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Registration Information

Location: Heather Room

Hours of Operation:

Thursday, July 8

7:00 PM–9:00 PM

Friday, July 9

8:00 AM–8:30 AM

10:00 AM–10:30 AM

3:00 PM–3:30 PM

Saturday, July 10

8:00 AM–9:00 AM

10:30 AM–11:00 AM



Recycle Badges

At the end of the conference, please drop your badges in marked boxes that will be provided on site. Thank you for your cooperation.

Society for Conservation GIS

May 4, 2010

Dear Friends and Respected Colleagues:

It is my pleasure to welcome you to the 13th annual conference of the Society for Conservation GIS (SCGIS). It's been another tough year for all of us—a year of surviving, enduring, and being careful with resources and costs. As I said last year, times of challenge are sometimes a part of making relationships stronger and communities more resilient. I've been happy to see how SCGIS has illustrated this, moving forward in several important areas and expanding our support for others at a time they need it most. This has also been a year of deep reflection on the nature, extent, and reasons for ESRI's long commitment to SCGIS and conservation as a whole. Accordingly, along with the normal highlights I like to mention each year, I will this year, for the first time, be asking a favor.

After a long five years, SCGIS's board of fantastic volunteers was renewed and revived with the election of several new board members, equally spectacular in their dedication to SCGIS and their passion for conservation. Pete August and Lisa Pierce led SCGIS into new territory when they signed us up for the first national competition based on electronic communities. SCGIS had to collaborate as an online community to spot 10 test balloons deployed across the United States, and indeed, we were first to report sightings of several balloons. We would have won if our competition had not used a sophisticated pay-for-your-sightings scheme worthy of Wall Street.

SCGIS's International Program endured a crisis in 2009 when the number of our scholars fell to less than 10. We put out the call for help in areas like training and hosting—areas that are tough for people to do and that represent hard work and deep commitment. Sasha and I realized that support of international scholars can't expand unless it can involve many people. Thanks to leadership from Karen Beardsley and John Schaeffer and strong support from SCGIS's board, a new scholar training program will start in 2010 in the central California region. SCGIS's big nongovernmental organization members also made the first organized effort to form a special SCGIS chapter devoted to their international partners. Finally, for the first time since Jack Dangermond provided the personal endowment that made SCGIS a reality, I also asked him for a personal grant to cover half of our scholarship budget this year, and he kindly agreed. What this means is that in 2010, we were able to expand our scholar group to 15, and we were able to admit applicants from all over the globe.

2010 was also a year where online collaborative GIS made great strides. The Data Basin project, built from ArcGIS Online technology and ESRI funding, has become a reality, with rapidly expanding support from donors and data providers. Many of you responsible for online Web mapping projects came to the first-ever Web Mapping for Conservation workshop and helped create a road map for the needed technologies, open source support, and funding you'll require to move forward in the Web GIS world. Many other online spatial technologies have hit the spotlight, along with many new vendors interested in conservation, so it's been a very crowded, busy year for those of us working in online mapping. After 20 years of making GIS grants to conservation groups alone—of being the solitary bedrock for SCGIS year after year—Jack Dangermond and ESRI finally seem to have company. That's both the good news and the reason to ask a favor.

ESRI never asked me to publicize or promote our grants, so most folks don't know that since 1989, when the United Nations Environment Programme (UNEP) was the only conservation group that had a GIS, Jack has made over 20,000 GIS grants to over 6,000 organizations worldwide, totaling hundreds of millions of dollars' worth. ESRI has also granted cash, scholarships, and project funding for important advances in conservation GIS numbering in the hundreds of thousands. When new vendors with better marketing and more ad money get involved, it can get hard for newcomers to find organizations with long-term commitments versus the ones that are just better at telling a story. As a result, ESRI has asked me to ask a favor of all our grantees and SCGIS friends—past, present, and future. When you have data to share, include ArcGIS.com, and when you talk about a project, post a map or show research results that you are proud of and that relied on ESRI GIS grants or support. Mention ESRI so folks can know we're here too.

Growing a community takes all kinds of contributions, from impassioned leadership and vision to inspiring talks and maps to hours spent in each other's company. That's pretty easy to recognize and honor. Building community also sometimes takes gritty determination and hard, boring work, as well as someone willing to pay the bills. That's harder to recognize, because those folks often work in the background. As we gather together for this our 13th meeting, let's remember to honor and respect all the folks who make this community work, no matter what kind of contribution they make.

Regards,
Charles Convis and Sasha Yumakaev
SCGIS International Program

Text and Images to Come

Building Community

A Message from the Conference Committee

The theme for the 2010 SCGIS conference is Building Community. This is a regular conference theme for SCGIS that comes around every few years. It is an important theme, because SCGIS is a community. I have been a member of this community for nine years now, and I believe that I engage in better conservation because I am a part of this community. It supports my conservation work using the tools of GIS, and it provides me with the opportunity to support the work of others. This community inspires me to work harder and do better; it brings me the latest ideas and tips about technologies and tools that I would otherwise not know about and connects me with a global network of my peers. It is a very important community for me as a conservation GIS professional.

Conservation cannot be achieved by one person, or in isolation. It requires the work and willing participation of many. I encourage us all to think about the importance of our conservation GIS community during the conference. And when you return home after the conference, I encourage you all to reach out to others you know whose conservation efforts could also benefit from being a part of this bigger community of people like them.

Gillian Woolmer, WCS Canada
2010 SCGIS Conference Committee Chair



Conference Tips

- Use this program to familiarize yourself with events and locations.
- A map is on the back cover, and the last few pages are for note taking and to help you track what you want to see.
- Pace yourself—you can't see or do everything.
- Set priorities.
- Remain flexible.
- Skip something and relax if you need to.
- Catnaps are great.
- Drink a lot of water.
- Wear your name badge so we can all meet each other with great ease.
- Be on time—it is respectful.
- If you have any questions, head over to Viewpoint East and ask a friendly SCGIS volunteer.
- Attend the evening social, and hopefully you will make new friends.

About Asilomar

Meal Service

All meals are served semicafeteria style at Crocker Dining Hall. Your group will be seated together at designated tables.

Breakfast: 7:30 AM–9:00 AM

Lunch: NOON–1:00 PM

Dinner: 6:00 PM–7:00 PM

Neither cooking nor coffee making is permitted in the guest rooms or meeting rooms. Individual visitors are also welcome at Crocker Dining Hall. Meal tickets for individual meals may be purchased at the front desk.

Business Center

The Business Center is located next to the front desk. Its hours of operation are from 6:30 AM to midnight daily. Charges are collected on the honor system. A list of charges are posted in the Business Center. Features include

- Four dedicated local access lines
- One personal computer for word processing
- A speaker phone for conference calls

Photocopies and faxes are handled at the front desk.

Park Store

The Park Store is located in the administration building (Phoebe A. Hearst Social Hall). Its hours of operation are from 6:30 AM to 9:00 PM daily. Coffee and espresso drinks, bakery items, cold beverages, personal care items, phone cards, and gifts are available.

Check-in time: After 3:00 PM

Checkout time: By NOON

Guests will be charged 1/2 day rate for staying beyond noon. After 4:00 PM, a full day's charge is made. Guests are responsible for willful destruction, breakage, or misuse of property.

Parking

Parking at Asilomar is provided for guests residing on the grounds. Guests are required to park in designated areas. Disabled parking is available where indicated on the map (on

the back page).

Please note the one-way roads, speed limit of 15 mph, and 10-minute parking zones. Roads must be kept clear at all times for emergency and service vehicles. Violators are subject to citation under California Vehicle Code and under State Park Rules and Regulations. No RVs are allowed on the grounds.

Quiet Hours on the Grounds

Please respect your neighbors' rights and maintain quiet between 10:00 PM and 6:00 AM.

The Environment

Asilomar's 107 acres are dedicated to a natural ecological environment. Please walk on paved areas only. The dunes are a particularly fragile environment, and we request that you use the boardwalk to the beach. Trash receptacles are located throughout the grounds. Asilomar encourages recycling whenever possible; receptacles are available. Use cigarette receptacles for cigarette butts. Please do not litter in the park.

Conference at a Glance

Thursday, July 8	
9:00 AM–5:00 PM	Workshop 1: Using ArcGIS Spatial Analyst Kiln
	Workshop 2: Protected Area Tools for ArcGIS 9.3: Custom Tools That Support Protected Area Network Design Oak Shelter
1:00 PM–6:00 PM	Field Trip to the Monterey Aquarium
7:00 PM–9:00 PM	Registration and Welcome Reception Heather
Friday, July 9	
8:30 AM–10:00 AM	Opening Session Chapel
10:00 AM–10:30 AM	Break Heather
10:30 AM–NOON	Paper Sessions Toyon and Acacia
10:30 AM–NOON	Technical Session Kiln
10:30 AM–NOON	Special Session Chapel
NOON–1:30 PM	Lunch Crocker Dining Hall
1:30 PM–3:00 PM	Paper Sessions Toyon and Acacia
1:30 PM–3:00 PM	Technical Session Kiln
1:30 PM–3:00 PM	Special Session Chapel
3:00 PM–3:30 PM	Break Heather
3:30 PM–5:00 PM	Paper Sessions Toyon and Acacia
3:30 PM–5:00 PM	Technical Session Kiln
3:30 PM–5:00 PM	Special Session Chapel
6:00 PM–7:00 PM	Dinner Crocker Dining Hall
7:00 PM–9:00 PM	Map Gallery Opening and Reception Chapel

Registration and Welcome Reception

Catch up with old friends and meet new ones at the Thursday night Welcome Reception in the Heather Room. You will be able to register, pick up your conference materials, and enjoy an evening of socializing.

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.

Saturday, July 10

8:00 AM–9:00 AM	Breakfast Crocker Dining Hall
8:30 AM–10:00 AM	Paper Sessions Toyon and Acacia
8:30 AM–10:00 AM	Special Session Kiln
8:30 AM–10:00 AM	Technical Session Chapel
10:00 AM–10:30 AM	Break Heather
10:30 AM–NOON	Paper Sessions Toyon and Acacia
10:30 AM–NOON	Technical Sessions Kiln and Chapel
NOON–1:30 PM	Lunch Crocker Dining Hall
12:30 PM–1:00 PM	Special Lunch Session Chapel
1:30 PM–3:00 PM	Paper Sessions Toyon and Acacia
1:30 PM–3:00 PM	Technical Sessions Kiln and Chapel
3:00 PM–3:30 PM	Break Heather
3:30 PM–5:00 PM	Paper Sessions Toyon and Acacia
3:30 PM–5:00 PM	Technical Sessions Kiln and Chapel
6:00 PM–7:00 PM	Dinner Crocker Dining Hall
7:00 PM–10:00 PM	Auction and Wine Reception Chapel

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 money to support conservationists from around the world!

There will be a silent 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 9, 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.

Sunday, July 11

8:00 AM–9:00 AM	Breakfast Crocker Dining Hall
10:00 AM–NOON	Closing Session Chapel
NOON	Box Lunch Pickup Crocker Dining Hall

Preconference Training Workshops • Thursday, July 8

Workshop 1: Using ArcGIS Spatial Analyst

Room: Kiln

Presenter: John Schaeffer, Juniper GIS

This course will introduce participants to the Spatial Analyst extension by working through a couple of projects. The first project illustrates basic raster functionality by locating the best site for a solar installation. The final projects combine the skills learned in earlier projects to locate sites for elephant conservation zones in Kenya and to do cost-path analysis to find the shortest path between an elephant herd and a reserve. Time permitting, we will do a little work with ModelBuilder.

- Understanding raster GIS
- Interpolating surfaces from different types of data
- Using DEM elevation files
- Using map algebra for spatial analysis
- Using the Raster Calculator
- Cost-distance analysis
- Analysis properties and commands
- Distance, viewshed, and proximity grids
- Using grid commands
- Using ModelBuilder
- Site suitability analysis

Workshop 2: Protected Area Tools for ArcGIS 9.3: Custom Tools That Support Protected Area Network Design

Room: Oak Shelter

Presenter: Steve Schill, The Nature Conservancy; George Raber, University of Southern Mississippi

This workshop will provide an overview and hands-on demonstration of the latest version of the Protected Area Tools (PAT) for ArcGIS 9.3.

The Protected Area Tools for ArcGIS is 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. Drs. Steve Schill and George Raber designed and developed these tools with funding from the Inter-American Biodiversity Information Network (IABIN) and the World Bank Development Grant Facility (DGF) and will be providing the workshop training. The latest release of PAT provides a variety of new features, including compatibility with *Zonae Cogito*, a new decision support system developed by Watts et al (2009) for the family of *Marxan* software and new *Marxan* output analysis functions. The workshop will provide a hands-on demonstration and guide participants through each of the three modules, including

- Developing customized Environmental Risk Surfaces (ERS) based on mapped risk elements (i.e., socioeconomic activities), identified through expert review as having negative impacts on the health of targeted habitats, species, or ecological systems.
- Calculating a land- or seascape's Relative Biodiversity Index (RBI), which estimates relative biological richness, measured in terms of biodiversity feature abundance in comparison to the overall study area (Individual scores for each biodiversity occurrence can be used as a stand-alone assessment for each planning unit or subset of units [e.g., hexagons, watersheds].)
- Creating input files for use in *Marxan/Zonae Cogito*, providing users with an easy way to manipulate input parameters and review various conservation scenarios to achieve an optimal configuration of protected areas that meet user-defined conservation goals

Preconference Session Matrix • Thursday, July 8

	Kiln	Oak Shelter
9:00 AM–5:00 PM	Workshop 1 Using ArcGIS Spatial Analyst	Workshop 2 Protected Area Tools for ArcGIS 9.3: Custom Tools That Support Protected Area Network Design
1:00 PM–6:00 PM	Field Trip to the Monterey Aquarium	
7:00 PM–9:00 PM	Registration and Welcome Reception—Heather	



Opening Session Schedule • Friday, July 9

The Opening Session will take place in the Chapel Room.

