

SOCIETY FOR CONSERVATION GEOGRAPHIC INFORMATION SYSTEMS

SCGIS

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UNDERSTANDING

OUR WORLD WITH GIS

Conference Program

SCGIS Fourteenth Annual International Conference

July 16–18, 2011

Big Bear, California





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Registration

Sawmill, Second Floor

Saturday, July 16

7:00 PM–9:00 PM

Sunday, July 17

8:00 AM–9:00 AM

10:30 AM–11:00 AM

Monday, July 18

8:00 AM–9:00 AM

10:30 AM–11:00 AM

Recycle Badges

At the end of the conference, please return your name badge holder to the Registration Desk or the survey drop boxes.

Thank you for your cooperation.

Building Strength

A Message from the Conference Committee

Conservation, geography, and technology are three unifying factors that bring members of SCGIS together. The combination of these themes creates a unique group of passionate, smart, caring people who use their talents to enact positive change in every corner of the world. The Society for Conservation GIS belongs to people such as these—people like you.

The theme for 2011 is Building Strength. Each one of us at this conference has a mission. Given our common interests in conservation, geography, and technology, it's likely that our missions resemble each other in some way. One of the reasons we're here is to derive strength from our similarities. Take the opportunity this week to walk in your fellow conservationists' shoes and figure out how you're the same and how you're different. Learn to see things from different perspectives. Think creatively about how you can benefit from others' experiences. And be prepared to construct a new attitude on the foundation of working together to achieve our shared objectives. Here, you'll learn new tools and forge new partnerships. Individually, we can make small improvements in the world; imagine the impact we can make as a combined force.

Kurt Menke, Bird's Eye View
Carolyn Hughes, The Nature Conservancy
2011 SCGIS Conference Committee Co-chairs

Conference Tips

- Use this agenda to familiarize yourself with events and locations.
- A map is on the back cover, and the last few pages are for note taking.
- Pace yourself; you can't see or do everything.
- Set priorities.
- Remain flexible.
- Skip something and relax if you need to.
- Catnaps are great.
- Due to the high altitude, stay hydrated and 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.
- Any questions? Head over to Sawmill and ask a friendly SCGIS volunteer.
- Attend the evening socials and make new friends.
- Cool off by taking a dip in the heated pool.

Conference Meals

For conference participants who are staying at the Northwoods Resort and have purchased the accommodation and meal package, all meals will be served in the Ballroom located on the first floor:

Breakfast	7:00 AM–8:30 AM
Lunch	NOON–1:30 PM
Dinner	6:00 PM seated table service (Please try to be seated by 6:15 PM.)

For conference participants who are not staying at the Northwoods Resort and did not purchase the accommodation and meal package, there is a restaurant and lounge/bar at the resort with a breakfast, lunch, and dinner menu. A kids' menu is also available.

About Northwoods Resort and Conference Center

Check-in/Checkout: Our check-in time is 4:00 PM, and checkout time is 11:00 AM. Guests arriving prior to check-in time will be accommodated on a basis of available space. The resort's Guest Services Department can provide luggage storage and changing areas for guests arriving early or attending functions on their day of departure.

Northwoods Resort Facilities and Services

- Fitness Center—Fully equipped exercise facility with five-station universal, recumbent bicycle, Life Fitness 8500 Glidestep, sit-up bench, and sauna
- Outdoor Heated Pool and Spa—Open year-round for a warm, soothing dip in the pool
- Poolside Service—An extra hint of luxury available during the summer months
- Stillwell's Restaurant—Scrumptious Big Bear resort dining from dawn to dusk
- Stillwell's Lounge—Complements any evening with a joyful atmosphere and happy hour specials
- Room Service—Courtesy of the popular Big Bear restaurant
- Gift Shop—Sundries and souvenirs shop located on-site
- Complimentary Wireless Internet Access—Available throughout the resort
- Bell and Activity Concierge Service—To help you plan that perfect day
- In-Room Massage by Request Only

