portal. Models were executed in ArcSDE, and end results were published on the web portal and an Internet-based mapping application on the ArcGIS 10 for Server platform with Silverlight.

Using Scenario Modeling to Support Land Use Planning in Northern Ontario, Canada

Presenter(s): Cheryl Chetkiewicz, WCS Canada

Northern Ontario, together with the eastern part of neighbouring Manitoba, encompasses the largest intact, roadless portion of boreal forest in North America. Located just a few thousand kilometers north of the densely populated urban centres in southern Ontario, this 452,000 sq. km expanse of land and water represents 42% of Ontario. This subarctic region includes the world's largest peatland and wetland complexes creating aquatic and terrestrial habitats for many species, including lake sturgeon, caribou, and wolverine. These ecosystems provide important services far beyond the boundaries of the region, particularly climate regulation. The area has a long history of human occupancy and is home to a population of about 24,000 First Nations people within 36 communities that are remote, linked only by short-lived winter roads, air and water, and modern communications. The coming decades will see encroaching industrial development motivated by rich mineral deposits such as the Ring of Fire and strong economic imperatives for First Nations to develop their traditional lands. In 2010, the Government of Ontario committed to protect at least half of the region—the largest commitment to protection in Canadian history—and began land use planning efforts with First Nations communities to identify development opportunities in the region. We describe how the ALCES landscape

cumulative effects simulation model was used in a pilot project to explore possible outcomes on wildlife indicators (caribou, wolverine, fish communities, moose, boreal birds) of a moderate and high development scenario in a 150,000 km² subregion. Various geospatial data layers were integrated to approximate the region's current land cover, age-class composition, and anthropogenic footprint. The long-term (50-year) implications of forestry, mining and hydropower development were then assessed using ALCES and the companion Mapper tool, an ArcGIS application that combines regional land use trajectories with spatial rule sets to create maps of potential future landscape composition and indicator condition. Simulation outcomes are being used to initiate discussions with First Nation communities, Government agencies, and industry about wildlife conservation planning in the face of future land use and climate change impacts. Future model application can inform formal land use planning processes being led by First Nations and Provincial governments.

9:00 AM–10:30 AM

Paper Sessions

Wildlife Methods

Room: Triton

Telemetry Tracking Tool Add-in for ArcGIS

Presenter(s): Susan Witherly, Ducks Unlimited Canada

Tracking of radio-tagged wildlife is a widely used technique to understand many aspects of wildlife ecology and inform conservation activity. Telemetry tracking of waterfowl has been used by Ducks Unlimited Canada to better understand the habitat needs of breeding and wintering duck—home range size, movement distances, habitat use and nest site selection, nest and duckling survival, and brood movements. Tracking technique typically involves a vehicle-mounted directional antenna with sequential compass bearings taken from an existing road network to triangulate the location of a radio-marked animal.

Often, telemetry tracking is done with hard-copy field maps and a protractor that the tracker uses to manually plot bearings read from a directional antenna compass. While this is an effective technique, a great deal of work is involved in transferring plotted locations and associated data (animal identity, time, date, etc.) from field maps into a GIS for further analysis

(with associated transcription errors). While software packages exist to allow entry and plotting of bearings, none exist that are fully GIS integrated (e.g., allowing plotting on satellite or orthophoto basemaps). Further, existing software packages typically rely on costly electronic compass inputs and do not allow user-defined bearing reference systems useful where electronic compasses are not available or impractical.

An add-in tool for ArcGIS 10 is being developed with VB .NET and Microsoft Visual Studio Basic 2008 Express Edition. The tool will provide a fully GIS integrated and flexible option for on-the-fly entry of radio-tracking data. The tool plots bearings and associated user-defined error and calculates bearing intersect points (animal location) and error polygons. Bearing data and associated information (e.g., animal identity) is entered by the user and tagged to locations and polygons. This tool is in the development phase and will be tested in 2012 with radio-tagged Northern Pintail (*Anas acuta*) at a Ducks Unlimited Canada research site in Saskatchewan, Canada. Feedback from potential users of the tool is encouraged with the intent to make a version available for use by wildlife researchers.

Effects of Landscape Covariates on the Distribution of Mammalian Carnivores on Former Fort Ord Army Base

Presenter(s): Bart Kowalski, CSU Monterey Bay

Mammalian carnivores experience various effects of anthropogenic disturbance near urban environments. Urban expansion and increased anthropogenic activity in preserved habitat areas may cause changes to current spatial distribution of those species. To predict the effects of future land use changes on the mammalian carnivores we modeled their current probability of use across former Fort Ord Army Base as a function of urban proximity and road/trail density. We collected detection/nondetection data for coyotes, grey foxes, raccoons, and skunks using scent stations. We incorporated the probability of detection into logistic regression models and ranked the models using AIC for each species. Once we determined the best model and the coefficients of the predictive variables, using GIS we created a map of future species distribution given proposed landscape changes in the study area. Probability of occurrence varied across the species. Grey foxes showed a preference toward inland areas with higher road/trail densities. Striped skunks were more likely to use areas with low road/trail densities, while raccoons preferred areas with higher road/trail densities. The best model for coyotes was the null model, demonstrating coyotes' wide use of the Fort Ord landscape.

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(continued)

Our results suggest that the distribution of coyotes will most likely not be affected much by future development, while those of grey foxes will be adversely affected. Raccoons and grey foxes' use of the landscape would likely increase in areas with higher road/trail density but striped skunks would avoid such areas. The results from our study suggest that future land use changes will most likely have a varied effect on the distribution of mammalian carnivores and that careful consideration is needed to ensure those species' healthy populations.

9:00 AM–10:30 AM

Technical Workshop

Room: Toyon

Freshwater Conservation and the National Hydrographic Dataset

Presenter(s): Andrew D. Weiss, Washington Department of Fish and Wildlife

The National Hydrographic Dataset (NHD) is the U.S. national standard for streams and water bodies, managed by the United States Geological Survey (USGS). This workshop will provide an introduction to the NHD and the various tools to work with it. Participants will learn about the NHD data model, how to access and download NHD data, the features that NHD covers, a review of various NHD editing tools, and the stewardship and update processes. We will then explore the tools and processes to add user specific linear referenced data to the NHD hydrography and how to use out-of-the-box ArcGIS linear referencing and utility network tools to interact with the NHD to address fresh water.

9:00 AM–10:30 AM

Technical Workshop

Room: Nautilus

Understanding Projections for ArcGIS

Presenter(s): John Schaeffer, Juniper GIS

This presentation will take the mystery out of projections, coordinate systems, and datums. We'll start with an overview of projection concepts and then specifically discuss how these concepts and issues apply to GIS and also how to apply this knowledge correctly working with data in different projections in

ArcGIS and changing projections as needed. This presentation is useful for anyone working with GIS or GPS and is especially useful for people working with different projections in ArcGIS.