8:30 AM–8:40 AM	Welcome, Introductions, and Thanks Gillian Woolmer, Conference Committee Chair
8:40 AM–8:50 AM	Introduction of the 2010 SCGIS Board Rob Rose, SCGIS President
8:50 AM–9:05 AM	Introduction of 2010 International Scholars Sasha Yumakaev
9:05 AM–9:50 AM	Keynote Address
9:50 AM–10:00 AM	Announcements and Closing Remarks Gillian Woolmer

Session Matrix • Friday, July 9

9:00 AM–5:00 PM	Opening Session—Chapel			
10:00 AM–10:30 AM	Break—Heather			
10:30 AM–NOON	Toyon	Acacia	Kiln	Chapel
	GIS-Based Conservation Planning Tools	Landscapes and Human Communities	Technical Session	Special Session: Large Landscape Conservation at the Regional Scale
	A GIS-Based Multiple-Criteria Approach to Integrated Land Management Decision Analysis: Case Study in the Humber Region of Newfoundland, Canada	Comparing Landscape-Scale Land Management Strategies for the Tongrass National Forest, Alaska	Suitability Modeling with Spatial Analyst and ModelBuilder	California Essential Habitat Connectivity Project
	Optimizing around Regulatory Requirements: Bringing Conservation Planning Tools	Landscape Dynamics of an Atlantic Montane Rainforest in Trajano de Morais, Rio de Janeiro, Brazil		American Wildlands: Using GIS to Put Connectivity on the Map in the Northern Rockies
	Geotracking Invasive Species with iMapInvasives	A Regional Biodiversity Conservation Plan for the San Francisco Bay Area		Landscape Conservation Cooperatives: A Collaborative Approach to Address Landscape Change
The Ecosystem Assessment and Reporting Tool: Providing Direction on Conservation Actions	Protected Area in the City: Integrated Watershed Management in a Divided Community			
NOON–1:30PM	Lunch—Crocker Dining Hall			

Session Matrix • Friday, July 9

(continued)

	Toyon	Acacia	Kiln	Chapel
1:30 PM–3:00 PM	Conservation Decisions, Discovery, and DSS Tools	Human Impacts on Conservation	Technical Session	Special Session: Transborder and Continental-Scale Large Landscape Conservation GIS
	Design of a Decision Support System as a Stakeholder Participation Process for Wetland Conservation in the Gulf of California	The Geography of Over-the-Horizon Consumption, Its Influence on Areas of Conservation Priority and Its Online Preservation to Multiple Constituencies	Building Conservation GIS Knowledge: A New GIS Course for Conservationists	Protecting the Spine of the Continent Wildway
	Data Exploration and Visualization Using OpenNRM, OpenLayers, PostGIS, GRTools Graphing Application, and World Wind	An Analysis of Land-Use Options for the Mbirikani Group Ranch, Kenya		Western Governors' Association's Corridor Initiative and Montana's Crucial Areas Planning System: Moving the West Forward
	The Development of the New York State Conservation Land Database—Technologies Used and Lessons Learned	The Influence of Human Disturbance Patterns on Conservation Design		The Corridor Commons—A Continental Vision for Corridor Conservation
	Conservation GIS in Bhutan	Village Land-Use Planning as a Conservation Strategy in Africa: The Case of Chimpanzees in Western Tanzania		
3:00 PM–3:30 PM	Break—Heather			
3:30 PM–5:00 PM	GIS and Remote-Sensing Techniques for Forest Assessment and Conservation	Special Topics in Conservation Training and GIS Capacity Building	Technical Session	Special Session: Novel Tools and Approaches to Large Landscape Conservation GIS
	Remote Sensing Applied to Identify the Potential Areas of Occurrence of Golden Grass at Jalapao State Park in Tocantins State, Brazil	A New Training Program That Encourages the Use of Ecosystem-Based Decision Support Tools: The EBM Tools Training Program	Understanding Projections for ArcGIS	A Resilient Network of Sites: Quantifying Adaptive Capacity in Eastern North America
	Forestry Operations and Performance Monitoring in Russia Using Remote Sensing	Conservation GIS in an Online Teaching Environment: Adding Conservation to Penn State's MGIS Program		Data Basin: Expanding Access to Conservation Data, Tools, and People
		Using GIS and Google Earth to Develop Conservation Education and Outreach Programs for Migrating Shorebirds		EcoClim.org, a New Source of GIS-Based Climate Model Data for Ecological Impacts Analyses
	GIS for Planning and Management of Forest National Parks	Using GIS to Mobilize Communities to Take Conservation Action		LandScape America, Bringing Conservation into Focus
Forest Cover Assessment to Monitor Conservation Management in East Kalimantan				
6:00 PM–7:00 PM	Dinner—Crocker Dining Hall			
7:00 PM–9:00 PM	Map Gallery and Wine Reception—Chapel			

Session Matrix • Saturday, July 10

	Toyon	Acacia	Kiln	Chapel
8:30 AM–10:00 AM	Wildlife, Scale, and Time: Special Topics in Scale and Time	Climate Change and Communities	Special Session	Technical Session
	The Very Large Ecological Array	Developing Community-Based Data for Marine Spatial Planning	Support for ESRI Press Conservation Planning Book from SCGIS Members	Tips and Tricks for Working with the New ArcGIS 10
	Mapping the Climate near the Ground for Conservation: Macro-, Meso-, Topo-, and Microclimates in GIS	Application of GIS for Conservation Awareness in the Protected Areas of Nepal		
	GIS Data Fusion to Support Conservation of <i>Martes Americana</i> : The American Marten at a Lake Tahoe Ski Area	Subsistence Hunting Patterns by Ye'kuana and Sanema Indigenous Communities in Ka'kada River Watershed, Upper Caura, Bolivar State, Venezuela		
		Spatial Potentials for Development of Settlement System		
10:00 AM–10:30 AM	Break—Heather			
10:30 AM–NOON	GIS Tools for Bird Conservation	Climate Change and Conservation Planning in Coastal Ecosystems	Technical Session	Technical Session
	Landscape Modeling for Blue-Winged Teal in the Sheboygan River Basin: A Weighted Criterion Approach	Modeling Wetland Complexity for Coastal Landscapes within Sea Level Rise Scenarios	Working with ModelBuilder	Open Source Natural Resource Management: Introduction to OpenNRM for Your Organization
	A Decision Support System for Conservation of Birds	Natural Upland Habitat Shifts from Sea Level Rise on Coastal Peninsulas and Implications on Habitat Diversity		
	Bird Mash-up in the Bogota Wetlands	Community-Based Conservation Planning in Solomon Islands		
NOON–1:30PM	Lunch—Crocker Dining Hall			

	Toyon	Acacia	Kiln	Chapel
1:30 PM–3:00 PM	GIS Tools for Wildlife Habitats	Wildlife Movement, Corridors, and Connectivity	Technical Session	Technical Session
	GIS and Maximum Entropy Modeling Approach to Predicting Habitat Preferences and Distribution of <i>Peromyscus Leucopus</i>	Addressing Statewide Habitat Connectivity	Working with Linear Referencing and Routes for Streams	Firebug for Web Development
	Ecological and Anthropogenic Influences on Habitat Suitability for the Mountain Gorilla in Bwindi Impenetrable National Park, Uganda	Verifying Modeled Wildlife Corridors with Animal/Vehicle Collisions		
	Mammal Population Estimates in Zambia	Using Geographic Information System-Based Cost-Distance Models to Identify Potential Wildlife Corridors within an Important Tiger Landscape in Malaysia		
	Identifying Habitat Stewardship Needs Using Rapid GIS Mapping Assessment	Modeling Wildebeest Distribution in Serengeti National Park, Tanzania: An Application of GIS and Satellite Imagery		
3:00 PM–3:30 PM Break—Heather				
3:30 PM–5:00 PM	Climate Change Impacts in Forest Ecosystems	Wildlife Management and Monitoring	Technical Session	Technical Session
	The Impact of Deforestation on CO ₂ Emissions in Coastal Tanzania Circa 1990 to Circa 2007 and the Estimation of Carbon Stock of Remaining Forests	Applying GIS for Wildlife Aerial Monitoring in the Tarangire-Manyara Ecosystem, Tanzania	Using the National Hydrography Dataset in Conservation Research	An Open Source and Living Decision Support System for Land Conservation
	Protecting Highly Threatened Araucaria Forest by Designing a Mechanism for Small Landowners to Enter the Carbon Market	Guanacos of the Argentinean Dry Chaco: Identifying Conservation Strategies and Public Policies about the Situation of Its Population and Its Habitat		
Establishing CO ₂ Emission Baseline for a Reducing Emission from Deforestation and Degradation Project in the Fandriana Vondrozo Forest Corridor (Madagascar)	An Assessment of Management and Threats in Tiger Conservation Landscaping			
6:00 PM–7:00 PM Dinner—Crocker Dining Hall				
7:00 PM–9:00 PM Auction and Wine Reception—Chapel				

Session Descriptions • Friday, July 9

10:30 AM–NOON

Paper Sessions

GIS-Based Conservation Planning Tools

Room: Toyon

Moderator: Mike Engels, International Crane Foundation

A GIS-Based Multiple-Criteria Approach to Integrated Land Management Decision Analysis: Case Study in the Humber Region of Newfoundland, Canada

Presenter: Randal Greene, Department of Geography, Memorial University of Newfoundland

Land management is becoming increasingly important due to growing pressures on natural resources, recognition of biodiversity threats, and expectations on land managers to balance competing values. Decisions are typically complex due to conflicting objectives (e.g., development versus conservation) and a large number of potential criteria to measure each objective. As decisions increase in complexity and importance, so does the need to formalize and rationalize them.

Multiple Criteria Decision Analysis (MCDA) methods take into account qualitative and quantitative factors in exploring decision scenarios and are being applied to spatial problems using GIS. However, to apply GIS-based MCDA often requires a well-understood and structured problem. Moreover, available GIS software tools and MCDA methods are often aimed at trained analysts and are too complex to be used directly by decision makers.

This study presents an approach to GIS-based MCDA that combines two levels of analysis in a custom GIS tool: (1) exploratory visualization using coincidence analysis to help understand and structure problems and (2) multiple criteria evaluation to rate all locations within areas of interest. The approach was tested in a case study where six participants represented various land management perspectives in the Humber region of Newfoundland, Canada. The group evaluated the recently completed 25-year forest harvesting plan by rating stands on their potential for conflict with conservation values. Participants provided feedback to the research team in group sessions and questionnaires.

The research confirms that GIS-based MCDA is useful in simultaneously considering many land management values, thus helping avert conflicts. Participants concluded that the two-level approach was effective for supporting both the exploration and evaluation phases. Even with simplified tools and transparent methods, a number of complexities remain. These include data issues such as preparing and normalizing the many layers and evaluation challenges like criteria weighting in a group setting

and understanding model biases. The case study results and the software tool can be used by land managers in the region as the long-term harvest plan is rolled into operational plans. The custom tool is based on the widely used ArcGIS platform and can therefore be applied to virtually any spatially continuous multicriteria decision problem.

Optimizing around Regulatory Requirements: Bringing Conservation Planning Tools

Presenter: Kei Sochi, The Nature Conservancy

It is estimated that an unprecedented \$22 trillion will be invested to support increases in infrastructure development by 2030. With elevated pressure likely to be placed on natural resources as a result of this surge in development, there is increased urgency to find ways to balance these growing needs with those of biodiversity conservation. The mitigation hierarchy (avoid, minimize, restore, offset) provides a mechanism for maintaining or enhancing environmental values in situations where development is sought despite detrimental environmental impacts. Despite these potential benefits, to date, the mitigation hierarchy has received limited implementation, most notably for wetlands and threatened and endangered species. Projections of rapid development pose challenges for maintaining natural values; these challenges also create opportunities for expanding the application of mitigation to a wider suite of conservation targets. The Nature Conservancy (TNC) applied its mitigation planning framework, Development by Design, to address potential environmental impacts of oil and gas development in the San Juan Basin in southwestern Colorado. It used Marxan to design a landscape-scale mitigation portfolio to offset anticipated direct and indirect impacts to wildlife habitat from planned drilling. It also conducted a separate on-site analysis, which was applied to the framework's goals to avoid and minimize impacts within the development field itself. Here, I will demonstrate how optimization tools can be used to expand the benefits of mitigation to a wider array of biological targets beyond those covered through regulatory requirements.

Geotracking Invasive Species with iMapInvasives

Presenter: Brent Kinal, New York Natural Heritage Program

Invasive species are nonnative plants, animals, and pathogens that survive and spread outside cultivation. These species often have a negative impact on biodiversity, agriculture, human health, and the economy. A major challenge in the successful management and prevention of invasive species is an effective mechanism that allows sharing and aggregation of invasive species data between multiple users. iMapInvasives is designed to provide a collaborative venue for the comprehensive exchange of invasive species data using the latest GIS and Web-based technologies. iMapInvasives (iMap) is an online, all taxa mapping

tool that allows aggregation and display of invasive species location data through user-generated content from multiple sources. iMap is designed to allow anyone with invasive species responsibilities—whether it be natural resource managers; Partnerships for Regional Invasive Species Management; or national, state, regional, or local agencies/organizations—to contribute, view, and query invasive species data. A particular emphasis of iMap will be placed on early detection/rapid response. iMap will be released in three phases. Phase I, a demonstration site (<http://www.imapinvasives.org/map.html>), will allow users to view and query statewide invasive plant data. Phase II will allow users to input and query point data for all taxa of invasive species, as well as receive early detection alerts via e-mail. Phase III will integrate polygon and polyline data into iMap, allowing users to track management of invasive species. Future plans for iMap include the development of a field or mobile application and modeling capabilities. Training will be available on iMapInvasives beginning in 2010.

The Ecosystem Assessment and Reporting Tool: Providing Direction on Conservation Actions

Presenter: Steve Schill, The Nature Conservancy

Conservation decision makers often make decisions in an atmosphere of uncertainty and, sometimes, without a complete understanding of the different factors that can affect the environment. The Inter-American Biodiversity Information Network (IABIN) recognizes the need to develop decision support tools that synthesize biodiversity and management data, highlight gaps in current needs, and provide reports and maps for prioritizing conservation action on the ground. The development of the Ecosystem Assessment and Reporting (EAR) tool responds directly to that need and demonstrates how data from the IABIN Ecosystems and Protected Area Thematic Networks (ETN and PATN) can be effectively integrated and used in the decision-making process to guide and enhance environmental management decisions. The tool is provided in both Internet-based server and desktop versions, providing a manager's dashboard approach for querying current spatial information on ecosystem condition, socioeconomic threat to ecosystems, and protected area management status. By integrating biodiversity, socioeconomic, and protected area datasets, the EAR tool calculates eight conservation action classes for each ecosystem or species, providing a simple approach to answer questions such as which ecosystems are least protected? Of these ecosystems, where and how do we need to improve management? and where are the opportunities to most efficiently reduce threats to these ecosystems? By integrating data from ETN and PATN that have been assigned biodiversity, threat, and management status, conservation decision makers are able to cross-query ecosystems/species with protected area information, then report back, in spatial and

tabular format, user-defined categories on the condition and vulnerability of selected ecosystems/species. This information can then be used by conservation decision makers to develop focused and prioritized strategies, effectively allocating resources and activities to the most appropriate places. While methods may vary on how to calculate an ecosystem's viability, threat status, and management needs, the design of the EAR tool provides a common framework for conservation decision makers to obtain direction on where to implement critical management actions.

10:30 AM–NOON

Paper Sessions

Landscapes and Human Communities

Room: Acacia

Moderator: David Asbury, Center for Ecosystem Management and Restoration

Comparing Landscape-Scale Land Management Strategies for the Tongass National Forest, Alaska

Presenter: Melanie Smith, Audubon Alaska

The Tongass National Forest is a remote island archipelago covering 17 million acres in southeast Alaska, USA. Largely known for its old-growth trees and prolific fish and wildlife populations and home to over 70,000 residents, southeast Alaska is the last best opportunity for large-scale conservation of intact temperate rainforest in the nation, and probably in the world. Forest managers struggle to protect old-growth forest while providing adequate local economic opportunity, chiefly through fishing, mining, logging, and tourism. Audubon Alaska analyzed multiple currently proposed landscape-scale conservation strategies for the Tongass National Forest for their adequacy in protecting fish and wildlife values while leaving room for economic opportunity such as timber extraction. Land management strategies were evaluated based on a suite of metrics describing landscape pattern and biological value, such as amount and types of habitat protected, amount of core area, aggregation of intact lands, connectivity between conservation lands, and stratification across the range of biogeographic provinces. The results are discussed in the context of their effects on a set of target species including brown and black bears, Sitka black-tailed deer, and Pacific salmon.

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(continued)

Landscape Dynamics of an Atlantic Montane Rainforest in Trajano de Morais, Rio de Janeiro, Brazil

Presenter: Camila Linhares de Rezende, State Institute for the Environment of Rio de Janeiro (INEA), State Park of Ilha Grande, Brazil

Landscape dynamics is essential to determine the conservation status of natural habitat patches. The Atlantic Forest biome, one of the most important hot spots in the world, has suffered intense modification throughout its history, being replaced due to the growth of different activities, such as mining, sugar cane and coffee plantations, and extensive livestock and industrial production. This study aimed to analyze the effects of economic transition in the past four decades on the dynamics of the landscape of an Atlantic montane rainforest, located in the municipality of Trajano de Morais, Brazil. This region is considered by the Brazilian Ministry of Environment as a priority area for conservation of extremely high importance. Satellite images from Landsat and CBERS for the years 1978, 1988, 1999, and 2008, taken between the end of August and October to reduce the seasonal variation of the reflectance of forested areas, were analyzed. From the images interpretation, a map was built with the age of each forest area. Contrary to what would be expected, the preliminary results showed a relevant growth on the forest cover. They point to an increase of 74 percent of the forested areas. This is probably related to the decay of coffee plantations in this region, which reduced the pressure on the remaining forest, allowing the natural regeneration of areas that previously were grown. The creation of a rural settlement of agrarian reform in 1987 also contributed to the natural regeneration of forest cover—during its creation, an area of legal reserve was established that has been respected to this day. It should be noted that this type of property is characterized by family farms, which usually is a mode of production less harmful to the environment than the monoculture, since it is based on diversified, small-scale production.