Northwoods Resort Restaurant and Bar Hours

Stillwell's Restaurant

Sunday–Thursday
7:00 AM–2:00 PM and
5:00 PM–8:00 PM

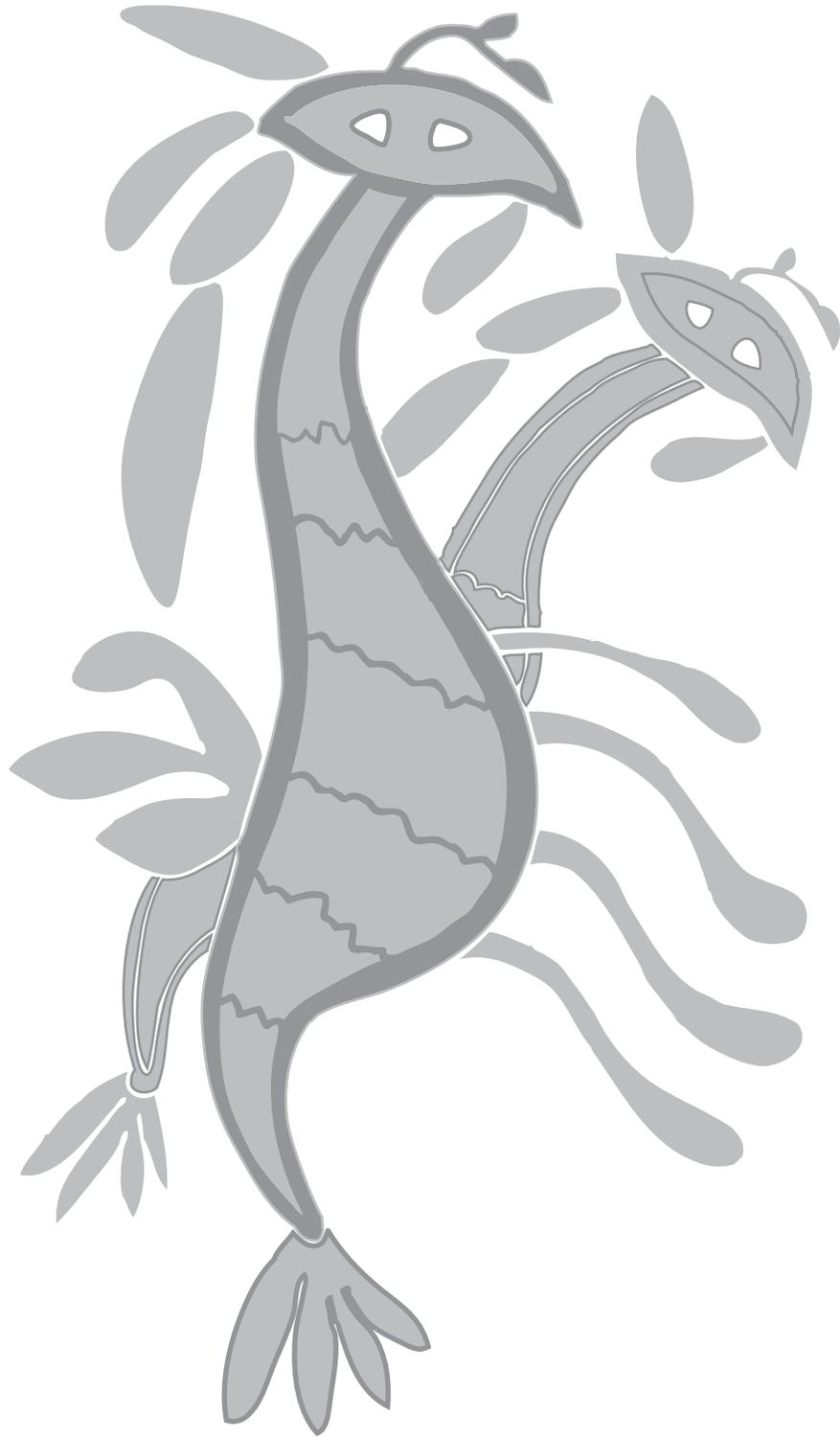
Friday–Saturday
7:00 AM–2:00 PM and
5:00 PM–10:00 PM

Stillwell's Lounge (Bar)

Sunday–Thursday
4:00 PM–10:00 PM

Friday–Saturday
4:00 PM–MIDNIGHT

Happy Hour
4:00 PM–6:00 PM



About Northwoods Resort and Conference Center (continued)

A Quick History of Big Bear, California

Tucked into a verdant valley of the San Bernardino Mountains and rich with four unique seasons of natural splendor, it's no wonder that the area known today as Big Bear has been populated and beloved for thousands of years. It's also no wonder that it remains one of the top vacation destinations in all of California.

Known first by the Serrano Indian name Yuhaviat, Big Bear received its striking title from Benjamin Davis Wilson, an esteemed California statesman and advocate of Native American rights. First visiting the area in 1845, Wilson was surprised to find an immense grizzly bear population, inspiring him to suggest the name. While Wilson only found bears, many Southern California prospectors found something else entirely: gold.

The discovery of gold in Big Bear Lake around 1860 resulted in the largest gold rush in the state's history, and within a matter of months, Big Bear was the latest, greatest boomtown. Shops, restaurants, and hotels were built, and by 1949, Big Bear was one of the leading ski resorts in Southern California.

Even though the gold rush is long gone, people the world over still find reason to come to Big Bear all year long. If they're not enjoying the incredible snow sports, hiking, bird watching, and boating, many people visit just for the glorious scenery. Hollywood, for instance, has returned time and again to film in Big Bear Valley. The famous musical *Paint Your Wagon*, *The Parent Trap*, and episodes of *Bonanza* were all filmed here.

Big Bear Hiking Trails

Discover Big Bear Valley National Forest, a peaceful sanctuary where an escape to nurture yourself is made better yet by awe-inspiring nature around every corner. The Big Bear hiking trails are many, so whether you're visiting with family or here for a trial of your best trekking skills, there's a scenic route and view for you.

Find the perfect day trip by choosing from among 39 miles of trails that form part of the renowned Pacific Crest Trail. Your options include the following:

Alpine Pedal Path (3.5 mi.—Very Easy)

An asphalt path along the north shore of Big Bear Lake is ideal for hikers, skaters, joggers, strollers, and wheelchairs.

Champion Lodgepole Pine Trail (0.6 mi. round-trip—Easy)

The trail runs on the south side of Big Bear Lake, streamside, and ends at Champion Lodgepole Pine, one of the largest in California.