9:00 AM–10:30 AM

Paper Session

Conservation Planning and Development

Room: Kiln

FracTracker: Web-Based GIS for Communities Facing Natural Gas Development

Presenter(s): Karen Edelstein, FracTracker.org

In our energy thirsty society, one of the next frontiers for fossil fuel extraction may be the shale beds that lie thousands of feet below us. Natural gas extraction using a process known as high-volume, slickwater, hydraulic fracturing has been tied to a list of social and environmental impacts, including air pollution, water pollution, earthquakes, and socioeconomic displacement. FracTracker.org is a free, web-based, participatory GIS platform that includes a crowd-sourced data library; a tool for data visualization; and a location for sharing stories, images, and information. Currently focused largely on shale-gas development issues in New York State and Pennsylvania, FracTracker can be used by scientists and citizen groups in Europe, South Africa, Canada, and elsewhere in the continental US—or wherever natural gas development is likely to stir public concerns.

Zanaga Mining Sensitivity Analysis

Presenter(s): Danielle LaBruna, Wildlife Conservation Society

The Wildlife Conservation Society is committed to conserving wildlife and wild places around the world. Recognizing resource extraction as a major threat to conservation efforts, WCS has proactively engaged with a mining company in the early stages of iron ore mine development near a WCS field program in Zanaga, Republic of Congo, in order to guide mine planning to be less harmful to resident species such as the IUCN "vulnerable" forest elephant (*Loxodonta cyclotis*), and the IUCN "critically endangered" gorilla (*Gorilla gorilla*).

This paper describes the mining sensitivity analysis conducted by WCS GIS Analysts in the fall of 2010. Two analyses were performed. First, a straightforward vector analysis of land disturbance created by mine infrastructure (i.e., the mine "footprint") was calculated, including a 2 km "elephant disturbance buffer"

around the mine footprint that elephants would avoid for at least 7 years after the disturbance. Results indicate at least a 300 square kilometer area of disturbance. Second, “before and after” models of changes in hunting rates were created based on increased human population (establishment of mine workers’ camp), utilizing the Summed Point Influences (SPI) script created by WCS staff (presented at 2011 SCGIS conference). The SPI required inputs of a “villages” vector layer (as a source of hunters) and a “travel cost” raster layer (made up of land cover, roads, and footpaths). Model results indicate an increase in hunting accessibility between the “premining” baseline and “early mining” stages.

This analysis illustrates two GIS methods for assessing the impact of resource extraction on wildlife and illustrates the utility of GIS in wildlife conservation. While the vector analysis is possible without GIS, GIS greatly facilitates area calculations and buffer creation enormously. The SPI tool, however, was specifically created for use in GIS and would be impossible otherwise. Using the results of these GIS analyses, WCS was able to make specific recommendations to the mining company to (a) reduce the impact of the mine footprint on wildlife habitat and (b) reduce mine workers’ hunting of native wildlife. This analysis is also an example of how, if done correctly, a wildlife conservation NGO and a resource extraction business can cooperate to lessen impacts on wildlife while gaining access to natural resources.

Terrestrial Impacts of Marcellus Shale and the Development of an Index of Forest Habitat Change to Inform Conservation Planning

Presenter(s): Joseph Bishop, Riparia, Pennsylvania State University

Exploration and development of the Marcellus and Utica shale regions is occurring at a rapid rate with the number of permits and wells drilled increasing exponentially. In 2010 The Nature Conservancy, partnering with Western Pennsylvania Conservancy and Audubon Pennsylvania, produced a report predicting landscape impacts based on varying well pad densities. We continued this line of investigation conducting pre- and post-GIS analyses of disturbance from Marcellus well pad locations in Pennsylvania and presented results that identify patterns of landscape fragmentation and habitat loss associated with Marcellus Shale development. This initial GIS exercise was followed by on-site mapping of Marcellus infrastructure to facilitate a finer-scale analysis. Approximately 45% of wells are going into farmland and 54% into forest habitat. Twenty-three percent of wells are going into core forest habitat

(areas >100 m from a pre-existing edge or opening) which increases the extent of fragmentation. The well pad footprint averaged 3 ha (6.7 acres). Eighty-eight percent of the pads and 90% of the wells are on private land. Trends indicate that pad location on public land is closer to existing infrastructure than those located on private land. Our results suggest that if rates and patterns of development continue as they currently are, core forest habitat is at risk particularly on private land. A goal of this research is to create an index of forest habitat change to guide land management decisions.

11:00 AM–12:30 PM

Paper Sessions

Conservation Planning for the Future

Room: Chapel

Incorporating Economic Models into Seasonal Pool Conservation Planning Using GIS

Presenter(s): Robb Freeman, University of Maine

Massachusetts, New Jersey, California, Connecticut, and Maine have adopted regulatory zones around seasonal (vernal) pools to conserve terrestrial habitat for pool-breeding amphibians. Most amphibians require access to distinct seasonal habitats in both terrestrial and aquatic ecosystems because of their biphasic life histories. These complex habitat requirements make them vulnerable to land use change. Regulatory efforts focusing on breeding pools without consideration of terrestrial habitat needs will not ensure the persistence of these populations. We used GIS to combine a discrete-choice, parcel-scale economic model of land conversion with a landscape permeability model based on the habitat requirements of wood frogs (*Lithobates sylvaticus*) in Maine (USA) to examine permeability among habitat elements for alternative future scenarios. The economic model predicts future landscapes under different subdivision open space and vernal pool regulatory requirements. Our model showed that even “no build” permit zones extending 76 m (250 ft) outward from the pool edge were insufficient to assure permeability among required habitat elements for wood frogs. Furthermore, effectiveness of permit zones may be inconsistent due to interactions with other growth management policies, highlighting the need for local as well as state planning for the long-term persistence of pool-breeding amphibians in developing landscapes.

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(continued)

A Map of the Human Footprint in the Conterminous United States

Presenter(s): Bill Hegman, Middlebury College

It is widely recognized that multivariate measures of landscape transformation contribute to environmental assessments that seek to identify priority conservation locations, however no such measures are currently available that are spatially explicit, high resolution, and comprehensive in extent across the U.S. To address this deficiency, we are attempting to develop a human footprint map for the conterminous United States following the methodology developed by Sanderson et al. (2002) at a low (1-km) resolution for the entire planet and refined by Woolmer et al. (2008) at a high (90-m) resolution for the Northern Appalachian/Acadian ecoregion in North America.

The key characteristics of a human footprint map are as follows:

- The conterminous United States is included in the analysis and is represented at a 90-meter resolution which is the smallest allowable based on the input data.
- Spatially explicit data that influence or reflect human transformation of the landscape are combined into an aggregate score, such as human settlement (e.g., population density, housing density, designation as urban area), human access (e.g., roads, rail lines, other relevant transportation networks), land use (e.g., land cover classes, locations of mining operations), and energy infrastructure.
- Scores are normalized to scale between 0 (the least amount of transformation observed) and 100 (the greatest amount of transformation observed). They can also be normalized for different subregions.

The purpose of this presentation is to invite comments on our methodology for the development of a human footprint map for the conterminous U.S. It is our hope that such comments will improve the development of a human footprint map and will in turn lead to improved conservation planning across a wide spectrum of spatial extents—from the local to multiregional.

Applying Local Climate Projections to Conservation and Community Planning

Presenter(s): Jessica Leonard, Geos Institute

Climate change is a global problem that is already having severe local impacts. These changes are projected to increase during the rest of the 21st century. While resources dedicated to global and national solutions are growing, resources available for planning at local or regional scales are limited.