A Regional Biodiversity Conservation Plan for the San Francisco Bay Area

Presenter: Ryan Branciforte, Bay Area Open Space Council

The San Francisco Bay Area Upland Habitat Goals Project is a comprehensive planning effort to identify a Conservation Lands Network (CLN) across 4.5 million acres in nine counties. We have implemented many standard conservation planning tools—convening focus teams of experts, identifying coarse-filter vegetation types and fine-filter rare species/communities, using gap analyses, setting geographically stratified goals, building from the existing network of protected lands, and assembling alternative networks using Marxan. The purpose of this presentation is to show some of our more interesting analyses as we grappled

with issues such as exurban sprawl, urban and agricultural lands, watershed integrity, riparian conservation, and scaling from 100 hectare Marxan hexagons to local parcels. We will also consider viability issues such as climate change, atmospheric N-deposition, range management, and more. A simple online tool will deliver appropriate reports to conservation practitioners. Our pragmatic approach develops acceptable first-order approximations using available data and always leaves the door open for improved data and analyses as Upland Goals is updated and refined as a living process in coming decades.

Protected Area in the City: Integrated Watershed Management in a Divided Community

Presenter: Simeona Medina Martinez, University of the Philippines, Diliman

The Marikina Watershed, which was proclaimed by the Philippine government as a watershed reserve in 1904, has an expanse of over 25,000 hectares and covers portions of Marikina City, Antipolo City, and Tanay and Montalban municipalities in Rizal, a province east of Manila. Barangay Calawis, the northernmost barangay in the City of Antipolo, falls within the protected area of the watershed. There are communities within the watershed that believe that the area where they reside and utilize resources should be reclassified as Alienable and Disposable (AnD) land since the forest cover has been replaced with perennial crops. On the other hand, some upland farmers fear losing the support of the Department of Environment and Natural Resources, which grants them agroforestry seedlings for sustaining their livelihoods. Security of tenure for the land they till has been the primary concern of upland farmers, who are mostly of Aklanon (from the Visayas) descent and are thus migrant; they explore other avenues such as legislation through the mandate of congress to achieve the reclassification of their land from its Protected Area status. While this process would take a long period to accomplish, the People's Organization (PO) tries to maintain its agreement with the government under the Protected Area Community-Based Resource Management Agreement (PACBRMA), which prohibits resource extraction inside its restriction zone and allows limited resource utilization within its restoration zone. This paper will document the steps undertaken by the local community in Barangay Calawis to make the best out of their situation amidst regulation and political alliances and resource use conflicts that have ensued from land rights issues in the Protected Area of the Marikina Watershed.

10:30 AM–NOON

Technical Session

Suitability Modeling with Spatial Analyst and ModelBuilder

Room: Kiln

Presenter: John Schaeffer, Juniper GIS

This workshop will first discuss the concepts of suitability modeling, including determining criteria and setting ranks and weights and how raster GIS is well suited for this task. Then we will demonstrate how suitability modeling can work by showing some examples using Spatial Analyst and ModelBuilder.

10:30 AM–NOON

Special Session

Large Landscape Conservation at the Regional Scale

Room: Chapel

Moderator: Healy Hamilton

California Essential Habitat Connectivity Project

Presenter: Kristeen Penrod, Science and Collaboration for Connected Wildlands

The California Departments of Transportation and Fish and Game commissioned the California Essential Habitat Connectivity Project because a functional network of connected wildlands is essential to the continued support of California's diverse natural communities in the face of human development and climate change. Science and Collaboration for Connected Wildlands was part of a consulting team that worked in collaboration with an interagency multidisciplinary team to address connectivity at the statewide level. The project produced three primary products: (1) a statewide Essential Habitat Connectivity Map, (2) data characterizing areas delineated on the map, and (3) guidance for mitigating the fragmenting effects of roads and for developing and implementing local and regional connectivity plans.

The Essential Connectivity Map depicts large, relatively natural habitat blocks that support native biodiversity and areas essential for ecological connectivity between them. The statewide network consists of 850 relatively intact and well-conserved Natural Landscape Blocks (ranging from 2,000 to about

3.7 million acres each) with over 1,000 potential connections among them. The 192 Essential Connectivity Areas represent principle connections between the Natural Landscape Blocks within which land conservation and management actions should be prioritized to maintain and enhance ecological connectivity.

American Wildlands: Using GIS to Put Connectivity on the Map in the Northern Rockies

Presenter: Dylan Taylor, American Wildlands

Maintaining ecological connectivity between core wildlife habitats is one of the most pressing challenges for conservation in the Northern Rockies today. This is particularly important in the face of climate change. American Wildlands staff use GIS to synthesize, analyze, and present habitat connectivity information to a variety of audiences, including NGOs, agencies, local governments, and other partners. Our Priority Linkage Assessments (PLA) determined the most important wildlife movement areas and core habitats in western Montana and northeastern Idaho. Our methodology combined a meta-analysis of existing wildlife research and systematic expert interviews about wide-ranging carnivore and ungulate species. Using GIS, we mapped these linkages, providing much needed information to our partners. After finishing the PLA, our GIS lab analyzed the overlay between roadkill data for western Montana and linkage data from the PLA. This project highlighted potential areas for wildlife mitigations on roadways. Our data and information products are being used by managers and conservationists to make management decisions and protect important habitats. We are building on this effort to create even more useful products. We are working to include more fine-scale information in our new Wildlife Information Linkage Database (WILD). In the next year, we plan to link WILD to a Web-based map server to make our linkage data more useful and easily available. We work to use our GIS resources to inform policy and planning processes and as a guide for regional and local efforts to protect wildlife habitat and maintain connectivity in the Northern Rockies.

Landscape Conservation Cooperatives: A Collaborative Approach to Address Landscape Change

Presenter: Richard Kearney, Assistant Regional Director for Climate Change and Science Applications, USFWS Pacific Southwest Region

Presentation abstract is not available.

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1:30 PM–3:00 PM

Paper Sessions

Conservation Decisions, Discovery, and DSS Tools

Room: Toyon

Moderator: Candace Paulman, SC Wildlands

Design of a Decision Support System as a Stakeholder Participation Process for Wetland Conservation in the Gulf of California

Presenter: Carlos Valdes, Pronatura Noroeste

Wetland conservation is becoming a milestone in environmental management in Mexico. Increasing attention for wetland conservation has been triggered by the participation of Mexico in the North America Waterfowl Management Plan. Changes in approaches for wetland conservation will be reviewed, and the process design and establishment of a regional decision support system focused on the continental wetland corridor of the Gulf of California will be discussed. Spatial datasets were used to trigger state and local participation to promote greater awareness of wetlands importance for integrated coastal zone management. It is expected that this presentation will prompt discussion on the implementation process as a socialization and integration of regional datasets and support of wetland conservation.

Data Exploration and Visualization Using OpenNRM, OpenLayers, PostGIS, GRTools Graphing Application, and World Wind

Presenter: Amye Osti, 34 North

This will be an introduction to data exploration and visualization using OpenNRM custom toolsets built on popular open source tools including OpenLayers, PostGIS, and NASA World Wind Java SDK. Participants will view OpenNRM visualization of real-time water monitoring using WaterML 2.0 datasets (particle tracking and groundwater) and species distribution patterns (USFWS fish catch data and sampling).

Final output will result in 3D visualization in NASA World Wind. Important concepts covered throughout the presentation will include Get Data tools, using open APIs for spatial data retrieval, preparing data for graphing and visualization, and the importance of OGC standards.

The Development of the New York State Conservation Lands Database—Technologies Used and Lessons Learned

Presenter: Brent Kinal, New York Natural Heritage Program

The State of New York contains over six million acres of land protected for the purposes of conservation, recreation, and open space. Unfortunately, at this time, no single compiled statewide conservation lands database is available to document the protected land holdings within New York State. The lack of a comprehensive statewide conservation lands database reduces the abilities and effectiveness of conservation scientists, government agencies, and nonprofit conservation organizations when attempting to make accurate assessments of protected lands. This results in a less than complete understanding of the location of protected lands when conducting ecological management and land-use assessments.

A clear, consistent, and regularly maintained database of public and private conservation and open-space lands has been found to be one of the most valuable and most requested spatial datasets by governmental, not-for-profit, and educational organizations in New York as well as other states. These databases have been indispensable in answering the most basic conservation-related questions, developing conservation strategies, setting land acquisition priorities, and assessing ecological threats.

The New York Natural Heritage Program (NYNHP) is currently developing a statewide conservation lands database. The database development process has provided many challenges, both conceptual and technical. Conceptually, the greatest difficulty is the precise definition of what a conservation land is and determining what lands should be included or excluded. The technical challenges include collecting and combining spatial and attribute data from disparate sources, determination of attribute accuracy, database design, spatial accuracy and topology correction, and feature attribute development. Many of these tasks were able to be automated and streamlined through the use of Python scripting, ArcGIS ModelBuilder, and database design.

Conservation GIS in Bhutan

Presenter: Kinley Gyeltshen, WWF Bhutan

WWF Bhutan began its conservation work in 1977 by providing training opportunities for Bhutanese nationals and gradually evolved into a full-country program facilitating several conservation projects that are currently being implemented by national agencies. Since the establishment of a program of office in Thimphu in 1992, WWF has worked closely with the Royal Government of Bhutan to develop an integrated and collaborative conservation program. Since 1992, the WWF Program office's main thrust in Bhutan has included works on national parks; corridors; and conservation and protection of wildlife

species such as the Royal Bengal tiger, snow leopard, Asiatic elephant, black-necked crane, white-bellied heron, and red panda.

1:30 PM–3:00 PM

Paper Sessions

Human Impacts on Conservation

Room: Acacia

Moderator: Jennifer L. Rechel, USDA Forest Service

The Geography of Over-the-Horizon Consumption, Its Influence on Areas of Conservation Priority and Its Online Presentation to Multiple Constituencies

Presenter: Kim Fisher, Wildlife Conservation Society

Where conservationists see threats from overpopulation, land conversion, and infrastructure development, economists and political leaders see instead vital factors of economic production. For each constituency to engage with the other constructively, we need ways of linking to and interacting with each other's data. This presentation will demonstrate one way of connecting economic statistics on trade and domestic production with a global measure of human influence—the human footprint—and present the results within a Web interface. Expressing consumption in terms of human influence within an easily navigated, universally accessible Web site allows policy makers, conservation biologists, and the general public to see the geographic influence of consumption over the horizon, where it frequently intersects with areas of conservation priority (e.g., tiger conservation landscapes, wild places, ecoregions, and hot spots). Because of the large amounts and complexity of the data involved, analysis would be impossible without the power and automation afforded by Python scripts using ArcGIS geoprocessing objects, and presentation and comprehensibility would be impossible without a Web interface, backed by ArcGIS Server and using the ArcGIS JavaScript API, that provides a few simple user controls that allow different constituencies to look at the same data from different perspectives.

An Analysis of Land-Use Options for the Mbirikani Group Ranch, Kenya

Presenter: Karen Beardsley, University of California, Davis

After centuries of a pastoral way of life, with livestock providing the basis for sustenance, many Maasai pastoralists in southern Kenya are transitioning from communal land tenure to individual parcel ownership. The introduction of private land

holdings frequently leads to a more sedentary, agriculture-based livelihood, and the land is often demarcated with fences. Effects of land subdivision go beyond the direct changes to people's landownership to include landscape-scale habitat fragmentation, reduced resistance to drought, and a decrease in wildlife populations. Some of the group ranches in southern Kajiado District, Kenya, have completely converted from communal lands to individual landownership, while others still have a choice in setting their land-use policies but are struggling with decisions about whether to subdivide their land and how.

To date, there has been no systematic way of estimating longer-term impacts of differing growth scenarios on wildlife and other environmental resources. This presentation will explore whether a simple growth model widely used for long-range planning in California—UPlan—can be adapted to the Kenyan policy framework. UPlan is a land-use change model originally developed for use in urban areas of California to help decision makers quantify and visualize the potential implications of land-use decisions and policy. The feasibility of using UPlan in rural Africa is tested by applying the model to the Mbirikani Group Ranch in the Amboseli ecosystem in Kajiado District for the nine-year period 2007–2016. The output from five different scenarios, based on past trends, possible land-use options, and management plans for Mbirikani, will assist researchers and ultimately local ranch members with land subdivision decisions. To further demonstrate the value of applying UPlan in Mbirikani, the pattern of human settlement from each scenario was combined with modeled wildlife migratory routes across Mbirikani. Methods developed for Mbirikani may be applied to other group ranches in Kajiado and Narok districts in Kenya where people face difficult land subdivision decisions.

The Influence of Human Disturbance Patterns on Conservation Design

Presenter: Lynn Scharf, The Nature Conservancy

Human-induced environmental disturbance could serve as a blueprint to minimize conflicts between biodiversity conservation and future development. Disturbance patterns play a critical role in conservation planning, where the ultimate goal is to balance development with conservation objectives. Because conservation planning is conducted at landscape or regional scales, fragmentation patterns at larger scales are often overlooked. This can lead to missed opportunities to reduce fragmentation across planning boundaries. Presented will be a disturbance index for the contiguous United States that reveals complex trends in disturbance driven by regional land-use patterns and resource availability. We will evaluate the alignment of select conservation plans against disturbance patterns and identify missed opportunities for maintaining connectivity across planning boundaries. Additionally, we will analyze habitat

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diversity patterns within undisturbed areas. Habitat diversity is often used as a proxy for vertebrate biodiversity where observation data is lacking. By identifying unprotected areas of high habitat diversity, we can identify areas that may have greater return on conservation investment. Our analyses point to several possible opportunities to target undisturbed, highly diverse, and unprotected areas.

Village Land-Use Planning as a Conservation Strategy in Africa: The Case of Chimpanzees in Western Tanzania

Presenter: Lilian Pintea, The Jane Goodall Institute

Made famous by the pioneering work of Dr. Jane Goodall, Gombe National Park is the site of the longest study of our closest living relatives, chimpanzees. Remote-sensing analysis showed that since the establishment of the National Park in 1968, forests and woodlands have been recovering inside the park although more than 85 percent of chimpanzee habitats on village land but outside the park were lost between 1972 and 2003. In 2005 with funds from the U.S. Agency for International Development (U.S. AID) and other donors, the Jane Goodall Institute and its partners embarked on the five-year Greater Gombe Ecosystem (GGE) Project to protect biodiversity with an emphasis on chimpanzees through a livelihood-driven approach. A Conservation Action Plan approach was developed, and land-use planning at the village scale was identified as one of the top strategies to address some of the critical threats. GIS and 60-cm QuickBird imagery were used to prioritize a conservation area that if protected would substantially increase the viability of conservation targets: chimpanzee communities inside and outside the park and stable watersheds. At the end of the project in 2009, 13 villages within GGE completed their participatory village land-use plans, which became ratified by the Tanzanian government. Villagers voluntarily assigned 9,690 ha or 26 percent of their village lands as Village Forest Reserves. These forest reserves are interconnected across village boundaries to minimize fragmentation and cover 68 percent of the priority conservation area identified by the Conservation Action Plan. This presentation discusses the implications of the Village Land Use Plans to chimpanzee conservation and the role of GIS, QuickBird imagery, and citizen science to implement and continuously monitor conservation results at the community level in Africa.

1:30 PM–3:00 PM

Technical Session

Room: Kiln

Building Conservation GIS Knowledge: A New GIS Course for Conservationists

Presenter: Robert Rose, Wildlife Conservation Society

Approximately two years ago, conservation GIS professionals from The Nature Conservancy (TNC), Wildlife Conservation Society (WCS), and World Wildlife Fund (WWF) began a three-way partnership in developing an introductory GIS Web course for conservationists. The course, slated to debut in early summer 2010, is a collaboration of conservation experiences, technological expertise in GIS, and instructional design techniques and promises to develop and secure a global network of mentors and partners who will help shape and develop the next generation of GIS users. This project and course have the ability to touch many involved in GIS and conservation around the world.