Conference at a Glance

Saturday, July 16

9:00 AM–5:00 PM	Preconference Training Workshop 1: Publishing Spatial Data Online Boulder Bay
	Preconference Training Workshop 2: Working with ModelBuilder Metcalf Bay
1:30 PM–5:00 PM	Field Trip Hike around Big Bear Lake
7:00 PM–9:00 PM	Registration Sawmill
	Welcome Reception Woodlands Lobby

Welcome Reception

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

Sunday, July 17

8:00 AM–9:00 AM	Registration
9:00 AM–10:30 AM	Opening Session Ballroom
10:30 AM–11:00 AM	Break Woodlands Lobby
	Registration
11:00 AM–12:30 PM	Special Session: Wildlife Habitat Connectivity Timbers
	Paper Sessions Meadows, Boulder Bay, and Metcalf Bay

12:30 PM–2:00 PM	Lunch Ballroom
2:00 PM–3:30 PM	Paper Sessions Meadows, Boulder Bay
	Special Technical Session: Wildlife Habitat Connectivity Timbers
	Technical Session Metcalf Bay
3:30 PM–4:00 PM	Break Woodlands Lobby
4:00 PM–5:30 PM	Paper Sessions Meadows, Boulder Bay
	Special Technical Session: Wildlife Habitat Connectivity Timbers
	Technical Session Metcalf Bay
6:00 PM–7:00 PM	Dinner Ballroom
7:00 PM–9:00 PM	Map Gallery Opening and Reception Woodlands Lobby

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 geographic information systems (GIS) from around the world. The Map Gallery opens with a reception on Sunday evening and will remain on display throughout the conference.

Conference at a Glance

Monday, July 18

8:00 AM–9:00 AM	Registration
9:00 AM–10:30 AM	Opening Session Ballroom
	Paper Sessions Meadows, Boulder Bay
	Special Technical Session: Wildlife Habitat Connectivity Timbers
	Technical Session Metcalf Bay
10:30 AM–11:00 AM	Break Woodlands Lobby
	Registration
11:00 AM–12:30 PM	Paper Sessions Timbers, Meadows, and Boulder Bay
	Technical Session Metcalf Bay
12:30 PM–2:00 PM	Lunch Ballroom
2:00 PM–3:30 PM	Paper Sessions Timbers, Meadows, and Boulder Bay
	Technical Session Metcalf Bay
3:30 PM–4:00 PM	Break Woodlands Lobby
4:00 PM–5:30 PM	Paper Sessions Timbers, Meadows, and Boulder Bay

4:00 PM–5:30 PM	Technical Session Metcalf Bay
6:00 PM–7:00 PM	Dinner Ballroom
7:00 PM–10:00 PM	Auction and Wine Reception Ballroom

Auction and Wine Reception Information

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 both silent and live auctions to share treasures and artwork from around the globe. Please bring an item from your culture, community, or country and come prepared to bid on some wonderful and exotic trinkets. All donations are appreciated, and no item is too big or too small.

Share your work, your history, or your passion with other conservation colleagues. Proceeds will be used to support the SCGIS International Scholarship Program.

Items for the auction can be delivered to Sawmill on the second floor during breaks and lunch on Monday, July 18, or between 5:30 PM and 6:00 PM. A volunteer will help you complete an item description form.

Tuesday, July 19

10:00 AM	Box Lunch Pickup Ballroom
10:00 AM–12:30 PM	Closing Session Ballroom

Preconference Training Workshops Descriptions

Saturday, July 16

Workshop 1: Publishing Spatial Data Online

Room: Boulder Bay

Presenters: Jon Fisher and Paul Angelino, The Nature Conservancy; Wendy Peterman, Conservation Biology Institute

This workshop will provide a variety of information about publishing spatial data via web maps and similar formats. It will begin with an overview of what web maps can and should be used for, as well as things to keep in mind before publishing. An overview of various choices for publishing will be presented, with detailed help on strengths and weaknesses, choices for converting format (e.g., .shp to .kml), etc. We will actually go through as a group and publish data that attendees bring using one or two different technologies and leave plenty of time for discussion of the topics and hands-on assistance with the publishing process.

Workshop 2: Working with ModelBuilder

Room: Metcalf Bay

Presenter: John Schaeffer, Juniper GIS

This course will show how to use ModelBuilder to create tools for performing basic and advanced geoprocessing and analysis tasks. The course will first cover the ArcGIS geoprocessing environment, which provides the foundation for ModelBuilder operations. Students will then learn how to create models and tools (dialog boxes with user input) in ModelBuilder. Students will see how to use ModelBuilder to both automate basic workflows and perform complex analysis. The models will cover a variety of functions, including iteration, batch operations, and branching. Students will also learn how to add Python scripts to ModelBuilder. This is a practical, hands-on course designed to increase your productivity, making both analysis and basic tasks more efficient. This course will also cover the more conceptual aspects of modeling, such as suitability analysis, cartographic modeling, and establishing preference scales.