The Geos Institute uses GIS to incorporate climate modeling data in community-based climate change adaptation planning. We have developed Python scripts that use the built-in geoprocessing functionality of ArcGIS to access these large files and produce cartographic and tabular output used in climate change adaptation planning processes.

This presentation will discuss the application of these datasets in both our ClimateWise process, which addresses the need to integrate planning across natural and human communities, and our Conservation Blueprint program, which identifies priority areas expected to provide species and ecosystems with the greatest likelihood of persistence and function in the next century.

11:00 AM–12:30 PM

Paper Session

Bird Conservation

Room: Triton

Study Breeding Habitat of Sarus Crane (*Grus antigone sharpii*) in Yok Don National Park, Dak Lak Province, Vietnam

Presenter(s): Nguyen Hoai Bao, Department of Ecology, University of Science, Vietnam*

Eastern Sarus Crane (*Grus antigone sharpii*) is one of three subspecies of globally threatened cranes and is the tallest bird that flies. Population estimates for this subspecies is 1000 birds (Archibald et al. 2003) and is declining due to feeding and breeding habitats lost. The biology and breeding habitats of the Eastern Sarus have not been studied in detail. Recent records indicate the Eastern Sarus nested at small wetlands in dipterocarp forest (Barzen 2003).

Yok Don National Park is the only protected area in Vietnam with an ecology system of dry dipterocarp forest accounting for a large area of the park. Many small wetlands in the park were believed appropriate for nesting of the Eastern Sarus. These wetlands can be found on RASTER images 15x15 by using Envi 4.0 to produce different band compounds. After determining wetlands location, the field surveys were conducted for further detailed studies including shape, hydrology, water quality and biodiversity. Total of 127 lakes were recorded and determined, including 19 permanent lakes and 108 tem-

porary lakes, of which, evidence of nesting of Eastern Sarus was found at 2 lakes. Additional research in more detail was undertaken to describe the breeding habitats of the Eastern Sarus.

The Crowned Solitary Eagle in Argentina: Evaluation of Its Current Distribution Map

*Presenter(s): Nicolás Lois, Zoológico de Buenos Aires, Argentina**

The crowned solitary eagle (*Harpyhaliaetus coronatus*) is one of the most threatened and unknown species in the Neotropical region. Little is known on its general biology. In recent years, a series of workshops has been held bringing together all the experts working with the species and they have agreed on some conservation and research priorities.

The real distribution of the species is hardly known. There are many problems with the current distribution maps that are being used as foundation for all the studies conducted nowadays. In La Pampa Province, Argentina, where most of the research is being carried out, the IUCN distribution map for the species does not take into account many areas with confirmed reproductive success during the past few years. Knowing the distribution of an endangered species is a key matter for its accurate management. And also, this eagle may be used as an umbrella for the protection of the environment in which they live.

All the confirmed records for the species will be collected and organized. This data will be analyzed and then plotted into an updated distribution map for the species that will help fellow researchers in their investigations. This map will be published on the Aves Argentinas (Bird Life International) web page. This organization will provide the support for the map to be available online.

Conserving the Lilian's Lovebird in Liwonde National Park: A Look at Lovebirds Distribution, Water Availability and Poison Hunters

*Presenter(s): Tiwonge I Mzumara, Wildlife and Environmental Society of Malawi, Malawi**

The Lilian's lovebird is a near threatened species which occurs in Liwonde National Park in the South of Malawi. Poachers who use poison to hunt in the park pose a big threat to the Lovebirds' existence. These poachers poison small pools of water in order to catch animals especially in the dry season. The Lilians lovebird usually forms large groups of up to 100 birds when they come to drink. Thus many of them die at

once when they come to drink at water pools that have been previously poisoned. A study was carried out in 2010 to Map all the areas that have previous records of 'poison hunting'. Areas that have natural pools that contain water till late in the dry season were also mapped. Work is currently under way to map the distribution of lovebirds in the park and estimate their populations. This data will be used to generate maps that show the relationship between the lovebirds distribution, the availability of water and poaching activity and what this means with respect to the Lovebirds conservation. These maps will help determine the populations that are most vulnerable to this hunting. These maps will also help the law enforcement department in planning their patrols within the park.

11:00 AM–12:30 PM

Technical Workshop

Room: Toyon

Protected Area Tools (PAT) for ArcGIS 10: Custom Tools That Support Protected Area Network Design

Presenter(s): Steve Schill, The Nature Conservancy

This workshop will provide an overview and hands-on demonstration of the latest version of the Protected Area Tools (PAT) for ArcGIS 10. The Protected Area Tools for ArcGIS are a suite of tools designed as part of an ongoing process to help build GIS technical capacity in countries seeking assistance in identifying and filling protected area gaps. These tools permit the calculation of complex conservation models within an easy-to-use interface. The latest release of PAT provides a variety of new features, including a new Marxan Decision-Support tool that facilitates multiple Marxan runs and output analysis.

The workshop will provide a hands-on demonstration and guide participants through each of the three modules including (1) Developing customized Environmental Risk Surfaces (ERS), (2) Calculating a land or seascape's Relative Biodiversity Index (RBI) and (3) Creating input files for use in Marxan.

* Denotes international scholar presentation

Session Descriptions Saturday, July 21

(continued)

11:00 AM–12:30 PM

Technical Workshop

Room: Nautilus

Working with Linear Referencing and Routes for Streams

Presenter(s): John Schaeffer, Juniper GIS

Linear Referencing allows us to take a set of separate linear features that share the same value such as a stream name, and convert them into one continuous feature, usually referred to as a "route," with a measurement system that has a logical beginning and logical end with known values. Common examples of this are river-mile measurements along streams or mileposts along highways. Once this measurement system is set, we can then work with tables that relate events to positions along that route based on measure values. These events can be either point events with a single measure value or linear events with a from-measure value and a to-measure value. Using routes creates better tools to manage multiple sets of data linked to the route and to perform analysis.

The presentation will discuss Linear Reference concepts, how to create routes, and some analysis examples using stream data from the Wenatchee National Forest.

11:00 AM–12:30 PM

Paper Session

Cultural Landscape Analysis

Room: Kiln

A Landscape Space Syntax Analysis in Support of a World Heritage List Nomination

Presenter(s): Douglas Comer, CSRM Foundation

An important element in the nomination of a site to the World Heritage List is the comparative analysis of the site with others of a similar nature, in which an effort is made to identify unique or extraordinarily important characteristics that contribute to a site's outstanding universal value. Poverty Point is a monumental earthwork landscape in northeastern Louisiana, which dates between 1650 and 700 BC. Unlike almost all other monumental sites, it was not constructed by a society in which agriculture was practiced. Instead, hunter-gatherers who lived in the rich

environment near the Mississippi River created these intricately designed monuments. We will report here on a space syntax landscape analysis of Poverty Point and environs. The means by which to apply scale space syntax analysis, originally developed for use at settlements, has been suggested by Erin J. Hudson (2012). This approach employs concepts basic to space syntax analysis, such as symmetry/asymmetry and distributed/nondistributed patterning in an effort to gauge openness and accessibility of the sites under study, which are then linked to different modes of social organization. In addition to line-of-sight view shed, this approach utilizes view shed size and least-cost path analyses to determine the number of possible paths to key locations on the landscape.