In this hands-on 90-minute workshop, individuals from TNC, WCS, and WWF, participating in the GIS project, will discuss the new GIS Web-based course for conservationists, including where to access it, the course structure and activities, and how to successfully complete it. Attendees will be guided through many of the features of the course, including the self-paced lectures, GIS demonstrations, quizzes, and videos, and will have an opportunity to access and explore the course in the presence of the course's creators and authors.

1:30 PM–3:00 PM

Special Session

Transborder and Continental-Scale Large Landscape Conservation GIS

Room: Chapel

Moderator: Tosha Comendant, Conservation Biology Institute

Protecting the Spine of the Continent Wildway

Presenter: Kurt Menke, Birds Eye View, Inc.

An international network of conservation organizations is collaborating to connect a 5,000-mile "wildway" stretching from Alaska's Brooks Range south through the Canadian and U.S. Rockies to the Sierra Madre Occidental in northern Mexico. Led by Wildlands Network and a committed steering team, including nine of the west's most respected wildlands protection organiza-

tions, the Spine of the Continent Initiative is the largest conservation effort ever undertaken in North America, with a goal of linking existing regional wildlife corridor connection projects into a continuous chain of wildlife-friendly pathways. Together, these wildlands networks will provide room to roam for the continent's wide-ranging native species, allowing them to respond to climate change and maintain genetic diversity. The Spine of the Continent Initiative is, in essence, networks of people protecting networks of land.

Western Governors' Association's Corridor Initiative and Montana's Crucial Areas Planning System: Moving the West Forward

Presenter: Janet Hess-Herbert, Montana Fish, Wildlife and Parks

The Western Governors' Wildlife Council was created in June 2008 to coordinate and oversee implementation of the recommendations made in WGA's Wildlife Corridors Initiative Report. The council's goals are to identify key wildlife corridors and crucial wildlife habitats in the west and conserve these lands—and the vast wildlife species that depend upon them—for future generations. Montana Fish, Wildlife and Parks, as part of this western regional effort as well as having drivers of its own, initiated the Crucial Areas Assessment in 2008. Montana's assessment identified and developed fundamental aquatic and terrestrial data layers to be used for identifying crucial areas and an Internet-based mapping system, which was released in 2010.

The Corridor Commons—A Continental Vision for Corridor Conservation

Presenter: Julia Kintsch, Freedom to Roam

The Corridor Commons is Freedom to Roam's collaborative initiative to integrate the science and stories of wildlife movement across North America. By compiling a comprehensive and representative map, the Commons paints a picture of the need for wildlife corridors and landscape connectivity across all geographies and for all types of species. More than just maps or data points, the Corridor Commons includes stories linked to each corridor, enabling the science to compliment the stories of wildlife spectacles, movement obstacles, and organizations working to find solutions. As such, the Corridor Commons is a centralized resource for agencies, nonprofits, and businesses developing strategic partnerships to corridor-friendly practices, as well as support a growing community of engaged citizens inspired to promote wildlife corridor conservation.

3:30 PM–5:00 PM

Paper Sessions

GIS and Remote-Sensing Techniques for Forest Assessment and Conservation

Room: Toyon

Moderator: Fabiano Godoy, Conservation International

Remote Sensing Applied to Identify the Potential Areas of Occurrence of Golden Grass at Jalapão State Park in Tocantins State, Brazil

Presenter: Gabriel Antunes Daldegan, TNC Brazil

This study aimed to identify the potential occurrence area of the *Syngonanthus nitens* (golden grass), *Eriocaulaceae*, at Jalapão State Park in Tocantins State. Jalapão State Park is the biggest continuous cerrado savanna area under protection in northern Brazil and the one with the highest biodiversity and unique landscape diversity. The traditional communities that live in the region use golden grass to make handcrafts that represent a significant part of their economy. Recently, the sales of handcrafts made with golden grass have increased and, as a result, the demand for it has increased substantially.

Because of this rise, the local community, named Mumbuca, decided to look for sustainable ways to use golden grass. Further, there are other communities located in the limits of Jalapão State Park, so NATURATINS (Environmental Agency of Tocantins State) has been studying the possibility of defining a new boundary for the park, intending to reclassify the conservation unity, changing its goal to allow the sustainable use.

In this sense, identifying and mapping the potential areas of golden grass occurrence is very relevant, since it could help the government agencies manage the species and redefine the limit of the park. Remote sensing and GIS are essential to identify the potential areas of golden grass occurrence.

The methodology was efficient to classify the materials found in the studied image, allowing the identification of the phytosionomy where the golden grass grows. This is a pioneering work concerning *Syngonanthus nitens*, which could be used in others' research focused on the relationship between the local community and the sustainable use of the golden grass.

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Forestry Operations and Performance Monitoring in Russia Using Remote Sensing

Presenter: Julia Zenkevich, Nonprofit Partnership "Transparent World"

The aim of the project is to develop remote-sensing techniques for monitoring illegal logging based on high-resolution satellite imagery. The most sensitive and unique forest in Russia—Primorski Kri, in the Russian Far East—was selected as a pilot area for the first stage of monitoring. Illegal logging activity is the main threat to this forest, and due to the territory's remoteness, the use of satellite information is the best way to identify threats. The project was carried out jointly by several environmental NGOs (WWF Russia and other NGOs working in the region), and Transparent World served as a main GIS and remote-sensing work implementer.

Later, monitoring was expanded to other Russian regions, including Siberia, Caucasus, and the Russian Northwest. We focused on the most problematic regions in the territory (southern Russian Far East, Karelia, Arkhangelsk, Kirov regions, and Krasnodar Krai).

Project outcomes have been used by local environmental organizations in the Far East for finding and combating illegal logging. As a result, numerous violations of forestry and environmental laws have been detected and reported to officials. The monitoring results are published online (in Russian) at <http://maps.transparentworld.ru/forest.html>.

GIS for Planning and Management of Forest National Parks

Presenter: Fredrick Wanyama, Uganda Wildlife Authority

This paper will describe the use of computers and other technological devices in planning and managing forest national parks. Uganda Wildlife Authority developed a computerized monitoring and information system called MIST, which is installed on computers at the two park offices.

MIST GIS is a combined data entry, data analysis, and geographic information system software program. The program is used for entry and analysis of data collected in parks and protected areas; the majority of such data consists of observations that are each associated with a specific geographic location (i.e., georeferenced). Therefore, the program is designed to display and analyze this data geographically. The data from the program can also be exported to other GIS software for further processing.

The data is collected through ranger-based monitoring (RBM). This is an activity where rangers collect data during their routine field patrols about the changing conditions in the park, for example, recording the levels of human impact and animal encounters. The type of information gathered by rangers is

outlined in the monitoring and research plans of the individual parks. During this process, rangers use GPS units, and the data collected is analyzed using computers to determine the locations of the major threats to the park.

Mammal surveys have also been undertaken in Kibale National Park (KNP). The DISTANCE program was used for designing line transects used during the ground counts. A total of 40 transects, each 4 kilometers in length, were realized, while the spacing between the transect was 2.787 kilometers. A subsequent survey is to be performed this year.

Due to KNP being a forested area, indirect census methods were used for some animal species (dung for elephants, buffalos, and bush pigs and nests for chimpanzees). Each transect was revisited three times to undertake a marked nest and dung count for chimpanzees and elephants/buffalos, respectively. Repeated visits avoid the need to calculate decay rates for both nests and dung. The ground counts team in KNP consisted of four groups, each with four persons.

Data was analyzed using the DISTANCE program, while the distribution maps were produced using ArcView 9.3.

Forest Cover Assessment to Monitor Conservation Management in East Kalimantan

Presenter: Lenny Christy Ong, TNC Indonesia

TNC's overall conservation strategy in East Kalimantan is to protect large areas of lowland forest against deforestation by implementing effective conservation management in selected sites based on ecoregional planning and applying the knowledge from successful management in these sites to larger landscapes.

To monitor the effectiveness of TNC-facilitated management, a forest cover monitoring has been conducted for two TNC field sites, Lesan and Wehea; two sustainably managed timber concessions with whom we work (SLJ II and SLJ IV); and one highly threatened national park, which is under national government management with little NGO involvement.

A time series of Landsat imageries (1990s, 2000s, 2005, 2006/2007) were used as the data sources. In each of those sites, we determined vegetation classes (forest, degraded forest, scrub, grass, open land) in 1990, 2000, 2004/2005, and 2006/2007. This gave us an idea about how much forest was lost in each of those sites before and after TNC became active in the region.

To have a consistent forest cover change view within the same area over time, the cloud coverage from each image was compiled and applied to all subsequent images. In this way, the images would have the same cloud coverage.

To determine whether any changes in forest loss could be attributed to TNC's management, we compared the 5 sites to

20 randomly generated control sites of 10,000 hectares each. These control sites were located in a threat stratum similar to our sites (medium threat), as determined by a range of factors, including human population density and road network. These control sites gave us the required counterfactual evidence, that is, the outcome that would have happened if there had been no conservation intervention.

The overall tentative conclusion is that our sites are doing relatively well compared to the randomly selected controls. We cannot yet conclusively show that this is the result of TNC's conservation work, but we expect that, once we add the 2007 and 2008 data, this will become a lot clearer. This belief stems from the knowledge that our field collaborative programs, such as community patrolling and other measures, have completely stopped illegal logging in all sites. We also know that our work in Lesan and Wehea is very much supported by the local communities that have suddenly worked out the economic value of intact forests, for instance, in their much-increased wild honey proceeds. Local government is similarly supportive, providing both management input and funding for area management. There is thus an increasingly strong basis for financially and ecologically sustainable conservation in these sites.

3:30 PM–5:00 PM

Paper Sessions

Special Topics in Conservation Training and GIS Capacity Building

Room: Acacia

Moderator: Carlos Valdes-Casillas, Pronatura Noroeste

A New Training Program That Encourages the Use of Ecosystem-Based Decision Support Tools: The EBM Tools Training Program

Presenter: John Rozum, NatureServe/EBM Tools Network

Ecosystem-based approaches to resource management are increasingly common among state, regional, and local planners and decision makers. Many software tools have been developed to incorporate an understanding of ecosystem processes into management; however, the transfer of knowledge about these tools is slow, since practitioners often lack the time and resources to fully research tool capabilities and developers often lack the funding, infrastructure, and experience to provide effective training on their decision support tools (DST). In 2004, a voluntary alliance of tools providers, researchers, and users formed the Coastal-Marine Ecosystem-Based Management (EBM) Tools Network to promote the awareness, development, and effective

use of DST. The network works to connect coastal and marine practitioners with appropriate DST through outreach activities and the creation of the EBM Tools database. Several surveys of these practitioners, however, have shown that targeted, in-depth training was needed to realize the potential for tool adoption. Recently, the EBM Tools Network has begun work on a dedicated training program that will target marine and coastal managers on the West Coast. This presentation will give an overview of EBM Tools Network's products and services and will outline the goals and future plans of the training program.

Conservation GIS in an Online Teaching Environment: Adding Conservation to Penn State's MGIS Program

Presenter: Joseph Bishop, Penn State University

Penn State University's department of geography has offered instructor-led online education for current and aspiring geographic information systems professionals since 1999. As part of this program, Penn State's Master of Geographic Information Systems degree (MGIS) Program was launched in the 2004–2005 academic year. The MGIS Program is designed for experienced GIS practitioners who aspire to be leaders in the geographic information systems profession but who are only able to study part-time and at a distance. The original certificate and MGIS curriculum included one environmental applications course. Exit interviews from many students identified the need for more courses that included environmental techniques. In 2007, I was approached regarding the creation of a new conservation applications course to be part of the MGIS curriculum. Conservation GIS was a natural fit for the program, and I designed a conservation GIS course first offered for the 2009–2010 academic year. The results and commentaries reflect two offerings of this new course. The course strives to address the multiple factors influencing the conservation planning process by applying appropriate geospatial techniques. Conservation planning requires interdisciplinary approaches that blend spatial and temporal information on physical, biological, and socioeconomic factors as a basis to establish current conditions, monitor change, and predict possible futures. They combine geospatial capability with core concepts from landscape ecology, biodiversity monitoring, environmental impact analysis, watershed assessment, and wildlife management to address specific planning challenges. The course provides students with the opportunity to expand on the GIS concepts introduced in the environmental applications course while incorporating a problem-solving approach. This course emphasizes the unique nature of each conservation problem and the multiple pathways that may result depending on the geospatial techniques that are applied. Problem understanding is emphasized as a prerequisite to the application of the full range of possible geospatial techniques that could be used to unravel complex conservation challenges.

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Using GIS and Google Earth to Develop Conservation Education and Outreach Programs for Migrating Shorebirds

Presenter: Nicole Morgan, Center for Coastal Studies

Tidal flats are essential habitat for migrating and wintering shorebirds, and those species that use the Central Flyway in North America during migration to Central and South America depend on extensive tidal flats along the Texas coast. The U.S. Shorebird Conservation Plan describes the importance of Bird Conservation Region 37 in maintaining shorebird populations. The large numbers of shorebirds that migrate, winter, and breed on the Texas Gulf Coast provide the impetus to conserve these habitats within a rapidly developing coastal landscape. Public perception of the ecological value of tidal flats, as well as other unvegetated habitats (gulf and bay beaches) is minimal, and education and outreach are imperative to conserve the biodiversity. The U.S. Fish and Wildlife Service (FWS) funded a project to develop and produce education video materials on shorebird migration and show the importance of Texas tidal flats during transcontinental migrations. The science-based spatial data on breeding, migration, and wintering ranges for 30 species was downloaded from NatureServe Explorer and imported into ArcMap 9.3.1 (ESRI 2008), and legends were standardized. Tidal flat and beach data was clipped for Texas from National Wetland Inventory data (FWS, 1998). Datasets were saved as *.kml files and imported into Google Earth 5.0. Range maps provided the migration pathways, and wetland maps provided the potential stopover sites. Sample migration pathways were created for 17 selected species using the Tour function that enables the viewer to virtually experience hemispheric migration. This approach allows an interactive learning approach about the importance of this habitat along the Texas coast for shorebirds and will be incorporated into lesson plans in association with the education video.

Using GIS to Mobilize Communities to Take Conservation Action

Presenter: Doreen Whitley, Grange Insurance Audubon Center

The Grange Insurance Audubon Center is located in downtown Columbus, Ohio, within an Audubon and BirdLife International Important Bird Area. The center implements conservation strategies on a site-based level to reduce threats on a regional level to the Mississippi River Basin. Using students and community partners, research staff work to reduce invasive species and monitor avian response. This spring, two GIS projects enabled staff to intentionalize this work. Six-inch resolution aerial imagery was analyzed to detect Amur honeysuckle on private lands. Vector data was overlaid to identify landowners, and center staff and volunteers conducted outreach and training to assist in honeysuckle removal and native plant replacement. At the

same time, volunteers were deployed to collect avian data on point counts identified through a spatial analysis of area search data. All data is housed in the USGS point count database and analyzed in ArcView to track diversity and abundance of priority species as a response mechanism to habitat restoration. This presentation will focus on the use of GIS to "intentionalize" the work of urban conservationists and use community members to implement strategies.

3:30 PM–5:00 PM

Technical Session

Room: Kiln

Understanding Projections for ArcGIS

Presenter: 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, then specifically discuss how these concepts and issues apply to GIS and how to apply this knowledge correctly working with ArcGIS. This presentation will be useful for anyone working with GIS or GPS and especially useful for people working with different projections in ArcGIS.

3:30 PM–5:00 PM

Special Session

Novel Tools and Approaches to Large Landscape Conservation GIS

Room: Chapel

Moderator: Julia Kintsch, Freedom to Roam

A Resilient Network of Sites: Quantifying Adaptive Capacity in Eastern North America

Presenter: Mark Anderson, Director of Conservation Science, The Nature Conservancy, Eastern North America

Biodiversity is threatened by climate change, and conservationists urgently require a way to prioritize strategic land conservation that will conserve biological diversity under a dynamic climate. Emerging research indicates that because species diversity is tightly correlated with geophysical diversity, conserving particular geophysical settings offers a robust approach to conservation that protects diversity under current and future

climates. Building on this research, The Nature Conservancy has developed a novel modeling approach to identify the most resilient sites in eastern North America (13 U.S. states) that collectively and individually will sustain native biodiversity, while accounting for how the changing climate is altering current distribution patterns. The analysis is based on identifying landscape-scale sites and quantifying their topographic diversity, elevation gradients, local connectedness, and position relative to regional movement pathways and pinch points. Utilizing circuit theory and resistant kernel approaches to measuring landscape connectivity, combined with basic information on landscape structure, our aim is to direct the decisions of land acquisition and other strategic conservation activities toward the most resilient sites.