Opening Session Schedule

Sunday, July 17 | Ballroom

- 9:00 AM–9:10 AM **Welcomes, Introductions, and Thanks**
Carolyn Hughes and Kurt Menke
- 9:10 AM–9:25 AM **Introduction**
Rob Rose, WCS
- 9:25 AM–9:35 AM **Introduction to 2011 International Scholars**
Sasha Yumakaev, Esri
- 9:35 AM–10:20 AM **Keynote Presentation**
Biodiversity Informatics: Integrating GIS, Ecological Niche Modeling, and Burgeoning Datasets for Biodiversity Conservation
Dr. Richard Pearson, American Museum of Natural History
- 10:20 AM–10:30 AM **Announcements and Close**
Carolyn Hughes and Kurt Menke



Speaker Bio



Richard Pearson

Richard Pearson is a scientist at the American Museum of Natural History (AMNH), where he is director of biodiversity informatics research at the Center for Biodiversity and Conservation and a research scientist in the Department of Herpetology. Pearson completed his PhD in biogeography at the University of Oxford in 2004 and joined AMNH in 2005. His research seeks to explain the distribution of species at large spatial scales, from landscape to

continental, and understand the processes by which distributions change over time. His research falls largely within the field of biogeography and addresses questions that span ecology, evolution, and conservation. Key questions of interest concern the relationship between ecological niches and geographic distributions and the impacts of climate change on biodiversity.

While his research is principally question driven, Pearson also develops and tests novel tools of analysis, including ecological niche models (species distribution models). These models make use of GIS and data from a variety of sources, including natural history museum collections, recent field surveys, and remote sensing. Since his interests are primarily in understanding general ecological and evolutionary principles, his research is not confined to a particular type of organism, habitat, or region. To date, he has studied amphibians, reptiles, birds, plants, and primates in Europe, Madagascar, North America, South Africa, and the Arctic.

Pearson organizes and teaches a course on species distribution modeling at the museum's Southwestern Research Station and has made available teaching materials on the topic. He also organizes a discussion group for researchers and students in the New York region who are interested in distribution modeling. He also teaches GIS and remote sensing at AMNH's Richard Gilder Graduate School. He is an associate editor of the *Journal of Biogeography*.

Session Matrix Sunday, July 17

9:00 AM–10:30 AM	Opening Session—Ballroom			
10:30 AM–11:00 AM	Break—Woodlands Lobby			
11:00 AM–12:30 PM	Timbers	Meadows	Boulder Bay	Metcalf Bay
	Special Session: Wildlife Habitat Connectivity	GIS and Aquatic Resources	GIS Techniques and Technologies	International Conservation
	No Species Left Behind: Science-Based Approaches to Connectivity from Statewide Decision-Support Maps to Local Linkage Designs	Community-Based Project to Inventory and Protect Springs Ecosystems	Summed Point Influences: The Creation of a Practical Conservation GIS Tool in Python	Mapping Burned Area in Rondônia State Using MODIS Data*
	Scale and Wildlife Connectivity: From Corridors to Permeability Surfaces	Geospatial Mapping of Wetlands in Afikpo North Local Government Areas of Ebonyi State, Nigeria	Leveraging Mobile Technologies to Engage Citizen Scientists and Professionals in Invasive Species Data Collection: The iMapInvasives Strategy	Problem Animal Control Strategies in Human-Elephant Conflict Areas of Dande Communal Area, Zimbabwe*
	Googling Wildlife Connectivity: How New Tools for Analysis of the Structure of the Internet Can Help Map Habitat Linkages	Application of GIS on Biodiversity Conservation on the Tonle Sap Great Lake, Cambodia*	Remote Sensing as Supplement to Studies of Plant Physiology	Community-Based GIS Approach to Assess Fisheries Activities in Raja Ampat Marine Protected Area Network*
				GIS for Environmental Assessment of the State of Floodplain Territories in the Ukrainian Part of the Danube Delta*
12:30 PM–2:00 PM	Lunch—Ballroom			

* Denotes International Scholar Presentation

Session Matrix Sunday, July 17

(continued)

2:00 PM–3:30 PM	Timbers	Meadows	Boulder Bay	Metcalf Bay
	Special Technical Session: Wildlife Habitat Connectivity	GIS for Marine Species	GIS on the Web	Technical Session
	Using CorridorDesigner to Design Wildlife Linkages	Defining Conservation Threats of Marine Species and Geographic Areas of Global Concern Using GIS: Examples from IUCN Red List Assessments of Corals, Seagrasses, and Mangroves	Web Mapping—What Are Your Choices?	Strategic Conservation Planning Using the Habitat Priority Planner
Marine Connectivity Modeling for Protected Area Conversation Planning		Data Basin: Spatial Data, Tools, and Social Networks to Address Conservation Challenges		
Review of the Seasonality of Leatherback Turtle Occurrence and Movements and Its Relation with Pelagic Longline Fisheries Operating in the Southwestern Atlantic Ocean*		ConservationTraining.org: Building Partnerships, Educating the Globe, Empowering Conservationists		
		Western Governors' Association—Wildlife Corridor Decision Support Systems		
3:30 PM–4:00 PM	Break—Woodlands Lobby			