Paleontology Probability Screening Tool Using CA Geology Data

Presenter(s): Lisa Pierce, Cogstone Resource Management

This ArcGIS paleontology screening tool integrates georeferenced images of California Geological Survey maps with USDA soil data. This application estimates a sensitivity ranking for probability of finding fossils by geologic formation. Each formation was assigned a BLM Potential Fossil Yield Classification (PFYC) value based on literature and museum records of known fossils. These rankings are accompanied by management recommendations. For example, rock units ranked 1 or 2 do not require survey. This application was designed to help meet CEQA/NEPA requirements by allowing agency planners to determine whether a particular project requires additional paleontological work or not and to allow them a way to check the results they receive from consultants. It can also be used for a rough estimate of mitigation costs for projects.

Using GIS Predictive and Fetch Models to Increase the Efficiency and Effectiveness of Future Surveys for Possible Emerging Archaeological Sites along the Shore of Lake Mead Because of Dropping Water Levels

Presenter(s): Stacey Crowe, Bureau of Reclamation

Lake Mead's water levels fluctuate annually and over multi-yearly periods because of the variation in water flowing into the lake and variation in water releases. From 2000 through 2010, the water level has dropped from 1215 to 1082 because of the continuing drought in the Colorado River Basin. If the lake level drops below 1080 feet, there is the possibility of cultural resources emerging that have not been exposed since the lake filled over 70 years ago. These resources that have

been sheltered by the lake could now be exposed to wave action as the lake level drops and possibly vandalism once fully emerged. Because of the immense size of Lake Mead, Bureau of Reclamation is developing GIS models to increase the efficiency and effectiveness of archaeological surveys to locate possible emerging cultural resources. These GIS models include two different types of models. The first is predictive archaeological models using environmental variables as well as the locations of known archaeological sites near Lake Mead. The second type of models are wind fetch models to predict areas of low wave action where wave damage to culture resources will be lessened and it could be possible to preserve cultural sites. By combining these two models Bureau of Reclamation hopes to better manage emerging archaeological resources. Two different modeling techniques were used to create archaeological predictive models, maximum entropy model and logistic regression. The most significant environmental variable for all models was distance to water. The next variables that contributed heavily to all the models were slope and landform plain. Most of the models also implied that the direction of the surfaces (aspect) contributed to the models. The archeological sites are negatively associated with south and west facing surfaces. Fetch is an important characteristic of open water because a longer fetch can result in larger wind-generated waves. It was decided to develop multiple fetch models for Lake Mead at 17 different water elevation levels because the lake levels are continuously changing. Each fetch direction raster was multiplied by the percentage of wind observed at the respective direction then summed to produce a weighted fetch raster for each lake level and at multiple wind thresholds.

2:00 PM–3:30 PM

Paper Sessions

Land Prioritization

Room: Chapel

Chesapeake Fish Passage Prioritization Web Map and Tool

Presenter(s): Erik Martin, The Nature Conservancy

Dams and other barriers to aquatic organism passage have fragmented river networks throughout the eastern United States and contributed to declines in diadromous fish runs

and coldwater stream communities. The Nature Conservancy, in partnership with NOAA & USFWS, has developed a web map and geoprocessing tool to allow fisheries managers to prioritize potential fish passage projects at dams in the Chesapeake Bay watershed. The prioritization is based on a suite of network and ecological metrics that are calculated in ArcGIS Desktop. These metrics are assigned relative weights and entered into a simple algorithm to prioritize dams based on the relative ecological benefit of creating fish passage at each dam. A Flex map provides the user interface and access to the Python-based prioritization geoprocessing tool & map services via ArcGIS Server. Users can run custom analyses for any combination of subwatersheds, political jurisdictions, or other spatial or attribute filters and apply custom metric weights for species-specific prioritization scenarios. The results can help managers evaluate the impact of potential projects, allocate funds more effectively, and provide a resource for further investigation.

The Development of GIS Tools to Aid Avian Site Evaluation

Presenter(s): William A. Ostrander, Tioga County, NY

The site review process for development or preservation involves the evaluation of the site's importance to native flora and fauna. For most taxa, mapping historic condition and species occurrence is straightforward and effectively aids in this evaluation process. Birds, however, present special challenges due to their seasonal migrations and their ability to respond to local conditions that often lead to temporary population shifts. As a result, environmental evaluation often lacks sufficient avian data and misrepresents an area's value to birds.

The Important Bird Area (IBA) Program of BirdLife International has led to the establishment, in the United States, of specific statewide criteria to evaluate sites for inclusion in the program. State-based technical committees use these criteria to identify sites that meet one or more of the following criteria: (1) regularly support significant seasonal populations of at risk species, (2) contain large areas of habitat for assemblages of species for which the state has special responsibility by virtue of containing a large portion of their ranges, and (3) support large congregations of birds. This project makes use of these criteria as the currency used to evaluate the importance of areas to birds.

In New York State, Audubon New York has identified specific thresholds for each IBA criterion. Proof that a site meets one or more of these thresholds requires observation-based data.

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This project takes advantage of the rapidly growing abundance of crowd-sourced “citizen science” observation data accumulated through projects such as eBird.

Using ArcGIS, observation data pertaining to Tioga County, New York, have been organized and point data have been redefined as polygons through interpretation of their attributes. These data provide input to a model that tests the data against the IBA criteria. The model calculates for any designated area in the county, a single value indicating its importance to birds. Environmental planners can use the generated values in a variety of ways including: use of the values to prioritize areas for bird preservation, to predict the potential impacts of human activity, and to provide land managers with a means to compare effects of development activities or conservation efforts. Finally, the output values also provide a way to measure the cumulative effects of a geographically dispersed activity that alters habitat.

2:00 PM–3:30 PM

Paper Sessions

Marine Wildlife

Room: Triton

Applying GIS Tools to Determine the Spatial-Temporal Resource Overlap between the Foraging Areas of Lactating South American Sea Lions (*Otaria flavescens*) and the Uruguayan Commercial Fisheries

*Presenter(s): Federico Riet, Cetáceos, Uruguay**

The negative impacts of the trophic competition between fisheries and marine mammals continue to raise considerable concern worldwide. In order to measure the potential overlap, data on fisheries and marine mammal food resource utilization, areas of fisheries operation and at sea movement of marine mammals are needed. Our aims were to determine the foraging behavior, diet, and utilization distribution of lactating South American sea lions (SASL, *Otaria flavescens*) and assess the potential resource overlap with the artisanal fisheries (AF) and the coastal bottom trawl fisheries (CBTF). Lactating females ($n = 10$) were fitted with satellite tags and Time-Depth Recorders. We used kernel and peeled minimum convex polygon (95%) methods for estimating the foraging utilization distribution of lactating SASL. In order to assess the potential resource overlap, we integrated sea lion diet and consump-

tion estimates and satellite-tracking data from lactating SASL with data on fishing effort areas and fisheries landings in the Rio de la Plata Estuary-Atlantic Ocean. Restricted to forage in shallow waters within the continental shelf, lactating SASLs' foraging areas overlapped with CBTF (15%) and AF (>1%) fisheries' operational areas. For both fisheries the Resource Overlap/Fisheries Impact index identified the “hot spots” and they were distributed along the coast, west of the breeding colony (56W - 55W). The results of this work showed differing degrees of resource overlap with AF and CBTF, highlighting (a) differences in potential impact from each fishery and (b) that different management/conservation approaches may need to be taken to solve the fisheries-SASL conflict.