Data Basin: Expanding Access to Conservation Data, Tools, and People

Presenter: Tosha Comendant, Conservation Biology Institute

Data Basin (www.databasin.org) is an online system that connects users with spatial datasets, tools, and networks of scientists and practitioners. Data Basin's tools are designed to meet specific needs of scientists, managers, and policy makers; however, using Data Basin does not require any prior technical training. Given the importance and challenges associated with connecting large landscapes, it is critical to have a common platform that can facilitate the sharing and evaluating of spatial data. Data Basin provides a wide range of functions, including (1) private workspaces to organize datasets and maps; (2) extensive documentation (e.g., metadata, reports) for datasets; (3) capability to upload data and share it publicly or keep it private; (4) ability to download publicly shared data; (5) visualization tools that combine datasets and make customized maps; (6) searchable profiles of users, including science and policy experts; (7) searchable galleries (collections of datasets and maps); (8) user-defined working groups for collaborating and reviewing specific issues; and (9) concentrated content on focal topics of interest to Data Basin users (called Centers).

EcoClim.org, a New Source of GIS-Based Climate Model Data for Ecological Impact Analyses

Presenter: Healy Hamilton, California Academy of Sciences

Global circulation models are the primary source of information about earth's future environment. Forecasting the response of species and ecosystems to future climate change is inherently uncertain and requires data from many different climate model outputs to fully explore future climate scenarios. However, global climate model outputs are not easily translated for biodiversity impact studies. The syntax of climate models and their outputs can be very confusing—climate model results are produced at very coarse spatial scales, and the standard netCDF

format is not GIS friendly. EcoClim.org provides a large set of relatively fine spatial and temporal scale climate model outputs in GIS format for ecological impacts analysis.

EcoClim.org is a series of almost 10,000 future climate surfaces downscaled to 10-square-kilometer resolution for the terrestrial surface of Earth. Using the simple delta method, EcoClim.org offers climate model parameters including monthly T_{max}, T_{min}, T_{ave}, and monthly total precipitation from 17 different global circulation models vetted by the IPCC and archived at the WCRP PCMDI. Each monthly variable has been averaged over 10 years of climate model outputs, supporting decadal time series analysis through 2100. Two complete sets of future climate surfaces are available, run under the A2 and B1 greenhouse gas emissions scenarios. EcoClim.org data is available either globally or clipped to seven major zoogeographic regions. Our goal is to provide resource managers and conservationists with a wide range of spatial climate data to fully explore potential climate impacts on species and ecosystems.

LandScope America, Bringing Conservation into Focus

Presenter: Lori Scott, NatureServe

LandScope America is a unique collaborative effort by NatureServe and the National Geographic Society designed to inform and inspire conservation of our land and waters. This new online resource brings together maps, data, photos, and stories about America's natural places and open spaces. Currently in a public beta release, the Web site includes more than 140 data layers organized into five themes: Conservation Priorities, Protected Areas, Threats, Plants and Animals, and Ecosystems. This data—assembled from numerous data provider partners, including the NatureServe network of natural heritage programs—is organized and optimized for efficient access through the LandScope map viewer. For land trusts, local and state governments, federal agencies, foundations, landowners, and others in the land protection community, LandScope America is a tool for strategic conservation planning and priority setting that can help focus your work toward the places that need it most.



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8:30 AM–10:00 AM

Paper Sessions

Wildlife, Scale, and Time: Special Topics in Scale and Time

A deep problem in conservation and GIS is dealing with the different ways scale and time frame every aspect of a landscape and any effort to study or manage it. Different spatial and temporal scales reflect different processes and structures and yield different types of data. These papers will present three different approaches to thinking about the problems of scale, time, and data integration in ecosystems.

Room: Toyon

Moderator: Kim Fisher, *Wildlife Conservation Society*

The Very Large Ecological Array

Presenter: Michael Hamilton, *UC Berkeley, Blue Oak Ranch Reserve, CA*

The Very Large Ecological Array (VeLEA) is being deployed this year and utilizes wireless sensor network technology for general-purpose environmental sensing. VeLEA will function as a scalable, configurable distributed wireless (WiFi) communication backbone to allow investigators and educators at the Blue Oak Ranch Reserve (BORR) to deploy off-the-shelf environmental sensors, network cameras, custom sensors, and specialized instruments at any location or habitat. The science applications for such a modular general-purpose array of sensors are multifaceted. VeLEA will provide a multiscale representation of the temporal and spatial variability of micrometeorological parameters across the diverse topographic and ecological communities at BORR, of relevance to numerous proposed and ongoing research projects. Sensors distributed in hundreds of locations will monitor soil profiles for moisture and temperature gradients, and near-ground sensors will document temporal changes in temperature, relative humidity, rainfall, wind speed, and solar radiation. Aquatic sensors will track surface and subsurface flows, concentrations, and gradients of moisture across micro- and macrowatersheds. Studies of the responses of species and ecosystems to regional and microclimatic variability will benefit from the VeLEA observatory data streams. Sensor network hardware can integrate sap flow sensing to track transpiration and water flux from rainfall through soils and into trees and will be of value to studies of plant physiology.

Mapping the Climate near the Ground for Conservation: Macro-, Meso-, Topo-, and Microclimate in GIS

Presenter: Stuart Weiss, *Creekside Center for Earth Observation*

Addressing climate change for conservation will require innovative approaches to mapping climate at multiple spatial and temporal scales, eventually characterizing “the climate near the ground.” The purpose of this presentation will be to demonstrate GIS techniques that can capture key climatic variables for use in resource assessment and modeling.

Spatial variability in climate can be classified into macroclimate, mesoclimate, topoclimate, and microclimate. Macroclimate refers to broad-scale atmospheric circulation over scales of 100+ kilometers and is the ultimate forcing of surface climate. Mesoclimates scale from 100 to < 1 kilometer; represent coastal-inland gradients or elevation gradients up mountains; and are effectively captured by spatial interpolations, such as PRISM, that are now readily available online. Mesoclimatic variability within a protected area network can be a first-order estimate of the resilience to macroclimatic change. But, topography below the mesoclimate scale provides large local climatic gradients according to cold air drainage and insolation across slopes. These gradients often exceed the range of projected macroclimate shifts and are readily addressed through DEM calculations of topographic position, slope, and insolation (Solar Tools). When combined with sensor networks, principles of environmental biophysics, and statistical modeling, topoclimatic modeling scales down to where populations of organisms actually live. At the finest microclimate scales, determined by vegetation structure and fine-scale surface features, methods such as hemispherical photography and sensor networks can be integrated. The range of techniques will be illustrated with real-life applications in conservation/restoration of endangered butterflies and plants and climate change across protected area networks.

GIS Data Fusion to Support Conservation of *Martes Americana*: The American Marten at a Lake Tahoe Ski Area

Presenter: Mary Cablk, *Desert Research Institute*

Data fusion is the combining of information and/or data from multiple inputs to establish inferences and explain linkages that would otherwise not be resolved based on the individual data elements alone. The research presented will be a conservation application of fusion of disparate datasets with spatial reference collected from different field techniques and sensors. The objective of the research was to (1) establish habitat use patterns by a U.S. Forest Service species of concern, *Martes americana*, and (2) compare the spatial-temporal activity patterns of marten

within the ski area to results found elsewhere on nonski area managed landscapes.

The project was conducted over a two-year period at Heavenly Ski Area, Lake Tahoe, USA, including summer and winter field data collection. Presence/Absence was established using 26 infrared remote monitor camera stations and sooted track plates installed throughout the ski area and via snowtracking. Habitat and subnivean access data was collected during snowtracking using a GPS with data logger for the skied transects and the marten tracks, which were followed off-transect. IKONOS satellite imagery was used to refine existing habitat data. Other data included a vegetation polygon layer derived from aerial photography photointerpretation, computer-assisted drawing files of the ski area, digital elevation model data, and raster data extracted from the Multi-resolution Land Characterization Consortium National Land Cover Dataset.

Statistical analyses were conducted to test for significance in activity patterns and habitat use. Marten occurrence differed significantly between summer and winter. Temporal use patterns at Heavenly Ski Area were similar to results reported in nearby nonski area managed landscapes. Spatial analyses in a GIS were conducted to establish and test four hierarchical rule-based habitat definitions. Snow track data presented habitat definitions of statistically significant difference from those derived solely from stationary point data. The fusion of data derived from a dynamic process—martens' movement through the landscape—with stationary sampling locations provided a habitat association model that better informs management strategies.

8:30 AM–10:00 AM

Paper Sessions

Climate Change and Communities

These sessions will detail community-based techniques for assessing and managing conservation values around the world.

Room: Acacia

Moderator: Heather Loring

Developing Community-Based Data for Marine Spatial Planning

Presenter: Jon Bonkoski, Ecotrust

In Oregon, marine spatial planning (MSP) has become a major focus for state agencies as well as coastal communities. Driven in large part by growing interest in wave energy development, MSP promotes informed and coordinated decision making to protect current interests and accommodate future ocean uses.

Balancing new plans with the current uses, such as commercial and recreational fishing, requires properly vetted data on the value, spatial extent, and potential impacts to current uses. One way to create these vital datasets for integration into the planning process is to build community-based spatial fishing data and map products. To that end, Ecotrust worked with the Southern Oregon Ocean Resource Coalition (SOORC) to collect information about important and traditional fishing grounds. The goal of this pilot project, part of the Oregon Territorial Sea Plan (TSP) revision, was to compile a comprehensive map of commercial, charter, and sport fishing use patterns along the southern Oregon coast from Bandon to Reedsport using the expert knowledge of local fishermen. The main objectives of this project were to develop accurate maps of the local fishing grounds and describe their economic importance to local fishermen, as well as incorporate local fishermen's knowledge into deliberations on the development of future amendments to the Oregon TSP. The result of this mapping effort was a community-based cross-sector fishing use map—a single map that incorporates all three sectors (i.e., commercial, charter, and sportfishing) in a way that highlights the value of all three fisheries equally. The success of the pilot project has led to an ongoing statewide mapping effort and has encouraged other Oregon fishermen to bring their knowledge directly to bear on the marine planning process. By asking fishermen to share knowledge of their fishing grounds and by giving them a forum in which to express their values, this project engaged stakeholders, characterized the relative importance of various fishing grounds in a spatially explicit format, and provided a new source of community-based information for the marine planning process.

Application of GIS for Conservation Awareness in the Protected Areas of Nepal

Presenter: Ashok Pathak, Society for Wetland and Biodiversity Conservation (WBC Nepal)

This paper is about the community GIS concepts to increase conservation awareness in the protected areas of Nepal. This is based on the application of GIS introduced by WBC Nepal, with technical support from SCGIS Nepal, to enhance the spatial thinking and geographic approaches of the local people with the help of colorful maps, satellite images, and group discussion. This paper is divided into three parts. The first part is about the importance of community GIS in developing countries. The second describes the preparation of a GIS database for community GIS. The third describes the transfer of the map and images to the local community.

Our experience is that, because of the poverty and rapid population growth, protected areas of Nepal get more pressure. People are extracting the resources from these areas without considering sustainable use. To increase the conservation awareness for

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the local people, we have started different income-generating activities to reduce the pressure in conservation areas. We came to learn that community mobilization is essential for conservation awareness. For this, we have prepared a GIS database of protected areas that we share with the local people. They are very interested when they see their grazing areas, firewood collection areas, houses, and settlements on the map and satellite images. They also narrate the different events and activities in their everyday lives. They add more information to the GIS map such as habitat assessment, wildlife corridor, and vegetation type data. With this experience, we came to know that GIS and RS technology are very useful to increase the conservation awareness in developing countries where local people have never seen maps and satellite images of their surrounding landscapes. Considering this, we have started a community GIS concept to increase conservation awareness.

Subsistence Hunting Patterns by Ye'kuana and Sanema Indigenous Communities in Ka'kada River Watershed, Upper Caura, Bolivar State, Venezuela

Presenter: Lucy Elena Perera Romero, Wildlife Conservation Society, Venezuela

The Caura watershed is home to several indigenous communities, the Ye'kuanas and Sanemas being the largest. During the last century, these traditionally nomadic tribes have turned to sedentary habits. It is locally perceived that the resultant pattern of subsistence hunting around the communities has led to a wildlife population decline, especially for the preferred prey species. To address this situation and secure their protein resources, Ye'kuana and Sanema communities have designated some watersheds of their territory as wildlife reservoirs, where no human presence is allowed. Hunting and fishing are allowed activities, but only on an occasional basis and just for those communities settled near the reservoir. There are three of these reservoirs in Caura. In this work, we will report the spatial pattern of use in one of these watersheds, the Ka'kada River. Working in this area, we aim to categorize zones in different hunting pressures in terms of frequency and overall biomass extraction of the observed hunting events. Hunting registries were made continuously between October 2008 and June 2009 by indigenous parabiologists. Every group making use of the reservoir was interviewed to collect information about visited locations and harvest details. I will use this information to map Ka'kada River use—the most frequent routes and places most commonly used. I will investigate whether or not important areas exist for some species and if resulting maps are similar or not for the different group of species. When finished, I expect to obtain a hunting pressure map of the areas along Ka'kada River. Characterizing this spatial use is a crucial step when assessing hunting sustainability for the most preferred species.

Spatial Potentials for Development of Settlement System

Presenter: Rok Cigli, Anton Melik Geographical Institute, Slovenia

Human activities are influenced by physical and social factors. Influence is also strong in the opposite direction. That's why both groups of factors have to be studied before planning different spheres of activities, including expansion of settlements. In more natural areas, the first group (physical factors) is even more important due to the preserved natural environment. In presented research, a map displaying a degree of general suitability for settlement development has been made. Before making the final map, I took into consideration three separate aspects: suitability according to natural factors, suitability according to land use, and suitability according to existent infrastructure. Each aspect has been analyzed with the help of digital datasets. I've evaluated different datasets (digital elevation mode, bedrock, vegetation cover, solar energy, water area, water protected area, natural protected area, type of aquifer, land use, road system, water pipeline system, and electricity system) and summarized them together with a multicriteria evaluation method (weighted linear combination).

Directives for the development of the settlement in the municipality have been introduced after the analysis. Furthermore, some guidelines for the improvement of such analyses have been set. Namely, in this research, only possibilities for settlement development (primary residential areas) have been taken into account. Before making a decision, possibilities for other land-use categories (agriculture, industry, tourism, etc.) should also be analyzed and compared to one another similarly to how I did in presented research.

8:30 AM–10:00 AM

Special Session

Room: Kiln

Support for ESRI Press Conservation Planning Book from SCGIS Members

This session is planned as a group discussion among SCGIS members interested in assisting with the completion of a book on conservation planning authored by Lance Craighead and Charles Convis. This is an opportunity for members to contribute in several ways. Other possibilities may be brought up during the meeting, but basically there will be opportunities such as

1. SCGIS members with cartographic expertise can help finalize maps for the book and be given credit in the publication.

Maps have been prepared by a wide group of "GISers" with varying styles, and we would like to adjust some of the final maps to give the entire book a more uniform look. This will involve getting data layers from authors and allowing them to review the newer versions to ensure that they are in agreement with changes. Craighead and Convis will act as points of contact between cartographers and authors.

2. A partial manuscript with over six chapters will be available to SCGIS members willing to provide an informal review of the subject matter and presentation. Each chapter will undergo a formal peer review at a later date, but we are interested in getting some preliminary input from some of the end-user community regarding

- Interest level of the chapter and readability
- Topics you would like to see included related to this topic
- Relative value of various approaches from a teacher's viewpoint

- Checklists of steps needed

- Level of detail provided/desired
- Availability/Accessibility of GIS tools, scripts
- Availability/Accessibility of case studies/examples
- Availability/Accessibility of supporting literature

3. Informal reviewers will be mentioned in acknowledgments. There may be a possibility for free copies if we can secure additional funding.