* Denotes International Scholar Presentation

4:00 PM–5:30 PM	Timbers	Meadows	Boulder Bay	Metcalf Bay
	Special Technical Session: Wildlife Habitat Connectivity	Coastal, Marine, and Aquatic Conservation	GIS in Climate Change	Technical Session
	The Connectivity Analysis Toolkit: New Methods for Analysis of Habitat Linkages and Centrality	Application of GIS for Data Preparation and Modeling for Coastal and Marine Conservation Planning in Madagascar*	Climate Change and Sustainable Living Conditions in Nigeria	Land Use for the Risk Area of the Opium Poppy Cultivation Region in Laos
		The Bay Area Aquatic Resources Inventory	Prediction of Wetland Expansion/Reduction for Coastal Species on Barrier Peninsulas in Relation to Sea-Level Rise	
		Influence of Environmental Flow Recommendations for Bays and Estuaries on Riparian Corridors	Analysis of Change in Mass Balance of Imja Glacier Using Remote-Sensing Techniques	
			International Climate Change Seminar: The Role of GIS	
		National Wetlands Inventory's Strategic Response to Climate Change		
6:00 PM–7:00 PM	Dinner—Ballroom			
7:00 PM–9:00 PM	Map Gallery and Wine Reception—Woodlands Lobby			

Session Matrix Monday, July 18

9:00 AM–10:30 AM	Timbers	Meadows	Boulder Bay	Metcalf Bay
	Special Technical Session: Wildlife Habitat Connectivity	GIS in Protected Areas	GIS for Cultural Resources Protection	Technical Session
	How and Why to Model Landscape Connectivity Using Raster Gradients	Building (and Mapping) Databases for Protected Areas of the Altai Region on the Basis of GIS*	Monument Conservation by GIS	Online Sharing and Conservation Planning at 10.1
Using the Mpumalanga Biodiversity Conservation Plan in Protected Area Expansion and Land-Use Decision Making in Mpumalanga Province, South Africa*		Spatial Model of the First Bulgarian Capital Pliska Based on Remote Sensing and Ground-Based Data*		
TPL's ParkScore Project		Distribution of Important Natural Resources with Conservation Needs in the Ancestral Territory of Tikuna Native Community at San Martín de Amacayacu, Amazonas, Colombia*		
Analyzing Habitat Preference of Argali Sheep (<i>Ovis ammon</i>) and Siberian Ibex (<i>Capra siberica</i>) in Mongolia				
10:30 AM–11:00 AM	Break—Woodlands Lobby			

* Denotes International Scholar Presentation

11:00 AM–12:30 PM	Timbers	Meadows	Boulder Bay	Metcalf Bay
	Wildlife Corridors	Wildlife Species Conservation	Collaborative Processes for Conservation	Technical Session
	Linking GIS Models with Animal Behavior: Example of Snow Leopards in Mongolia	Camera Trapping of the Coyote (<i>Canis latrans</i>) and Other Mammal Species on the Wind River Ranch, Watrous, New Mexico	Geoenabling Rainforest Conservation and Communities in Brazil	Conservation GIS and Google's Geo Services
	Analysis of the Corridor Area for Tiger Conservation in the Dangku Landscape, Sumatra, Indonesia*	Sensibility Index for Bat Cave Refuges in Arid Zones of Northern Venezuela and Bonaire Island Using GIS as an Important Tool	Using a Collaborative Process as a Basis for Developing Landscape-Scale Assessment Information	
	From Bugoma to Budongo Forest Reserves: Securing the Chimpanzee Corridor in the Agricultural Landscapes of Western Uganda*	Shrub-Dominated Mediterranean Ecosystems Are Important Habitats for Bird Communities in an Urban Interface in Southern California	Greenprints—Creating Community-Driven Conservation Plans	
	Incorporating Climate Change into Conservation Planning: A Case Study of Species' Range Wide Priority Setting			
12:30 PM–2:00 PM	Lunch—Ballroom			

Session Matrix Monday, July 18

(continued)

2:00 PM–3:30 PM	Timbers	Meadows	Boulder Bay	Metcalf Bay
	Conservation Planning	Habitat Mapping	Participatory Mapping for Indigenous Communities	Technical Session
	The GIS Challenges of Transboundary Ecoregional Conservation Planning: Lessons Learned in the Northern Appalachians	Developing a Vegetation Departure Calculator for the Contiguous United States	Developing Effective Land-Use Planning with Indigenous Forest Owners of Papua New Guinea*	Understanding Projections for ArcGIS
	Historic Imagery to Enhance Conservation Planning in Central Pennsylvania	Development of the Florida Cooperative Land Cover Map	Applications of GIS to Ancestral Domain Planning of the Iraya Mangyan of Occidental Mindoro: Creating Participatory 3D Maps for Consolidating and Managing Indigenous Communities*	
	Building Strength by Leveraging Expert Knowledge to Model Conservation Priority of Natural Lands in the Western Reserve Region of Ohio	Fire Survey in Tsitongambarika Forest and its Surroundings*	Challenges to the Critical Role of the Mangyan Ancestral Domain in Conserving the Watershed and Protecting the Lowland from Disastrous Floods*	
	The Role of Geographic Information Systems (GIS) in Evaluating Potential Wind Site Farms		Participatory GIS and Resource Use Assessments: A Case Study of Greater Segera Community Conservation Trust*	