Involving Fishermen to Better Understand the Habitat Use of the Endangered Franciscana Dolphin in Uruguay: A New Hypothesis

*Presenter(s): María Nube Szephegyi, Cetáceos, Uruguay**

Since 2004 Franciscana Project has worked jointly with artisanal and industrial fishermen to know more about the incidental capture of the endangered franciscana dolphin. During this volunteer work, many hypotheses about the reasons why the animals were caught involved oceanographic and ecological issues. So, we decided to use the information gathered to develop habitat use models for the species, based on previous research background and fishermen's hypotheses. Because we had presence-only data (captures and sightings) we used two different approaches to develop maps. One such is based on Maximum entropy models, that compare iteratively environmental data associated to the presence locations and background points. The second one is based on logistic regressions with Generalized Linear Models, using occurrence information and what is known as pseudo-absences (generated for modeling purposes). We then generated 5 pseudo-absence data sets to model the relation among franciscana presence and environmental and physiographic features and possible feeding grounds from the Uruguayan coast, provided by international and national sources. We used ArcMap 9.2 to generate the pseudo-absences and the predictor layers to run the 6 models and to develop spatial predictions of presence probabilities based on each model. With this work we have now the first habitat use models for the species, with different levels of accuracy and prediction capability. But the peculiarity of these maps, highly requested by the resources management agencies, is that they were created combining fishermen local knowledge and updated information from regional and global research.

Identification and Channel Characteristics of Cetacean Hot Spots in Waterways of the Eastern Sundarbans Mangrove Forest, Bangladesh

*Presenter(s): Mohammad Abdullah Abu Diyan, Bangladesh Cetacean Diversity Project, Bangladesh**

Sightings data of two freshwater-dependent cetaceans, the Ganges River dolphin (*Platanista gangetica gangetica*) and Irrawaddy dolphin (*Orcaella brevirostris*), were recorded by captains of three nature tourism vessels operating in waterways of the eastern Sundarbans mangrove forest, Bangladesh. These data were used to investigate channel-type preferences and identify cetacean hot spots according to a scoring system based on group, individual and calf encounter rates; the co-occurrence of both species; and encounter rates in neighbouring segments recorded during monsoon, postmonsoon and dry seasons. Six 5-km segments were identified for priority conservation attention from a total of 38 that were surveyed on at least three occasions during each season. Understanding the preferred habitat and identifying hot spots of freshwater-dependent cetaceans in the Sundarbans is the first step of a planning process for the potential establishment of a network of protected waterways for these threatened species.

2:00 PM–3:30 PM

Paper Session

Ecological Methods and Tools I

Room: Toyon

Forecasting Plant Invasions: Can We Predict Impact from Occurrence Data?

Presenter(s): Lori Pelech, UMass Amherst

Numerous habitat suitability models have been constructed based on invasive species occurrence points, resulting in models of invasion risk defined as any location suitable for the species to establish or survive. However, a more conservation-relevant measure of invasion risk should emphasize environmental conditions where an invasive plant can become abundant, a better predictor of ecological impact.

Since most available invasive species datasets do not contain abundance information, we aim to determine whether it is possible to model abundance based on distribution data alone. We compiled distribution data for nine problematic invasive

species in the western U.S. from regional archives and collected abundance data through a combination of field efforts and expert surveys. We compare the climate space of locations where a given species is known to survive to locations where it is thriving and find a significant difference. We use the multispecies results to test whether abundance points are located within a consistent subset of occurrence points, which would suggest that abundance can be predicted from occurrence alone. However, it is clear that regional data collection differentiating high abundance from occurrence would vastly improve predictions of impact risk.

Springs Distribution Inventory Design with Incomplete Data

Presenter(s): Jeri Ledbetter, Springs Stewardship Institute

Understanding the distribution of springs is important because springs are often biocultural diversity hot spots that support a wide array of rare and endemic biota and other resources. Resource managers are increasingly interested in the distribution and ecological condition of springs under their jurisdiction. However, springs are too poorly mapped to develop statistically credible sampling designs or estimate logistics costs. Our atlas of Arizona springs has increased the number of known springs from 5600 to 10300, but this is likely less than 30 percent of the total. Here we examine the role of information uncertainty in development of geospatial inventory sampling designs in 4 landscapes with varying ruggedness in western North America, using logistics cost as a response variable. Three levels of uncertainty are considered: U1—little information is available on the distribution of springs (southern Alberta); U2—some springs locations known, but many (half or more) unknown (Coconino National Forest, Arizona; Spring Mountains, Nevada); and U3—most springs locations known (Kaibab National Forest, Arizona). Information to be reviewed should include topographic maps, aerial photography, other remote sensing data, interviews with experts, rare wetland and aquatic species distributions, land surveys and water rights, and groundwater and landscape modeling. A ground-based U1 sampling design may involve searching for springs from randomly selected points and randomly oriented belt transects. While statistically credible, this approach was unproductive and excessively costly. In contrast, remote sensing may be more cost effective. Under the U2 scenario, we tested two approaches using reported springs locations—fully randomized sampling, and cluster analysis of x,y,z locations with stratified random sampling of clusters and of springs within

* Denotes international scholar presentation

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(continued)

clusters. Both approaches resulted in discovery of unmapped springs, but the fully randomized approach could miss the natural clustering phenomenon of springs. Coupling this clustering approach with a groundwater-based landscape model may indicate the location of unmapped springs. Using the same approaches for U3 reduced logistics costs considerably; increasing funds for inventory, monitoring, and stewardship. These results are likely applicable to other, similar geospatial sampling design problems.

2:00 PM–3:30 PM

Technical Workshop

Room: Nautilus

Ecosystem Monitoring Using Earth Observation Image Time Series

Presenter(s): Ronald Eastman, Clark Labs

The earth system has entered a highly dynamic and transitional phase. To assist in the monitoring and analysis of these changes, a large number of Earth Observation platforms, instruments and products have been developed, resulting in a rapidly expanding archive of image time series. These data provide unprecedented opportunities for the monitoring of ecosystems and earth system components. However, the analytical approaches required are new and rapidly evolving. This workshop explores these developments by introducing the Earth Trends Modeler (ETM)—an extension to the IDRISI GIS and Image Processing software system that is specifically focused on the special needs of image time series analysis. Although the breadth of ETM will be surveyed, special emphasis will be given to Seasonal Trends Analysis—a technique that has special utility in the analysis of phenological trends in vegetation productivity. Participants will receive a 30-day evaluation copy of IDRISI including the Earth Trends Modeler, data and tutorials.