4. We are developing an accompanying Web source on DataBasin. We are particularly interested in relevant case studies using GIS and conservation planning tools to achieve social gains. If you have a project that illustrates the use of any of the topics presented in the book we would be interested in hosting information, tools, maps, and approaches that were effectively used, in particular, any project that illustrates how defensible science has achieved conservation and social change. This should provide a public forum for SCGIS members to gain additional exposure of their projects and causes to an audience that will include a broad spectrum of book purchasers, students, and members of DataBasin.

8:30 AM–10:00 AM

Technical Session

Room: Chapel

Tips and Tricks for Working with the New ArcGIS 10

Presenter: Miriam Schmidts, ESRI

When you first open ArcMap 10, the interface will look much different than what you've been used to. The organization of menus and toolbars has been improved, it's easy to add great-looking basemaps to your map, and you can now access and manage your data through the new dockable Catalog window built into ArcMap. A new dockable Search window lets you instantly search for maps, data, and tools. Most important for a lot of us, the ArcMap editing environment has an updated look, with streamlined access to functionality. This workshop will help you get started with ArcMap at version 10. I will give you a tour of the new ArcMap interface and show how to use some new key functionality, with a focus on the new editing environment. You will learn how to use the new Editor tools and create and edit features using feature templates.

10:30 AM–NOON

Paper Sessions

GIS Tools for Bird Conservation

Room: Toyon

Moderator: Kellee Koenig, Conservation International

Landscape Modeling for Blue-Winged Teal in the Sheboygan River Basin: A Weighted Criterion Approach

Presenter: Chris Pekar, Natural Resources Consulting, Inc.

The Sheboygan River Basin Area of Concern Fish and Wildlife Technical Advisory Committee is undertaking a watershed-based approach to a GIS site selection search for potentially restorable wetlands with the intent of improving nest success for the blue-winged teal in the Sheboygan River Basin. The GIS model will incorporate up to 10 criterion layers that will be differentially weighted by the committee members and a limited number of experts by using the analytic hierarchy process (AHP). The expert panel is composed of stakeholders found throughout the state of Wisconsin who will determine the relative importance of each criterion with respect to all other criteria by using an online

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survey form. This online survey method allows the participants to fill this out at their convenience. The results of these rankings will be averaged and entered into an AHP plug-in tool that integrates with the ArcGIS Spatial Analyst extension. The resulting suitability map will be used by the committee to guide restoration efforts throughout the Sheboygan River Basin. Additionally, a comparison map will be created that identifies any differences between the primary output map and an unweighted version of the output map. This step will provide insight into how significant the weighting process is.

The Sheboygan River Basin was listed as an Area of Concern by the United States Environmental Protection Agency in 1985 due to historic discharge of pollutants and habitat loss along the lower 14 river miles of the Sheboygan River. Although delisting targets for the Sheboygan River Basin Area of Concern are still being created, these targets are required to have a wildlife habitat restoration component. Blue-winged teals are an ideal focal species for watershed-based restoration planning efforts for many reasons. They are considered a species of greatest conservation need by the Wisconsin Department of Natural Resources and are also considered an umbrella species, meaning that restoration efforts made to enhance the blue-winged teal populations will likely benefit many other wetland flora and fauna.

A Decision Support System for Conservation of Birds

Presenter: Amanda Borens, University of Arizona

Conservation planning attempts to mitigate declines in biodiversity, and one common approach is to establish habitat reserves. But in a highly developed region with pervasive and accelerating human impacts, as in most areas of the United States, it is unlikely that a large enough portion of land will ever be set aside to preserve a full representation of biodiversity and ensure its persistence. A complementary effort to mitigate human impacts in other areas is also necessary. To facilitate decisions about conservation of birds in Arizona, I processed 441 distribution models for birds inhabiting the five-state region of the Southwestern United States in ERDAS Imagine format at a 240-meter resolution. These 261 models represented more than 88 percent of 295 confirmed or probable breeding bird species in Arizona. I used ArcInfo 9.2 tools to create a GIS with map layers indicating the presence of features in three categories of conservation priorities: species richness, development risk, and composite conservation value. I created a relational database to complement the GIS by providing composition data for comparisons between map cells and by summarizing statistics across map layers. I used MySQL 5.1 to store attributes for each of 5,113,078 map cells, including geographic coordinates for the centroids, an associated list of predicted species, and scores for conservation priorities. I also created a master list of species in the database with expanded details

about taxonomy, Arizona Partners in Flight (APIF) priority score, rarity, and proportion of breeding range within Arizona. The GIS and database together comprise a robust decision support system (DSS) with a total of 219,594,242 species cell records. GIS tools alone provided some summary statistics, but the DSS was critical for comparing attributes between cells and performing statistical analyses and calculations when questions are related to specific groups of species. While the DSS is useful for identifying areas for reserves, the perceived quality of reserve selections will vary with stakeholders and criteria sets. The fine scale and specificity with regard to species composition and cell attributes make the DSS particularly valuable for sharing information between agencies and advocacy groups, as conservation priorities may differ at various spatial scales, but overarching biodiversity goals for a region are ideally synergistic.

Bird Mash-up in the Bogota Wetlands

Presenter: Juan Manuel Prada, SERVICAT LTDA

Using the collaborative dates obtained from many ornithologists and birdwatchers of Christmas bird counts from the last 10 years in the wetlands of the northern sabana and in Bogota, we customized a topographic map from ArcGIS Online and extended its use to mash up the birdwatching activities in places inside the city so that in the future, these places can be of interest to common tourists and visitors to the capital city. These services don't exist yet in the city; the intent is to provide a service for the public in general, so that when the visitors confirm the place or location of historic views for historic dates, we can specialize the observation and interact with the map for report online over the images or thematic maps in general, using the platform of free resources from ESRI to invite users to share observations in ArcExplorer. In the future, for localization, it will be more possible to observe the species of bird that you want to see in a specific wetland of Bogota.

10:30 AM–NOON

Paper Sessions

Climate Change and Conservation Planning in Coastal Ecosystems

GIS techniques for predicting coastal impacts of climate change and community conservation practices to plan for those impacts on coastal communities will be covered.

Room: Acacia

Moderator: Rob Rose, Wildlife Conservation Society

Modeling Wetland Complexity for Coastal Landscapes within Sea Level Rise Scenarios

Presenter: Elizabeth Smith, Center for Coastal Studies

Digital elevation model (DEM) data is used to predict inundation along coastal shorelines. Understanding how coastal wetlands may respond to inundation is more difficult, especially in microtidal (< 1 m) areas along the Gulf of Mexico. We incorporated DEM, Soil Survey Geographic Database (SSURGO), and National Wetland Inventory (NWI) data to model the wetland landscape for areas inundated following a 1-meter sea level rise (SLR) around Lamar Peninsula, Aransas County, Texas. While DEM data provided the areal extent of inundation, soils and wetlands data was used to delineate the wetland type and orientation. Crosswalks were constructed and decision rules developed to determine which wetland type would occur across the tidal gradient. Sandy soils were assumed to be redistributed along the shoreline as sea levels rose and were designated as either flats or beaches; clay soils were converted into either flats, intertidal marshes, sea grass, or open bay bottom, depending on the level of inundation. Freshwater wetlands in NWI data were converted to unvegetated flats or sea grass and provided an additional level of complexity not available in the soils data. It appears that the geomorphic orientation and low elevation gradient of the Lamar Peninsula will provide more wetland habitat under a 1-meter SLR scenario than is presently available. These findings are important to the continued conservation of endangered whooping cranes, which are recovering and currently expanding their winter range to Lamar Peninsula. This study will be useful to identify areas that will support appropriate habitat in the future and prioritize conservation acquisition or easements.

Natural Upland Habitat Shifts from Sea Level Rise on Coastal Peninsulas and Implications for Habitat Diversity

Presenter: Rosaleen March, Center for Coastal Studies, TAMU-CC

The Texas Coastal Bend provides critical habitat to neotropical migrants, and shifts in habitat from sea level rise may reduce availability of this habitat. This study evaluated potential habitat conversion in the event of sea level rise on five peninsulas: Seadrift-Port O'Connor Ridge, Blackjack, Lamar, Live Oak, and Encinal peninsulas. To determine if management techniques for migrant habitat could be generally uniform throughout the peninsulas, we characterized them individually as well as comparing them to each other using GIS (ArcMap 9.3.1) and the following digital data: elevation (30-meter digital elevation models), soil and ecological habitats (Soil Survey Geographic Database), and wetland composition (National Wetland Inventory). Potential habitat conversion was evaluated using three scenarios: 1-, 2-, and 3-meter sea level rise (SLR). On the Lamar peninsula (the smallest

areal extent), a 1-meter SLR resulted in salty prairie converting to wetland (decrease of 99%), grasslands decreasing 61 percent to unconsolidated shore, and evergreen reduction of 7 percent. With 3-meter SLR, grassland was reduced by 99 percent and evergreen by 71 percent. Due to its higher elevation, Live Oak exhibited less upland habitat loss. At 1-meter SLR, 60 percent loss in salty prairie, 18 percent loss in grassland, and less than 1 percent loss in evergreen occurred. With 3-meter SLR, overall loss in salty prairie, grassland, and evergreen were reduced by 91, 62, and 15 percent, respectively. Assessing how sea level rise-induced habitat alterations will occur and correlating this with possible biodiversity shifts will give us insight into how we can better manage migratory stopover habitat in the Texas Coastal Bend.

Community-Based Conservation Planning in Solomon Islands

Presenter: Nate Peterson, The Nature Conservancy

Less than 1 percent of Choiseul Province in the far western Solomon Islands is currently under protection. Protected areas include locally managed marine areas and traditional closures, or tambu sites. While these areas contribute to the protection and management of biodiversity, sites have largely been established based on opportunity and local traditions. The Luru Land Conference of Tribal Communities (LLCTC) is a grassroots, ecumenical, nongovernment organization that has strong community support throughout Choiseul Province. At the request of LLCTC and the Choiseul provincial government, The Nature Conservancy facilitated and completed the Choiseul Ridges to Reefs Conservation Plan. A stakeholder workshop in May 2009 brought together community leaders from across Choiseul to identify locally important features. This local knowledge was combined with vegetation, geology, and coral reef data in a GIS as inputs for a Marxan analysis. A baseline target of 10 percent, as prescribed by the Convention on Biological Diversity (CBD), was used to identify conservation priority areas. A 20 percent target scenario was also developed to improve adequacy in anticipation of climate change. The results have been unanimously endorsed by LLCTC with a pledge to designate at least two protected areas in each of the 12 wards of the province, creating the Luru Protected Areas Network. This plan is now being used as a model to do a national scale gap analysis that will support the government's commitments under the CBD.

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10:30 AM–NOON

Technical Session

Room: Kiln

Working with ModelBuilder

Presenter: John Schaffer, Juniper GIS

This will be a practical look at working with ModelBuilder, including using scripts, branching, iteration, and creating Tool dialogs. To better understand how ModelBuilder works, we will briefly review how ModelBuilder fits within the ArcGIS geoprocessing environment, how this affects its operation, and how ModelBuilder can work with the other geoprocessing methods. Then we will look at the nuts and bolts of creating, modifying, and exporting models, along with some tips and tricks we've learned along the way.

10:30 AM–NOON

Technical Session

Room: Chapel

Open Source Natural Resource Management: Introduction to OpenNRM for Your Organization

Presenter: Amye Osti, 34 North

This hands-on workshop is intended as an introduction to Web mapping and collaborative natural resource management using the open source application OpenNRM. Participants will go through the simple process of setting up the OpenNRM environment. The setup process will give users the option to use the OpenNRM JavaScript Mapping API or the ESRI JavaScript API.

The creation of the application will include step-by-step examples for building custom maps (using various services such as ArcGIS Online, WMS, REST, and SOAP), profile pages, project libraries, wikis, a science center, document library, and more. Important Web mapping concepts will be discussed throughout the workshop. We will also discuss adding custom features like sensor observation networks, graphing applications, Twitter, Issuu, and other social networking tools to make your application more dynamic. Finally, we will discuss the benefits of participating in an open source community and professional services options to support your new application.

1:30 PM–3:00 PM

Paper Sessions

GIS Tools for Wildlife Habitats

Room: Toyon

Moderator: Nadia Martin

GIS and Maximum Entropy Modeling Approach to Predicting Habitat Preferences and Distribution of *Peromyscus Leucopus*

Presenter: Nadia Martin, University of Michigan

Peromyscus leucopus (white-footed mouse) is a common species found throughout the eastern United States. Recently, the species has been expanding its range from the lower peninsula of Michigan to the upper peninsula, possibly due to increasing temperatures. Given the shifting environment, being able to predict *P. leucopus* distribution based on habitat preferences could provide insight into their future distribution, aid the creation of conservation management plans, and provide understanding of how the species will be affected by climate change. A maximum entropy modeling approach (Maxent) was used to predict habitat preferences and future distribution of white-footed mice in Michigan, Indiana, and parts of Minnesota and Ontario. Both presence data and environmental data, including a digital elevation model, land-cover *le*, current climatic layers such as temperature and precipitation, and a future climate layer, were used in the model. The model's accuracy was assessed using a cross-validation process and receiver operating curve, and a jackknife test was used to determine which environmental layers are most important in predicting white-footed mice distribution. Results show that the model was fairly accurate in predicting the distribution of the species. Land cover was the environmental layer that contributed most to the habitat preferences of white-footed mice. Within the current land-cover *le*, *P. leucopus* were found most often in deciduous forest and woody wetland habitats. This study makes predictions on how climate changes will influence distribution patterns of white-footed mice in the Midwest and the resulting impact on interactions between *P. leucopus* and other species such as the closely related deer mouse (*P. maniculatus*).

Ecological and Anthropogenic Influences on Habitat Suitability for the Mountain Gorilla in Bwindi Impenetrable National Park, Uganda

Presenter: Dennis Babaasa, Uganda Christian University, Bishop Barham University College, Uganda

I will investigate the influence of ecological and anthropogenic factors on the spatial distribution of the endangered mountain gorillas in Bwindi Impenetrable National Park, Uganda. A critical missing piece of information for the protection of this high-profile species is a fine-scaled vegetation map of the park. This project will produce the map by collecting field vegetation data on plant composition along stratified random transects. The vegetation data will be used to classify recent satellite images of the park. Stratification will be based on landforms visible on a digital elevation model, and the different vegetation types along transects will be determined from differences in tone and texture on recent aerial photographs. Data on gorilla night nest locations of 1997, 2002, and 2006; other ecological variables such as rivers, elevation, aspect, slope, and food plants; and anthropogenic factors like roads, forest edge, settlements, population density, and human activity signs within the forest will be derived from the GIS database I have already built. Gorilla pseudo-absences will be randomly located using GIS in areas where gorilla presence has never been reported. I will then evaluate the independent ecological and anthropogenic variables in relation to the dependent gorilla presence/absence locations using both multiple linear and logistic regression statistical models to classify the park according to its habitat suitability for gorillas. Models will be validated for accuracy using an independent dataset. This information will help inform proactive planning and park policy by combining habitat suitability maps with maps of proposed developments to identify areas of conflict.

Mammal Population Estimates in Zambia

Presenter: Priscilla Sishone, Zambia Wildlife Authority

The presentation will describe how GIS tools have become an integral part in the planning, execution, and data analysis in conducting aerial surveys for large mammal census.

Identifying Habitat Stewardship Needs Using Rapid GIS Mapping Assessment

Presenter: Marcelle Caturia, Portland Metro

The Portland metropolitan area encompasses three counties and 26 cities. Within this region, the metro regional government manages more than 13,000 acres of land in order to protect water quality, fish and wildlife habitat, and public access to nature. In spite of limited staff and resources, our goal was to quickly assess where and in what condition habitats exist throughout our widespread properties and to estimate how

much it costs to manage these lands. To meet this challenge, we developed a methodology for classifying habitat type and management status and applying estimated costs per acre. This presentation will describe the technical steps followed during data capture, the various planning challenges encountered, and the initial results of the classification process. In addition, various approaches for analyzing management costs within the context of habitat stewardship needs will be outlined. Finally, we will discuss our next steps and where we hope to go from here.