* Denotes International Scholar Presentation

3:30 PM–4:00 PM	Break—Woodlands Lobby			
4:00 PM–5:30 PM	Timbers	Meadows	Boulder Bay	Metcalf Bay
	Habitat Planning	Landscape Planning	GIS for Sustainable Development	Technical Session
	GIS Applications in Conservation of Mountain Gorillas in Bwindi/Mgahinga Conservation Area, Uganda	A Landscape Decision Support System Combining Connectivity, Contiguity, User-Defined Criteria, and an Optimization Engine	Modeling Soil Erosion Risk by Using GIS and Spatially Distributed Event-Based Techniques in Upper Njoro River Watershed, Kenya	A Conservation Planning Online Clearinghouse
	Ungulate Population Distribution Modeling for Bamyán Plateau Landscape*	Analysis of Biological Impacts Screening Tool	Potential of Using Interpolated and Satellite Precipitation Estimates to Manage Agricultural Production Risk in Developing Countries	
A Management Landscape for Jaguars in the Upper Paraná Atlantic Forest Ecoregion*	Ten Years Mapping and Monitoring Intact Forest Landscape in Tropics*	SIGAM: A Water-Based GIS for Mexico		
6:00 PM–7:00 PM	Dinner—Ballroom			
7:00 PM–10:00 PM	Auction and Wine Reception—Ballroom			

Session Descriptions Sunday, July 17

11:00 AM–12:30 PM

Special Session: Wildlife Habitat Connectivity

Room: Timbers

No Species Left Behind: Science-Based Approaches to Connectivity from Statewide Decision Support Maps to Local Linkage Designs

Presenter: Paul Beier, Northern Arizona University

Planning for connectivity includes four tasks that follow a logical hierarchy (but that need not be applied in sequence):

1. Defining natural landscape blocks throughout a state or region and developing a map of fuzzy linkages between neighboring blocks. The Western Governors' Association recently mandated such decision support maps for each state. I will describe lessons learned from my work on the Arizona Wildlife Linkage Assessment (2006) and California Essential Habitat Connectivity Project (2010).
2. Prioritizing linkages for detailed planning and conservation action. Having participated in several prioritization efforts, I find this is inevitably a political decision. I will argue that that is just fine and that scientists should simply help investors make data-informed decisions.
3. Developing optimum linkage designs (implementable plans) for priority linkages. I will offer insights from my experience developing 27 linkage designs in California and Arizona.
4. Evaluating practical alternatives to the optimum linkage design. Because the optimum design (#3) will rarely be fully implemented, I developed tools to help decision makers identify biologically good compromises. I will describe use of these tools in one linkage near Tucson, Arizona, USA. Science-based approaches have the following virtues: They make assumptions explicit, they can be improved as underlying data are improved, and they help implementers focus on desired conservation outcomes rather than other constraints.

Scale and Wildlife Connectivity: From Corridors to Permeability Surfaces

Presenter: David M. Theobald, Colorado State University

Planning for wildlife connectivity forces us to think big and bold—to consider animals and processes that cross many ecological and political boundaries and to integrate data

across many temporal and spatial scales. It follows that our methods to analyze connectivity should be robust, simple, and appropriate for its intended use. I will discuss how three general types of connectivity modeling approaches commonly used today compare across scales, both from a conceptual (patches vs. gradient) and practical (computation, interpretability) perspective.

Googling Wildlife Connectivity: How New Tools for Analysis of the Structure of the Internet Can Help Map Habitat Linkages

Presenter: Carlos Carroll, Klamath Center for Conservation Research

Conservation biologists have long recognized that natural areas that are linked into networks are often more effective than isolated areas at preserving biodiversity. However, existing corridor mapping tools may not be flexible enough to incorporate new knowledge on patterns of animal movement and ecological processes. New methods developed for analysis of large graphs, such as the structure of the Internet, provide tools that can also be applied to habitat linkage mapping and landscape-level centrality analysis. Centrality refers to a group of landscape metrics that rank the importance of sites as gatekeepers for flow across a network to determine which areas across the landscape as a whole would be priorities for conservation measures that might facilitate connectivity and dispersal.

The new tools complement methods commonly available in GIS and allow planners to better evaluate alternate assumptions on how to represent wildlife movement. These approaches can also be applied to the more common question of mapping the best habitat linkages between a source and a target patch and to analyzing connectivity across time as habitat shifts under changing climates. I will describe several examples of the use of centrality in single-species and multispecies planning efforts at a range of scales from local watersheds to large regions. These include projects to identify key linkages for Northern Spotted Owl in the Pacific Northwest, gray wolf in western North America, and a suite of focal species in the Muskwa-Kechika region of British Columbia. Although corridor mapping functions have long been available in GIS, connectivity conservation planning will increasingly involve comparison of a variety of diverse metrics, including those we describe here, and validation with genetic data that records the effects of past dispersal movements.