2:00 PM–3:30 PM

Paper Session

Participatory Mapping

Room: Kiln

Participatory Mapping of Key Terrestrial Sites in the Transboundary Grenadine Islands

Presenter(s): Alison DeGraff, Compton Foundation

The transboundary Grenadine Island chain has a rich history of peoples who left their mark on the land—diverse societies ranging from the Arawaks to the Caribs (Kalinagas); the African maroons and slaves to the Garifuna (Black Caribs); and the French missionaries to the British colonizers. The Grenadine Islands are now at a pivotal point in their physical history. A rapidly growing tourism industry coupled with increasing development and overexploitation of resources is threatening the island chain's fragile ecosystems. Preservation of the remaining historical, cultural, and biological sites is vitally important to maintain identity, educate the next generation, and support ecotourism efforts. In order to protect these sites, a first step is to inventory and map them. This data can then be used as a key component of the planning efforts to manage development in a manner that preserves these resources, is sustainable, and is beneficial to both the communities and the ecosystem on which they rely. Participatory mapping is one tool which can enable communities to actively participate in the planning and decision-making process. Collecting and using local knowledge can also serve to increase community education and empowerment thereby strengthening the capacity of community groups to participate in governance.

This paper considers and outlines participatory mapping processes and how this methodology was applied for the mapping of historical and cultural resources on the Grenadine Islands. The end result is a detailed, island by island series of maps that identify and confirm the locations of colonial forts, coastal batteries, sugar mills, lime kilns, indigo vats, work stones, windmills, estate houses, Caribbean vernacular architecture, cemeteries, cisterns, wells, whaling stations, boat building, festivals, rites and rituals of passage, viewpoints, geologic features, and hiking trails. This information will be used to supplement the Grenadines Marine resource Space-use Information System (MarSIS)—a participatory GIS database—and fill identified data gaps in the application for a designation

of the Grenadine Islands as a transboundary UNESCO World Heritage Conservation Site.

Spatial Information Tools and Indigenous Participation in Sonora, México

Presenter(s): Carlos Valdes, Pronatura Noroeste

Recognition of the bio-cultural heritage in Sonora is challenging government's sectoral planning. It is proposed that by identifying traditional sites and knowledge on natural and cultural resources, their disappearing trends could be reduced. In the state of Sonora in Northwest Mexico, seven indigenous nations are struggling with ill development. Lack of information and mismanagement of natural resources have led to community uncertainty and ignore indigenous rights. This presentation explores how spatial information tools could promote indigenous participation and help to identify biocultural values that are required to protect and manage natural and cultural heritage in Sonora.

Participatory GIS in the Development of Wildlife Protected Areas Management Plans

*Presenter(s): Chabala Chiteta Chiyaze, Zambia Wildlife Authority, Zambia**

Participatory GIS is a practice in which members of the local communities share their indigenous knowledge, skills and opinions in the preparation of maps in partnership with GIS professionals to enhance management decision making. Participatory GIS fosters discussion and collaboration among stakeholders and can capture important knowledge from underrepresented groups. In this case, this paper shall elaborate how participatory GIS is used to concretize all the decisions made by various stakeholders in the preparation of management plans for wildlife protected areas.

The development of management plans is achieved through a number of steps and phases of the Strategic Planning Process (SPP) and it involves an interdisciplinary team of core planning team members drawn from professional planners, park managers and staffs knowledgeable about the area's resources and problems, scientists, research specialist, local communities and others with particular experience, expertise or interest in the area participate in the process of preparing management plans. The steps and phases which involve among others the following:

- Preliminary data collection and analysis,
- Development of possible scenarios,

- Presentation of findings through workshops to the parties involved, and
- Finalization of the plans on the basis of the chosen management options.

GIS plays a key role in the preparation of the Management Plans in that, a GIS expert is required in the data collection and analysis of the protected area. The data collected is then presented to all stakeholders who later shall be required to participate in the zoning scheme of the protected area. The various zones are formulated in order to enhance conservation and socio-economic utilization of the Protected area and its resources.

Climate Change and the Local Communities from Lagamar Brazil—Applying IPCC Predictions and Providing a Geovisualization Framework

*Presenter(s): Renato Miazaki de Toledo, Iniciativa Verde, Brazil**

This project has two overlapping fronts: First there is a sum of official cartographic data, SRTM data, land cover mapping, species distribution papers, and "community mapping," made with traditional communities for mapping cultural spots (religious places, economical activities, folklore sites, landmarks, historical sites, community business, and so on). And there is the work on spatial analysis, based on IPCC Climate models, to predict regional future scenarios (Climate Change over crops and forests; and Sea Level Rise). The selected region for this project is called "LAGAMAR" that is a large and isolated region with very well preserved estuary with mangroves and lowland forest. About 30,000 people live there, like Native American communities, African communities (old escaped slave shelters) and mixed communities with European contribution (traditional fisherman). This work provides data to be shared at ArcGIS.com in order to be developed and analyzed by local stakeholders.

* Denotes international scholar presentation

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4:00 PM–5:30 PM

Paper Session

Mapping Hot Spots

Room: Chapel

A Decision Support Tool for Wildlife Conservation in the National Petroleum Reserve—Alaska

Presenter(s): Nathan Walker, Audubon Alaska

Alaska's Western Arctic is one of the most remote and intact landscapes remaining in the United States. Home to over 400,000 caribou, millions of migratory birds, polar bears, and other Arctic wildlife, this area is also the location of the National Petroleum Reserve—Alaska (NPPRA). With energy development pressures rising, the Bureau of Land Management faces decisions regarding which tracts to make available for leasing and surface development, in balance with other important biological values in the NPPRA. To assist land managers in making these decisions and to assist conservation organizations in preparing meaningful, science-based policy recommendations, we created a decision support tool that summarizes wildlife data and identifies biological hot spots within the NPPRA.

This spatially explicit tool includes breeding bird densities, caribou seasonal habitat selection probabilities, polar bear critical habitat, and anadromous fish streams. The tool was designed using VB .NET and allows the user to select individual lease tracts or leasing scenarios from a map of lease tracts in the NPPRA. It then reports the total potentially affected wildlife and their habitat, so that the user can compare different scenarios and identify leasing strategies consistent with the conservation of important wildlife habitat. Summary information for the scenarios can be exported as a spreadsheet, which resource managers or conservationists can use to prepare reports, recommendations, and public comment letters. The tool allows individuals without GIS training to explore the NPPRA and quickly develop objective, science-based recommendations on land management decisions using an intuitive, easy-to-use interface.

Development of the Coastal Wetland and Tributary Decision Support Tool Web Map

Presenter(s): Allison Shaw, The Nature Conservancy

In 2007, The Nature Conservancy (TNC) completed the Green Bay Integrity Assessment, a Conservation Action Plan (CAP). This assessment proposed a map directing conservation practitioners to the best opportunities for protection and restoration of coastal wetlands. I will explain the process by which I created the resulting Coastal Wetland and Tributary Decision Support Tool web map using ArcGIS Viewer for Flex. TNC's Flex template made this possible in spite of my lack of programming experience. The Coastal Wetland and Tributary Decision Support Tool includes TNC data like a wetland functional assessment and external data like county tax parcels and federal data sets. I will discuss web map design considerations such as target users, desired functionality, and logistics of using other organizations' data and publishing your own map services. This presentation should help others interested in creating web maps to think through these issues and develop interactive maps for conservation stakeholders.