1:30 PM–3:00 PM

Paper Sessions

Wildlife Movement, Corridors, and Connectivity

Room: Acacia

Moderator: Gillian Woolmer, Wildlife Conservation Society Canada

Addressing Statewide Habitat Connectivity

Presenter: Candace Paulman, SC Wildlands

The California Departments of Transportation and Fish and Game commissioned the California Essential Habitat Connectivity Project because a functional network of connected wildlands is essential to the continued support of California's diverse natural communities in the face of human development and climate change. SC Wildlands was part of a consulting team that worked in collaboration with an interagency multi-disciplinary team to address connectivity at the statewide level. The project produced three primary products: (1) a statewide Essential Habitat Connectivity Map, (2) data characterizing areas delineated on the map, and (3) guidance for mitigating the fragmenting effects of roads and for developing and implementing local and regional connectivity plans.

The Essential Connectivity Map depicts large, relatively natural habitat blocks that support native biodiversity and areas essential for ecological connectivity between them. The statewide network consists of 850 relatively intact and well-conserved Natural Landscape Blocks (ranging from 2,000 to about 3.7 million acres each) with over 1,000 potential connections among them. The 192 Essential Connectivity Areas represent principal connections between the Natural Landscape Blocks within which land conservation and management actions should be prioritized to maintain and enhance ecological connectivity.

This presentation will describe the approach for conducting the GIS analyses that delineated the Natural Landscape Blocks and Essential Connectivity Areas.

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(continued)

Verifying Modeled Wildlife Corridors with Animal/Vehicle Collisions

Presenter: Connor Bailey, Center for Native Ecosystems

Animal/Vehicle collisions (AVC) are a major concern for many diverse interest groups because these events cause damage to vehicles and road infrastructure and injury or death of drivers, passengers, and wildlife. Connectivity must be considered not just for vehicle traffic flow but also for wildlife crossing the high-way corridors. Without the maintenance of connectivity across roads, wildlife risk injury, death, extirpation, and extinction. Building on previous work identifying the major wildlife corridors in the state of Colorado, the Center for Native Ecosystems utilized the Corridor Design least-cost corridor modeling tool created by Dan Majka and Paul Beier. Using an AVC dataset from the Colorado State Patrol, a number of statistical tests were conducted to validate the effectiveness of the modeled corridors. The research has fed directly into legislation to reduce speed limits within the identified wildlife corridor areas and is currently being incorporated into the State Wildlife Action Plan.

Using Geographic Information System-Based Cost-Distance Models to Identify Potential Wildlife Corridors within an Important Tiger Landscape in Malaysia

Presenter: Emmelia Ayub, WWF Malaysia

Wildlife corridors in Southeast Asia are not often identified with sufficient scientific rigor. For the first time in Malaysia, we used geographic information system-based cost-distance models to identify wildlife corridors within a level 1 Tiger Conservation Landscape. The corridors, when established, should potentially facilitate mammal movement between two important mammal habitats bisected by a major highway: the Royal Belum State Park and Belum-Temengor Forest Reserves. First, land use, forest classes, and topographical features were weighted as cost layers based on expert opinion. Next, we selected three levels that represent 5 percent, 10 percent, and 15 percent of least-cost cell slices to categorize level 1, 2, and 3 corridors, respectively. Finally, occurrence data from tigers (*Panthera tigris*) and elephants (*Elephas maximus*), as well as localities of proposed infrastructure projects along the highway, were overlaid onto the models to identify the most critical corridors. As part of WWF Malaysia's continued efforts to maintain habitat connectivity in this important tiger landscape, the identified corridors were submitted to the Department of Town and Country Planning for incorporation into existing land-use planning documents.

Modeling Wildebeest Distribution in Serengeti National Park, Tanzania: An Application of GIS and Satellite Imagery

Presenter: Hamza Kija, Tanzania Wildlife Research Institute

Animal presence in a given time at a particular location is determined by multiple biotic and abiotic factors. In view of this, the present study used GIS spatial and temporal analyses and remote-sensing techniques to ascertain factors affecting wildebeest density and distribution in Serengeti Plains, Tanzania. Five species–environment hypotheses related to vegetation structure, rainfall, rivers (water availability), roads, and elevation—together with wildebeest density data—were analyzed using simple and multiple regression. Positive relationships were detected for elevation and distance from the roads, while other factors were negatively related to wildebeest density. Based on coefficient of determination (r^2), individually, higher variations were accounted for by elevation (30%), vegetation structure (12%), distance from rivers (8.3%), rainfall (6.4%), and distance from roads (2%). However, on the final model, elevation turned out to be the most important factor influencing density and spatial distribution of wildebeest by explaining a total variation of 35.5 percent. Future work is proposed to repeat the present study with census data from different years and to include other factors such as vegetation greenness; soil types; and the effects of fire, temperature, predation, and other human-induced disturbances beyond the scope of the present study. Findings of the present study are expected to contribute information to the existing species–environment knowledge and facilitate management and conservation of wildebeest in the Serengeti ecosystem.

1:30 PM–3:00 PM

Technical Session

Room: Kiln

Working with Linear Referencing and Routes for Streams

Presenter: John Schaffer, 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.

1:30 PM–3:00 PM

Technical Session

Room: Chapel

Firebug for Web Development

Presenter: Paul Angelino, The Nature Conservancy

If you do any Web development work and you don't know much about Firebug, then you've been programming with one arm tied behind your back. Firebug is an amazing little plugin for the Firefox browser that lets you monitor HTTP traffic, perform JavaScript and CSS debugging, examine Ajax requests, and much more. We'll walk through some of the most useful functionality of Firebug using real examples to illustrate just how powerful this tool can be. You'll wonder how you ever lived without it!

3:30 PM–5:00 PM

Paper Sessions

Climate Change Impacts in Forest Ecosystems

Forest ecosystems were defined as a specific part of the Kyoto protocol, and these papers will present different GIS techniques for analyzing deforestation, forest carbon, and forest economics.

Room: Toyon

Moderator: Nanette Bragin, The Denver Zoo

The Impact of Deforestation on CO₂ Emissions in Coastal Tanzania circa 1990 to circa 2007 and the Estimation of Carbon Stock of Remaining Forests

Presenter: Fabiano Godoy, Conservation International

We estimated CO₂ emissions resulting from habitat loss from ~1990 to ~2007 and the remaining carbon stock for Tanzania's coastal forests. Results show there are 273,709 hectares of forest in coastal Tanzania circa 2007. Deforestation rates have been greatly reduced from the 1990s (3,735 hectares y-1, 0.98% y-1) to the 2000–2007 period (1,233 hectares y-1, 0.44% y-1). In addition to this data on forest loss, we used available data

on carbon density in the coastal forests of Kenya and Tanzania to estimate carbon lost from the forests over the past 20 years. CO₂ emissions from the coastal forest ecosystem deforestation were 6.3 Mt CO₂ in the 1990 and reduced to 1.3 Mt CO₂. The forest loss within protected areas was six times less than outside protected areas, but forest within protected areas near large cities can be heavily degraded, further reducing the amounts of stored carbon. The loss of forest cover and forest condition in this region of the world provides an opportunity for the implementation of projects aiming to reverse these losses and help slow global climate changes.

Protecting Highly Threatened Araucaria Forest by Designing a Mechanism for Small Landowners to Enter the Carbon Market

Presenter: Marlon Prestes, Society for Wildlife Research and Environmental Education, Brazil

This project focuses on conservation of private lands and the adequacy of legislation, seeking connectivity of fragments and installation of ecological corridors through a cooperative system of environmental services to capture and store carbon in native forests of the southwest region of Paraná, whose Human Development Index (HDI) is the worst in the state, with a high incidence of people living below the poverty line. The region has the largest reserves of Floresta ombrófila mista (Araucária forest) on private property and the third largest reforestation area of Paraná, as well as having the greatest number and area of conservation units of sustainable use of Araucária forest. There is about 0.8 percent of Araucária forest in Paraná State, and between the years 2000 and 2005, there was destruction of over 28,000 hectares, indicating a strong pressure on the last remnants. This project will also create a Carbon Bank through the study of the viability of implementing a CDM project for small-scale recovery areas, a viability study of forestry projects in parallel markets, and the consortium of fragments in good conservation. These activities will generate technical and financial incentives to owners of forest fragments and the adequacy of Legal Reserves and Permanent Preservation Areas, establishing a connection between these fragments and facilitating adjustment of the property law.

Establishing CO₂ Emission Baseline for a Reducing Emission from Deforestation and Degradation Project in the Fandriana Vondrozo Forest Corridor (Madagascar)

Presenter: Andriambolantsoa Rasolohery, Conservation International, Madagascar

Conservation International helps the government create a protected area in the Fandriana Vondrozo forest corridor in eastern Madagascar. We also help implement a Reducing Emission from

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Deforestation and Degradation (REDD+) project in the area; the revenue from the reduced emissions would be used to manage the protected area and fund local activities that help conserve the corridor. I am involved mainly in establishing the emission baseline for the REDD+ project:

- Establish the historical emission by evaluating past forest cover in the area. We did that as part of a national project; forest cover change from 1990, 2000, and 2005 was done using Landsat imagery processing.
- Evaluate carbon stock currently available in the corridor. Field inventory of biomass and carbon stock was taken, following guidelines from Winrock International on the sampling sizes and calculations.
- Project future forest loss under the business as usual scenario, and evaluate how much greenhouse gas would be emitted.

3:30 PM–5:00 PM

Paper Sessions

Wildlife Management and Monitoring

Room: Acacia

Moderator: Jessica Forest, WWF

Applying GIS for Wildlife Aerial Monitoring in the Tarangire-Manyara Ecosystem, Tanzania

Presenter: Honori T. Maliti, Tanzania Wildlife Research Institute

Wildlife monitoring is fundamentally necessary to understand how ecosystems function and how environmental changes affect wildlife populations and natural habitats. Traditionally, wildlife monitoring has relied primarily on statistical analysis to interpret trends and patterns. However, a constraint of most techniques is an inability to detect or depict spatial changes. This study investigates the use of GIS to add a spatial context to both short- and long-term systematic wildlife monitoring measurements and the evaluation of ecosystem processes. Data from 16 different aerial censuses conducted between 1987 and 2006 in the Tarangire ecosystem of northern Tanzania was used as a case study in the analysis. First, a geodatabase was created allowing all censuses, including spatial and attribute data, ever conducted in Tanzania to be uploaded. Then for the Tarangire-Manyara ecosystem, statistical and spatial analyses were performed. These showed that the oryx (*Oryx gazella*) and wildebeest (*Connochaetes taurinus*) populations had decreased significantly, while the zebra (*Equus burchelli*) and eland (*Taurotragus oryx*) populations had remained stable or unclear, and those of buffalo (*Syncerus caffer*) and elephant (*Loxodonta africana*) had increased. From a spatial context, kernel analysis

at the population level showed that the area used by wildebeest had shrunk significantly, and generally in later years most species preferred areas with low human influence. Generally, the study showed that GIS offered various types of spatial analysis, hence generating new information. Thus, GIS provides an alternative way for data and information presentation that may be easier to comprehend and interpret by wildlife managers, decision makers, and communities living around protected areas.

Guanacos of the Argentinean Dry Chaco: Identifying Conservation Strategies and Public Policies about the Situation of Its Population and Its Habitat

Presenter: Christian Fernando Schneider, Argentina

The Dry Chaco ecoregion in the center of Argentina is one of the regions that has been devastated by forest extraction and the agricultural and cattle expansion. This region presents a relictual population of Chacoan guanaco (*Lama guanicoe*), the only one reported, mistakenly considered extinct in the Gran Chaco of Argentina and endangered in Bolivia and Paraguay. We propose to determine the conservation of the guanaco population in the center of Biogeographic Corridor of the Arid Chaco (BCAC, protected area of the subregion Arid Chaco in Province of Córdoba) and to identify conservation strategies, using it like flagship species. Through foot and vehicle surveys, we will make surveys in wet and dry season, to estimate its relative abundance and distribution. Ethnographic interviews with the local actors will be made to involve traditional knowledge and to know the different land use. By means of GIS analysis, the information obtained about the distribution and the relative abundance of the guanaco, vegetation cover type, landownership, and land use will be integrated in order to generate a map of high-priority conservation sites of the corridor at landscape scale. With this product and the involvement of the local community (key actors, stakeholders, little farmers), we will try to promote new public policies for the conservation of this region.

An Assessment of Management and Threats in Tiger Conservation Landscaping

Presenter: Jessica Forest, WWF

Wild tigers in Asia have suffered dramatic decreases in population and habitat over the past century. Having once ranged throughout South, Southeast, and Central Asia; China; and the Russian Far East, tiger habitat has been reduced to a few core areas in the wild, with a total estimated population of only 3,000 to 4,000 individuals. Here, we characterize management and threats in TCLs at two scales, regionally and at the sublandscape scale. Our specific questions include: What is the breakdown of TCLs by management zone, including protected areas and other management types? Can we conclude anything

about inconsistencies or conflicts in management? And what is the distribution and presence of threats? We relied on data from the World Database of Protected Areas improved by local protected area data; the Management Effectiveness Tracking Tool (METT); and data on oil and gas, timber, and mining concessions. We found that a relatively small portion of the tiger range is under formal protection and that, in many places, protected areas directly conflict with alternate extractive uses. In addition, protected area management was found to be deficient in many parts of the tiger range, and threats of poaching, illegal logging, and deforestation had variable levels of impact in the landscapes assessed.

3:30 PM–5:00 PM

Technical Session

Room: Kiln

Using the National Hydrography Dataset in Conservation Research

Presenter: Jeff Simley, USGS

This class will provide the basic information you need to exploit the power of the National Hydrography Dataset (NHD) in representing the surface water of the United States. The NHD was carefully designed for scientific applications and consists of many attributes and characteristics perfectly suited for geographic analysis using GIS. However, the data was designed to be simple enough for anyone to use, not just for highly skilled GIS specialists. The ability to navigate throughout the stream network is covered, opening up new approaches for conducting analysis. The data structure is explored, revealing many new possibilities for network analysis. The important process of linking scientific data to the stream network is covered. These techniques, combined with network navigation, lead to cause-and-effect analysis, allowing the scientist to discover how one event in the environment can impact another event. The added power of NHDPlus will also be covered.

3:30 PM–5:00 PM

Technical Session

Room: Chapel

An Open Source and Living Decision Support System for Land Conservation

Presenter: John Gallo, The BioVision Community

The BioVision Decision Support System is an exciting new tool and provides an intriguing opportunity for the SCGIS community. It is designed to help organizations decide where to conserve, how (e.g., through acquisition, stewardship), and why. It uses a return on investment approach to essentially blend the objectives of NatureServe Vista, Marxan with Zones, and CorridorDesigner in one integrated and flexible package. In other words, the primary functions are a site valuation tool combined with systematic conservation planning that addresses and allocates a variety of land management options in a near-optimal solution that considers corridors, representation, and contiguity. Version 1.0 gets the job done and is an exciting opportunity, but there is so much room for improvement. It is programmed using Spatial Analyst and ModelBuilder, (which comes in all versions of ArcGIS 9.x). The ModelBuilder menu-driven icon interface allows you to see all the steps involved and/or customize the model to your unique needs, even if you do not know a programming language. BioVision is linked to region-specific data preprocessing steps, also in ModelBuilder, facilitating a living tool to easily provide updated decision support as conditions change on the biophysical landscape or within the sociopolitical culturescape. In the workshop, we plan to provide the theoretical background of BioVision, demonstrate how to use it, and discuss the protocol for contributing updates to the model and/or modules on the online user community.

2010 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. 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.

President

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Vice President

Gillian Woolmer, Wildlife Conservation Society, Canada

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SCGIS Domestic and 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 2010 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.