11:00 AM–12:30 PM

Paper Sessions

GIS and Aquatic Resources

Room: Meadows

Community-Based Project to Inventory and Protect Springs Ecosystems

Presenter: Jeri Ledbetter, Grand Canyon Wildlands Council

In arid regions, such as the desert Southwest, water is the most critical natural resource. Isolated by the harsh surrounding landscape, springs are ecologically vital islands of habitat that support high biodiversity and endemism (Stevens and Meretsky 2008). These sometimes tiny features are inadequately protected, poorly mapped, and insufficiently understood. Afforded little legal protection, relatively few springs ecosystems remain intact. In spite of the critical nature of water in arid climates, until recently there has been no systematic effort to survey springs across a landscape. Existing information is minimal, fragmented, and largely unavailable. Recognizing the importance of understanding and protecting springs ecosystems, we are partnering with conservation organizations and land managers to avoid duplication of effort and develop compatible data collection protocols. We have developed geographic and ecological tools to compile available information for easy retrieval by land managers, conservation organizations, indigenous tribes, and researchers. Although the lack of information about springs presents a global challenge, this pilot project is focused on springs in Arizona. America's second-driest state, Arizona likely contains the highest concentration of springs. Yet hundreds or perhaps thousands remain unmapped. We have compiled Arizona springs location data provided by many sources into a geodatabase that currently includes 10,227 features. We have also designed a relational database to facilitate data entry, export, and analysis of complex and interrelated information associated with springs across landscapes, including geomorphology, soils, flora, fauna, water quality, flow, cultural resources, and human impacts. Linking these databases provides a framework for a wide range of geospatial analyses. We are also launching an interactive web map that will provide access to this information by the various agencies,

conservation organizations, and researchers contributing to its development. Some springs information is sensitive and will be protected. However, the protocols and tools developed for this pilot project in Arizona will be made widely available to managers and researchers who are trying to locate, study, and protect these resources.

Geospatial Mapping of Wetlands in Afikpo North Local Government Areas of Ebonyi State, Nigeria

Presenter: Gypsyson Alexius Otunta Maiyanga, Yuri Gagarin-Neil Armstrong Continental Space Club Africa

The study examines the relevance of Nigeria Sat-I in mapping wetlands in Afikpo North Local Government Area of Ebonyi State, Nigeria. The objectives of the study include (1) to determine types and locations of wetlands in the study area, (2) to determine aerial extent of land covers and land uses in the study area, (3) to delineate the wetland areas and characterize their indicators, and (4) to produce accuracy assessment and reflectance response signatures of the study area. The study made use of data generated from the 2007 Nigeria Sat-I imagery and the 1965 topographic map of the study area drawn at the scale of 1:50,000. This was backed up with intensive fieldwork, ground truthing, and tracking of the training site features' coordinates with Global Positioning Systems (GPS).

The results of the classification were validated with ground truthing of the study area. The precision was 84 percent indicating that the classification method was reliable at a 95 percent level of confidence.

In view of the result thereof, close monitoring and inventorying is therefore recommended for sustainable management of wetlands in the study area. Above all, this study shows that Nigeria Sat-1 has strong efficacy and potential in mapping wetlands in particular and hydrology in general.

Application of GIS on Biodiversity Conservation on the Tonle Sap Great Lake, Cambodia

*Presenter: Sokrith Heng, Cambodia**

Tonle Sap Great Lake is a unique lake, with highly threatened flooded forest habitat; biodiversity; and one of the most productive inland fisheries in the world, which millions of poor Cambodians rely on for food and income. Conservation International is working with the Fisheries Administration of

Session Descriptions Sunday, July 17

(continued)

the Cambodian government to protect a large area of the lake and its floodplain, including a fish sanctuary, community fisheries, forest areas, and a variety of globally threatened wildlife species. GIS is an important and integrated tool used during research and conservation activities such as camera trapping, track and sign surveys, replanting of flooded forest habitat, ranger patrolling, placement of artificial reefs, monitoring of forest cover, and flood levels.

11:00 AM–12:30 PM

Paper Sessions

GIS Techniques and Technologies

Room: Boulder Bay

Summed Point Influences: The Creation of a Practical Conservation GIS Tool in Python

Presenter: Kim Fisher, Wildlife Conservation Society

The conservation GIS community continues to create more and more sophisticated and complex tools for modeling spatial interactions in our landscapes and seascapes. While the cutting edge is inspiring and useful, especially to better-funded projects and organizations, GIS practitioners in the field working on minimally funded projects often do not have sufficient data, know-how, or resources to use these tools. At the same time, the standard ArcGIS toolbox often does not by itself provide all the functionality needed for typical GIS analyses. ArcGIS, however, provides an oft-overlooked practical middle way to create relatively simple tools requiring relatively little data, using standard ArcGIS tools strung together using ModelBuilder or Python. This presentation will demonstrate the creation of one such tool, which produces an index of the intensity of a human activity, such as hunting or logging, based on the summed influence of multiple points (e.g., villages) using a cost surface (e.g., travel time). This tool requires significant but not overly precise or difficult-to-obtain inputs and generates a reasonable picture of, for example, the intensity of a human activity with medium effort, easy-to-follow logic, and minimal configuration.

Leveraging Mobile Technologies to Engage Citizen Scientists and Professionals in Invasive Species Data Collection: The iMapInvasives Strategy

Presenter: Brent Kinal, NY Natural Heritage Program

The last few years have seen a huge increase in the use of personal mobile devices including smartphones, tablets, and GPS. In the future, these devices will continue to become commonplace, changing the way in which we access and generate information. Technologies that a decade ago were only available to professionals at a cost of several thousand dollars are now available to the public for only a few hundred or less. Resource managers often have limited financial and personnel resources; therefore, leveraging personal mobile devices to engage volunteers and professional collaborators can assist land managers by providing a valuable source of data that would not normally be available.