Using the Power of GIS to Identify Endemic Hot Spots in Arizona

Presenter(s): Matthew King, Desert Botanical Garden

Arizona's flora is one of the most diverse in the United States. Over four thousand species of vascular plants, six percent of which are endemic, occur in the state. Because many of the endemic plants are also rare, knowledge about their distribution patterns is essential for informed conservation efforts. Furthermore, patterns of endemism can provide insight into the evolution of plant communities in the state. Drawing on the power of digitized natural history collections, we assembled data on the endemic plants of Arizona in order to identify hot spots of endemic richness. Online collections data from over 30 herbaria were obtained from SEINet (Southwest Environmental Information Network-<http://swbiodiversity.org/seinet>). These data were supplemented by observational data from Natural Heritage programs and the National Parks Service, resulting in a dataset of over 10,000 georeferenced points. Hot spots of endemism were identified and compared using two different methodologies. First, patterns of endemic richness were mapped by summarizing the collections data in 10 km² grid cells. Secondly, species distribution models were generated for each endemic taxon using Maxent, a well-established statistical approach commonly used with natural history collection data. These models were stacked on one another to

generate a map of predicted endemic richness for comparison with the raw collections data. Our results provide the first quantitative and predictive analyses of endemic plants for Arizona. Grid-based analyses clearly show centers of endemic richness dispersed throughout the state, but with highest levels in the central and northern Arizona. A comparison of the number of endemic species per biotic community has also identified habitats in which endemics are either over- or underrepresented. These analyses provide essential baseline knowledge to land management agencies for use in prioritizing future efforts in research, monitoring, and active management.

4:00 PM–5:30 PM

Paper Session

Marine Planning

Room: Triton

The Caribbean Marine Biological Corridor: Incorporating Ocean Currents into MPA Network Planning

Presenter(s): Steve Schill, The Nature Conservancy

With funding from the MacArthur Foundation, The Nature Conservancy has developed a Marine Action Plan for the Caribbean Biological Corridor. This plan has been designed to set in motion actions that identify common problems across the Caribbean region, consolidate information, and gather stakeholder input that will respond to biodiversity loss and address climate change adaptation needs from a marine corridor perspective. The plan provides a road map for identifying the highest conservation priority issues using the latest data and information on biodiversity importance and human activity pressures and a framework for decision making around resource allocation. To quantify the probability of connectivity between all coral reefs within the Caribbean Basin, we used the RTOFS (REAL-TIME OCEAN FORECASTING SYSTEM) data to model ocean circulation and major spawning events by releasing clouds of larvae into the system at each reef site. Model output for dispersal simulations are in the form of a 3D dispersal matrix (i.e., from reef, to reef, through time). This matrix is integrated through time to calculate the classic connectivity matrix describing the probability (strength) of connectivity between all pairs of habitat patches. The maximum rate of larvae dispersal was then used as input into a Marxan

analysis, using the dispersal rates as a basis to modify the boundary length between planning units. A series of Marxan conservation portfolios was produced for stakeholder review that prioritized areas based on connection strength between coral reefs throughout the Caribbean Basin.

A GIS Road Map for Sea Level Rise Vulnerability and Adaptation along the Hudson River Estuary

Presenter(s): Jason Winner, Scenic Hudson

Sea level rise (SLR) is the most immediate climate change threat to the Hudson River Estuary ecosystem, with projections of up to 1.4 meters of relative SLR by 2080. This project used GIS to conduct a vulnerability analysis that provides to stakeholders an understanding of SLR impacts through both space and time. Along 160 miles of tidal river, this project (1) developed local elevation datums for tidal water levels, (2) modeled inundation and flood risk for two SLR scenarios over time, (3) queried important natural and built resources within risk zones, and (4) classified each site according to its resilience or vulnerability to inundation. Models show that over 13,000 acres of tidal wetlands/vegetated shallows and over 5,000 acres of supratidal or floodplain habitats will likely be inundated by 2080. In those areas, inundation sites have been classified where natural resource conservation and infrastructure protection are easily achieved, as well as areas of potential conflict where balanced solutions must be found. Ultimately, this analysis developed a GIS model and planning framework for outreach to local communities for development of their own detailed road map to Sea Level Rise.

4:00 PM–5:30 PM

Paper Session

Ecological Methods and Tools II

Room: Toyon

Madagascar Biodiversity Data for Conservation Planning and Management: The REBIOMA Project

Presenter(s): Dimby Razafimpahanana, Wildlife Conservation Society

The vast majority of biodiversity data collected in the field is not available for conservation planning, management or decision making. Furthermore, biodiversity data available

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(continued)

through existing global networks can contain taxonomic inconsistencies and geographic errors that limit their utility. We present REBIOMA (<http://data.rebioma.net>), an online biodiversity data network that facilitates the publication of biodiversity occurrence data and species distribution models for Madagascar. REBIOMA promotes data accuracy through an automated and expert-mediated review process. Taxonomic names of uploaded occurrences are matched against a consensus taxonomy developed by Malagasy and international taxonomic experts. In addition, users may choose to mark their occurrence data as "private," hiding these from public view, and still have these records contribute to distribution models. The REBIOMA project uses these data and related tools such as MaxEnt, Marxan and Zonation for marine and terrestrial conservation planning in Madagascar. This work has recently contributed to the creation of more than four million hectares of new protected areas.

Mitigating Biofuels Impact in the Tropics

Presenter(s): Adam Dixon, World Wildlife Fund

The European Union Renewable Energy Directive increases biofuels consumption targets and defines land use sustainability criteria. The World Wildlife Fund-US is working on a project to operationalize the directive in two tropical regions with spatial products that define the geographic ranges of the sustainability criteria and implement a monitoring framework based on crowd-sourced data. The presentation will brief the audience on the deployment of geographic technologies in two very different cultures (Colombia, Indonesia) with massive tropical agricultural expansion. In addition to the use of GIS, stakeholder integration, peer review and systematic conservation planning principles are integral components of this new comprehensive monitoring platform.

4:00 PM–5:30 PM

Technical Workshop

Room: Nautilus

Land Change Modeling and Its Implications for Biodiversity

Presenter(s): Florencia Sangermano, Clark Labs

Although landscapes have been altered by human activity since prehistorical times, the current magnitude, rate and spatial scale of these changes have reached unprecedented levels.

This workshop will explore the use of GIS for the analysis and modeling of land cover change and evaluation of biodiversity implications. Attendees will learn the step-by-step process of land cover change modeling using the Land Change Modeler for Ecological Sustainability (LCM). LCM facilitates the process of analyzing land cover change, projecting its course into the future, and assessing its implications for habitat and biodiversity. The topics that will be covered include land cover change analysis, spatial generalization of land cover change, empirical land cover change modeling, development of future scenarios of land cover change, habitat assessment, and species distribution modeling. Participants will receive a 30-day evaluation copy of IDRISI including the land change modeler, data and tutorials.

4:00 PM–5:30 PM

Technical Workshop

Room: Kiln

Professional Tools for Raster Analysis

Presenter(s): Melanie Harlow, Esri

Esri's raster development team will present current tools, techniques, and resources for remote sensing, image analysis, and image management from Esri. The integration of raster solutions from Esri partners will also be discussed.

SCGIS International Scholars

The SCGIS International Scholarship Program is not a typical scholarship program. It is designed to allow conservation GIS practitioners from all over the world to travel to California for four weeks to attend the Esri International User Conference and SCGIS Annual Conference and receive two weeks of GIS training specifically designed and programmed for the scholarship recipients.