Andriambolantsoa Rasolohery
Conservation International
Madagascar
arasolohery@conservation.org

Ashok Pathak
Society for Wetland and Biodiversity
Conservation (WBC Nepal)
Nepal
pathakas@yahoo.com

Camila Rezende
State Institute for the Environment of
Rio de Janeiro (INEA), State Park of Ilha
Grande
Brazil
clrezende@gmail.com

Cristian Schneider
Asociación para la Conservación y
el Estudio de la Naturaleza (ACEN;
Association for the Conservation and
Study of Nature)
Argentina
cristian_schneider@hotmail.com

Dennis Babaasa
Uganda Christian University, Bishop
Barham University College
Uganda
dbabaasa@yahoo.co.uk

Emmelia Ayub
WWF
Malaysia
emmelia.ayub@gmail.com

Fredrick Wanyama
Uganda Wildlife Authority
Uganda
fred.wanyama@ugandawildlife.org

Gabriel Daldegan
TNC
Brazil
gdaldegan@tnc.org

Julia Zenkevich
Nonprofit Partnership "Transparent
World"
Russia
j.zenkevitch@gmail.com

Kinley Gyeltshen
WWF
Bhutan
kgyeltshen@wwfbhutan.org.bt

Lenny Christy Ong
TNC
Indonesia
lchristy@tnc.org

Lucy Perera
WCS
Venezuela
lperera@wcs.org

Marlon Prestes
Society for Wildlife Research and
Environmental Education
Brazil
marlon@scgisbr.org

Priscilla Sichone
Zambia Wildlife Authority
Zambia
pmwinji@yahoo.com

Rok Ciglic
Anton Melik Geographical Institute
Slovenia
rok.ciglic@zrc-sazu.si

Simeona Martinez
University of the Philippines, Diliman
Philippines
onymartinez@gmail.com

Susan Miller Scholarship

The Susan Miller Scholarship was created in 2005 to honor the many years of compassionate management and volunteer service that Miller gave and still gives to SCGIS.

The award goes to a returning scholar who has helped to create an SCGIS community in their home country that best exemplifies Miller's values of service, family, and community. This is not to diminish the incredible work done by hundreds of SCGIS volunteers around the world each year; indeed, building a community and keeping it united takes the hard work and sacrifice of everyone. This award is simply a way to remind us each year of the debt we owe Miller by highlighting the work of one scholar who shows that the SCGIS value of service to others is indeed a universal value.

In 2008, the Susan Miller Scholarship was designated to Sabino "Abe" Padilla, a lifelong conservationist, former political prisoner, defender of indigenous rights, and early mobilizer of the Philippines SCGIS chapter.

For many years, the Philippines chapter has functioned like a family, with constant attention to ensure that everyone gets a chance.

Society for Conservation GIS

www.scgis.org

SCGIS Committees

Domestic Chapters Committee

Purpose: The purpose of the committee is to facilitate the creation of local SCGIS chapters in the United States that support the mission of SCGIS.

Chair: Position Open

Domestic Scholarship Committee

Purpose: The primary objective of the Domestic Scholarship Committee is to foster communication and networking among conservationists through a well-defined scholarship program. Funding from this program will be distributed to residents within the United States and limited to covering the costs of SCGIS conference registration fees and assisting with lodging/food expenses incurred during the SCGIS conference.

Chair: Miriam Schmidts

Communications Committee

Purpose: The Communications Committee is responsible for the coordination of all official correspondence to/from SCGIS and communication tasks that 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 Web site; 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: Position Open

Conference Committee

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

Chair: Gillian Woolmer

Fund-raising

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

Chair: Eric Sandoval

International Committee

Purpose: This committee is strongly tied to the primary mission and goals of the society, evidenced by the presence of a worldwide focus. The primary objectives of the International Committee is to foster communication and networking among conservationists 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.

Chair(s): Charles Convis and Sasha Yumakaev

International Networks Committee

Purpose: The purpose of this committee is to facilitate, support, and assist in the creation of local in-country SCGIS chapters or Conservation GIS user networks and help them become self-sustainable. Currently, we have very successful SCGIS chapters in Russia and Madagascar and an informal network in Chile. We are currently working on forming networks in Colombia, Kenya, the Philippines, and Cameroon. We also collaborate with other similar networks and organizations already doing conservation work in various countries.

Cochairs: Prashant Hedao and Lata Iyer

Membership Committee

Purpose: This group is 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 don't attend the annual conference. The committee chair will work closely with the treasurer.

Chair: Position Open

Database Administrator: Marcelle Caturia

Web Site Committee

Purpose: This committee is responsible for the management and function of the SCGIS Listserv (CONSGIS, SCGIS, SCGISBD) and Web site (www.scgis.org). The e-mail administrator and Web czar 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 approval of the SCGIS board of directors. Members of this committee are responsible for developing content, assisting in maintenance, and any other technical or conceptual tasks deemed necessary.

Chair: Kim Fisher

Programming and Database Support: Bryan Baker and Marcelle Caturia

Listserves Administrator: Peter August

Acknowledgments

The 2010 SCGIS Conference would not have been possible without the efforts of a great many individuals. It is impossible to acknowledge everyone that has played a role in making this conference happen, as so many have contributed; however, there are a few people that we feel require special recognition. First, we would like to send special thanks to Pingkham Rattanababpha and her team at ESRI who have provided extensive organization and logistical support for this year's event. We would like to thank Nanette Bragin who provided support preparing the conference schedule. Huge thanks go to the fabulous folks of the SCGIS Web team—Tom Robinson, Kim Fisher, Bryan Baker, and Marcelle Caturia. They provided constant and reliable support throughout. They kept the conference Web site up-to-date and all the online registrations working. And thank you to Paul Mirangelpo for taking on the auction for the first time. Thank you, everyone.



Attendee Listing

Aaron Cole
University of California, Santa Cruz
aaroncole@gmail.com
831-428-2548
USA

Adamu Mohammed
Robert Gordon University
danjay77@yahoo.ca
+44 753-653-8847
United Kingdom

Alexander Yumakaev
ESRI Conservation Program
syumakaev@esri.com
909-335-2765
USA

Alison Gallensky
Center for Native Ecosystems
alison@nativeecosystems.org
303-619-0509
USA

Amanda Bednarz
University of Michigan
abednarz@umich.edu
860-573-6296
USA

Amanda Borens
University of Arizona
jacksona@email.arizona.edu
520-305-9977
USA

Amanda Tong
NOAA—National Marine Fisheries Service
amanda.tong@noaa.gov
315-723-7777
USA

Amit Hazra
alhazra@pbsj.com
305-514-3331
USA

Amye Osti
34 North/The Open Resource
Management Foundation
amy@34north.com
310-305-8289
USA

Beth Stone
East Bay Regional Park District
bstone@ebparks.org
510-540-5118
USA

Bhola Nath Dhakal
Nepal GIS Society, Nepal
dhakalbn@gmail.com
+977 01-5545525
Nepal

Candace Paulman
SC Wildlands
cbpaulman@gmail.com
858-353-5764
USA

Carolyn Hughes
The Nature Conservancy
chughes@tnc.org
703-577-9355
USA

Chris Macdonald
MarineMap
cmacdonald@marinemap.org
805-455-2936
USA

Chris Nicholas
chrignicholas@att.net
510-390-2960
USA

Chris Niemela
Tejon Ranch Conservancy
cniemela@tejonconservancy.org
805-602-2170
USA

Ciara Wirth
Student
ciara.wirth@duke.edu
916-307-9582
USA

Coqmar Rocheteau
Geo-Carthaiti Consulting and Services
geocarthaiti@yahoo.fr
+509 3437-7764
Haiti

Curtis Kendall
cbk@toyon.net
707-486-9128
USA

David Osti
34 North/The Open Resource
Management Foundation
david@34north.com
310-628-9944
USA

Debra Fischman
Oceana
dfischman@oceana.org
907-723-9020
USA

Destiny Hazra
Gannett Fleming
dhazra@gfnet.com
786-845-9540, extension 5829
USA

Elizabeth Smith
Texas A&M University, Corpus Christi
elizabeth.smith@tamucc.edu
361-543-4636
USA

Emily Yates
Chicago Botanic Garden
eyates@chicagobotanic.org
618-521-4894
USA

Eric Sandoval
eric@mpwmd.dst.ca.us
831-818-8966
USA

George Raber
The University of Southern Mississippi
george.raber@usm.edu
601-434-9489
USA

Gillian Woolmer
Wildlife Conservation Society
gwoolmer@wcs.org
416-944-3843
Canada

Hamza Kija
Tanzania Wildlife Research Institute
hamza01kija@yahoo.com
+255 784-853567 or 768-611844
Tanzania

Heather Loring
Asian Development Bank, Mongolia
heatherloring@hotmail.com
352-505-1887
USA

Honori Maliti
Tanzania Wildlife Research Institute
honorimaliti@yahoo.com
+255 27-254-4448
Tanzania

Jamie Chesser
The Nature Conservancy
jchesser@tnc.org
720-379-4992
USA

Janet Hess-Herbert
Mt. Fish, Wildlife and Parks
jhessherbert@mt.gov
406-444-7722
USA

Janice Thomson
The Wilderness Society
jthomson@twsw.org
206-624-6430
USA

Janine Bird
birdjanine@hotmail.com
831-420-1599
USA

Jason Jones
GreenInfo Network
jason@greeninfo.org
415-979-0343
USA

Jeff Lewis
Invasive Spartina Project
jeffreylouis@tws.org
503-830-0248
USA

Jenn Boggs
The Wilderness Society
jennifer_boggs@twsw.org
619-962-1736
USA

Attendee Listing

(continued)

Jennifer Rechel
USDA Forest Service
jrechel@fs.fed.us
951-680-1541
USA

Jessica Forrest
World Wildlife Fund
jessica.forrest@wwfus.org
917-848-2973
USA

John Chapman
Kauai Invasive Species Committee
johnchap@hawaii.edu
808-634-8032
USA

John Gallo
The Ecosystem Resilience Network
gallo.ja@gmail.com
707-813-7581
USA

John Gendron
jmg0@earthlink.net
916-308-9869
USA

John Rozum
NatureServe/NOAA
john.rozum@noaa.gov
513-251-8319
USA

Jon Bonkoski
EcotrUSAt
jbonkoski@ecotrust.org
503-807-1660
USA

Jon Caris
Smith College
jcaris@smith.edu
413-585-3042

Joseph Bishop
Department of Geography
Penn State University
jab190@psu.edu
814-876-3857
USA

Joseph Gomez
jggomez@scu.edu
615-305-7983
USA

Karen Beardsley
University of California, Davis
kbeardsley@ucdavis.edu
530-752-5678
USA

Karen Youngblood
Campbell Timberland Management
kyoungblood@campbellgroup.com
707-961-3302
USA

Kei Sochi
The Nature Conservancy
ksochi@tnc.org
303-817-2226
USA

Kim Fisher
Wildlife Conservation Society
k_sher@wcs.org
718-433-4990
USA

Kristeen Penrod
SC Wildlands
kristeen@scwildlands.org
877-945-3526
USA

Kurt Menke
Bird's Eye View
kurt@birdseyeviewgis.com
505-362-1776
USA

Lance Craighead
CERI
lance@craigheadresearch.org
406-587-1318
USA

Laura Kindsvater
Save the Redwoods League
lkindsvater@savetheredwoods.org
415-362-2352
USA

Leslie Backus
Chrysallis Biology
lanius@rocketmail.com
310-614-7994
USA

Lilian Pintea
The Jane Goodall Institute
lpintea@janegoodall.org
301-585-4265
USA

Lisa Lubeley
DUDEK
llubeley@dudek.com
760-215-3552
USA

Lori Scott
NatureServe
lori_scott@natureserve.org
703-908-1877
USA

Lynn Scharf
The Nature Conservancy
lscharf@tnc.org
970-484-9598
USA

Manju Kusahike
manjuk25@hotmail.com
510-402-4540
USA

Marcelle Caturia
Portland Metro
mcaturia@hotmail.com
503-477-8783
USA

Maria Idali Tachack-Garcia
Provita
mariaidali@gmail.com
+41 4205-41-16
VE

Marina Faber
Peace Parks Foundation
afredericks@ppf.org.za
+27 21-880-5100
Zambia

Mark McKay
SJCOE
mmckay@sjcoe.net
209-304-6525
USA

Mark Richardson
U.S. Fish & Wildlife Service
mark_richardson@fws.gov
304-876-7470
USA

Marta Benito
Natural Resources GIS
martabenito@hotmail.com
+56 288-59016
Chile

Mary Cablk
Desert Research Institute
mary.cablk@dri.edu
775-673-7371
USA

Melanie Smith
Audubon Alaska
masmith@audubon.org
907-440-1964
USA

Michael Hamilton
University of California, Blue Oak Ranch
Reserve
mphamilton@berkeley.edu
424-704-5908
USA

Michael Kelley
Cal Poly Pomona Department of
Landscape Architecture
mjkwow@sbcglobal.net
323-788-2624
USA

Mike Engels
International Crane Foundation
engels@savingcranes.org
608-355-0534
USA

Miriam Schmidts
ESRI
mschmidts@esri.com
909-793-4481
USA

Moses Selebatso
Conservation International
mselebatso@conservation.org
+267 716-39370
Botswana

Nadia Martin
nroumie@gmail.com
765-749-4768
USA

Nanette Bragin
University College
nbragin@denverzoo.org
303-376-4917
USA

Attendee Listing

(continued)

Nazim Uddin Ahammad
Data Experts Pvt. Ltd.
nazim_shuzan@yahoo.com
+88 11-961-96569
Bangladesh

Randal Greene
Memorial University of Newfoundland
rgreene@mun.ca
709-754-3475
Canada

Sandra Coveny
PC Trask and Associates
sandrac@peak.org
541-760-4201
USA

Neal Jander
Snoqualmie Tribe
njander@snoqualmientation.com
425-292-0249
USA

Rebecca Cull
Sustain Environmental Inc.
rebecca@sustaininc.com
916-736-2137
USA

Sarah Eichhorst
The Nature Conservancy
seichhorst@tnc.org
612-331-0733
USA

Nicole Morgan
Texas A&M University, Corpus Christi
nmorgan1@islander.tamucc.edu
210-788-2440
USA

Richard Tingey
Round River Conservation Studies
rtingey@xmission.com
801-521-2353
USA

Saumitra Mukherjee
Jawaharlal Nehru University
saumitramukherjee3@gmail.com
0091119313908512
India

O'Connor Bailey
Center for Native Ecosystems
connor@nativeecosystems.org
303-859-2816
USA

Robert Rose
Wildlife Conservation Society
rrose@wcs.org
617-939-4399
USA

Shawn Headley
Campbell Timberland Management
shadley@campbellgroup.com
707-961-3302
USA

Patience Assam
patienceassam@yahoo.co.uk
+44 755-233-2756
United Kingdom

Roland (Ron) White
City of San Jose Planning Department
ronwhite.1@comcast.net
408-629-4641
USA

Steve Schill
The Nature Conservancy
sschill@tnc.org
435-881-7838
USA

Paul Angelino
The Nature Conservancy
pangelino@tnc.org
303-601-4856
USA

Rosaleen March
Texas A&M University, Corpus Christi
rgbmarch@gmail.com
409-782-8215
USA

Steven Escobar
escobarscience@live.com
408-234-5065
USA

Peg Gronemeyer
New Mexico State University
moxxyfruv@nmsu.edu
575-496-3244
USA

Susan Miller
The Nature Conservancy
smiller@tnc.org
202-360-7319
USA

Syed Muhammad Raza Shah
Pakistan Wetlands Programme
smraza@wwf.org.pk
+92 51-2610880
Pakistan

Wade Hawkins
SAIT Polytechnic
wade.hawkins@sait.ca
403-968-2498
Canada

Thomas Strange
Grand Bay National Estuarine Research
Reserve
tom.strange@dmr.ms.gov
865-323-3027
USA

Waldo Hyman
Bishop Bros Forestry
rryeti@aol.com
843-346-5614
USA

Tom Elledge
South Slough NERR
tom.elledge@state.or.us
541-888-2581, x303
USA



Important Contacts

Name _____ Company _____

Address _____ City _____ State/ZIP _____

Phone _____ E-mail _____

.....

Name _____ Company _____

Address _____ City _____ State/ZIP _____

Phone _____ E-mail _____

.....

Name _____ Company _____

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