The Society for Conservation GIS would like to extend its warmest welcome to all the 2012 conference scholarship awardees and encourages conference participants to greet this year's scholars and attend their presentations to find out more about their conservation projects:

- Anna Komarova, Greenpeace
- Bhuwan Dhakal, Action for Conservation and Sustainability
- Carlos De Angelo, Research Center of the Atlantic Forest (CeIBA); Subtropical Biology Institute (IBS)
- Chabala Chiteta Chiyaze, Zambia Wildlife Authority
- Deborah Jewitt, Ezemvelo KZN Wildlife (EKZNW)
- Dominic Lesimirdana, Northern Rangelands Trust
- Federico Riet, Cetáceos, Uruguay
- Low Chee Pheng, Wildlife Conservation Society
- Manuel Lepe, Wildlife Conservation Society, Guatemala
- María Nube Szephegyi, Cetáceos, Uruguay
- Mohammad Abdullah Abu Diyan, Bangladesh Cetacean Diversity Project
- Nguyen Hoai Bao, ICF, Department of Ecology, University of Science
- Nicolás Lois, Zoológico de Buenos Aires
- Renato Miazaki de Toledo, Iniciativa Verde
- Sabrina Costa da Silva, Instituto BioAtlântica
- Tiwonge Ivy Mzumara, Wildlife and Environmental Society of Malawi

2012 SCGIS Board of Directors

The board of directors is the governing body of SCGIS. The board is responsible for steering the society and has all final decision-making authority for the society. Members of the board of directors are elected every three years. Once a complete board is elected, members of the board elect the president, vice president, treasurer, and secretary. Officers are in office for one year. Elections usually occur after the annual conference.

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Robert Rose
Wildlife Conservation Society, USA

Vice President

Mike Engels
International Crane Foundation, USA

Treasurer

Gillian Woolmer
Wildlife Conservation Society, Canada

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Gillian Woolmer
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Lata Iyer
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Juniper GIS, USA

Healy Hamilton
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Leslie Backus, Chrysalis Biology

Steve Beckwitt, Sierra Biodiversity Institute

Joe Bremen, University of Hawaii

Charles Convis, Esri Conservation Program

Sandra Coveny, PC Trask and Associates

Michelle Gudorf, Vermont Association of
Conservation Districts

Michael Hamilton, Blue Oak Ranch Reserve,
University of California, Berkeley

Prashant Hedao, Auroville, India/Esri
Conservation Program

Susan Miller, The Nature Conservancy

Roberta Pickert, Archbold Biological Station

Lisa Pierce, San Bernardino Valley Water
Conservation District

Kai Snyder, E&S Environmental

Alexander Yumakaev, Esri Conservation
Program

SCGIS Committees

Domestic Chapters Committee

Purpose: The purpose is to facilitate the creation of local SCGIS chapters in the United States that support the mission of SCGIS. We are starting with five pilot chapters in Arizona; Colorado; Hawaii; Utah; and Washington, DC.

Chair: Demian Rybock

Communications Committee

Purpose: The Communications Committee is responsible for the coordination of all official correspondence to/from SCGIS and communication tasks which lie outside the scope of other committees. Examples include handling formal requests to/from other societies; ensuring consistency between and within the SCGIS newsletter, brochures, announcements, and website; handling or routing all requests from members directed to the society; and assisting in newsletter development, under the direction of the newsletter editor in chief.

Chair: Rosemary Fassel

Conference Committee

Purpose: Assigned the goal of hosting the annual conference to promote information exchange and to develop network of expertise to support conservation efforts worldwide. Charged with the task of coordinating the conference as specified in the SCGIS Strategic Plan, 1999–2004. The committee chairperson reports to board of directors with details requiring vote (site selection), keeps other committees informed that rely on relative information, and reports monthly to treasurer. The treasurer will review and sign any negotiated contracts.

Chairs: Carolyn Hughes and Kurt Menke

Fund-raising

Purpose: Charged with the task/goals of expanding SCGIS membership (and monetary base) through marketing plans, writing proposals, and fund-raising and with recovering the costs of the newsletter through advertisements by the year 2004. Additionally, with conducting an SCGIS user community assessment identifying strengths, weaknesses, opportunities and threats in 1999, as specified in the SCGIS Strategic Plan, 1999–2004.

Chair: Eric Sandoval

SCGIS Committees (continued)

International Committee

Purpose: This committee is strongly tied to the primary mission and goals of the Society, evident by the presence of a worldwide focus. The primary objectives of the International Committee is to foster communication and networking among conservationist through a well-defined scholarship program, the development and support of regional groups, the creation of reverse scholarship programs, training and technical support programs, and a number of other activities. An international mentoring program may be an additional focus of this committee. The International Committee has, historically, been the largest of the SCGIS Standing Committees, currently exceeding 40 volunteer committee members.

Chairs: Charles Convis and Sasha Yumakaev

Membership Committee

Purpose: Charged with the task of administering all memberships (new and old) as specified in the SCGIS Strategic Plan, 1999–2004. Activities include developing and distributing a new member packet, maintaining the membership database, and addressing any membership issues that may arise. In addition, the committee will mail the SCGIS newsletter to new members and current members who didn't attend the annual conference. The committee chair will work closely with the treasurer.

Chairs: Miriam Schmidts and Marcelle Caturia

Website Committee

Purpose: This committee is responsible for the management and function of the SCGIS listserv (CONSGIS, SCGIS, SCGISBD) and website (www.scgis.org). The chair and listserv administrator are the technical contacts for maintenance and updates. It is the duty and obligation of this committee to ensure that all information representing SCGIS is accurate and has the blessing of the SCGIS Board of Directors. Members of this committee are responsible for maintenance and upgrades to electronic infrastructure and any other technical or conceptual tasks deemed worthy.

Chair: Kim Fisher

Listserves Administrator: Peter August

Acknowledgments

The 2012 SCGIS Conference would not have been possible without the efforts of many great individuals. It is impossible to acknowledge everyone who has played a role in making this conference a success. However, there are a few people and groups that deserve special recognition:

- Many thanks to Esri for its generosity in providing resources and support.
- Pingkham's team at Esri provided extensive organizational and logistical support for this year's event. Pingkham's hard work and Esri's generosity gave us this agenda, our signage, and fully installed laptops for the pre-conference workshops and registration.
- Exelis VIS for providing ENVI licenses for our pre-conference workshops.
- The SCGIS Web team, including Kim Fisher and Bryan Baker. They provided constant and reliable support throughout the conference planning process and beyond.
- Our pre-conference workshop instructors: John Schaeffer, Patti Bailey, Amy Ballard, Heather Coleman and Trevor Wiens, who gave of their own time and resources to be with us this week and share their incredible knowledge.
- Sasha Yumakaev for his masterful planning of the SCGIS Scholarship Program. We are grateful for all the hard work and personal investment that makes the Scholarship Program such a success.
- Charles Convis, whose extraordinary support has made SCGIS what it is today. Among other things, he is responsible for categorizing all abstracts into sessions (a monumental task), organizing panel sessions, and was instrumental in securing this year's conference logo and t-shirt design.
- Gillian Woolmer, who always goes above and beyond to help the Conference Committee with planning and logistics. She was an excellent resource and a patient font of wisdom throughout the entire planning process and during the conference itself.

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