The use of mobile technology for data collection should not be a one-size-fits-all approach; resource managers should provide multiple avenues for volunteers and collaborators to contribute data. iMapInvasives has adopted a multitiered approach to invasive species data collection, allowing contributors the ability to select the tool or application that best fits the capability of the mobile device and technical abilities of the volunteer. By using existing applications such as What's Invasive, as well as a more robust, custom iMapInvasives application, citizen scientists can be engaged in data collection specific to their level of comfort. Furthermore, iMapInvasives is developing advanced data collection tools allowing comprehensive data collection such as assessment, treatment, and survey data. By tailoring data collection tools rather than providing a single application, the iMapInvasives team hopes to engage citizen scientists and natural resource managers at multiple levels. Using mobile devices to engage citizen scientists increases the capacity to build a more comprehensive database of invasive species observations than would be possible without leveraging mobile devices.

Remote Sensing as Supplement to Studies of Plant Physiology

Presenter: Charles Levitan, Sierra Nevada College

We modeled the spectral reflectance of Sierra tree species to predict how it can influence primary productivity. Enhanced

near-infrared (NIR) reflectance, and concomitant increase in Normalized Difference Vegetation Index (NDVI), can reduce heat load and PET demand but shorten the potential growth season in cold climates. Trees with extended spring growth seasons, either from riparian or snowmelt moisture, may benefit from lower NIR reflectance, while those in dry areas are modeled to benefit from lower NIR reflectance. We also model how this may be detected through the Worldview II imagery.

11:00 AM–12:30 PM

Paper Sessions

International Conservation

Room: Metcalf Bay

Mapping Burned Area in Rondônia State Using MODIS Data

*Presenter: André Lima, Brazil**

The objective of this paper is to present a method for mapping burned areas in Brazilian Amazonia using Terra MODIS data. The proposed approach is based on National Institute for Space Research's (INPE) Detection of Deforested Areas in Real Time (DETER) project method that applies image segmentation to the fraction images derived from MODIS using a nonsupervised classification per region algorithm followed by an image edition procedure for minimizing misclassifications. Rondônia State, located in the western region of Brazilian Amazonia, was considered for this study. The study area is primarily covered by tropical moist forests (Floresta Ombrofila Aberta) that has been deforested during the last decades. MODIS (MOD09) data used in this work was acquired on September 3, 15, and 25, 2005, and on October 12, 2005, over the study area. The INPE's DETER 2004 dataset for Rondônia State was used to identify the land-cover types affected by the fires. The results of multitemporal analysis with MODIS showed that about 19,888 square kilometers of land surface were burned in Rondônia State. From this, 7,291 square kilometers (37 percent) corresponded to the previously deforested areas, and 7,942 square kilometers (40 percent) corresponded to the forested areas; the other 4,665 square kilometers (23 percent) occurred on the Cerrado

biome. This information is critical for regional and global environmental studies. The results showed that daily MODIS sensor data is a useful source of information for mapping burned areas, and the proposed method can be used in an operational project in Brazilian Amazonia.

Problem Animal Control Strategies in Human-Elephant Conflict Areas of Dande Communal Area, Zimbabwe

*Presenter: Arnold Moyo, Zimbabwe**

Human-elephant conflict is a major conservation and management issue across Africa. With most elephant range existing outside protected areas and agriculture rapidly expanding, the potential for conflict increases. Rural farmers in many areas are severely affected by conflict with wildlife. The purpose of this research was to assess levels of conflict between the Dande community of the Mid-Zambezi valley in Zimbabwe and the elephants (*Loxodonta africana*), the spatial distribution and nature of conflict, and the effectiveness of problem animal control (PAC) strategies implemented by the villagers in terms of ensuring the community's livelihood security.

Four villages in Guruve District, namely Chadope, Museruka, Bwazi, and Chikafa, were sampled for the study. Another two were sampled in Muzarabani for the research—Masawi and Chiwashira. In all six villages, the elephant was cited as the most difficult problem animal, followed by the baboon and the bush pig, respectively. For each problem animal and across the villages, the main point of conflict is the cropping field; this is followed by the gardens and the homesteads in five of the villages.

Villagers apply combinations of both traditional and modern PAC strategies to curb the extent of conflict with elephants at the various conflict points, as the elephants quickly habituate to the use of one method at a time, reducing the method's effectiveness. According to the villagers, those villages that are making use of the modern methods are having less difficulty in chasing or deterring crop raiders than those that are still using only the traditional PAC methods.

In conclusion, the PAC strategies that the Dande community is using against elephants, especially the modern methods, are quite effective in the field.

Session Descriptions Sunday, July 17

(continued)

Community-Based GIS Approach to Assess Fisheries Activities in Raja Ampat Marine Protected Area Network

*Presenter: Ismu Hidayat, Indonesia**

Fisheries are developing rapidly in Raja Ampat Islands, West Papua, Indonesia, in response to newly opened access to this remote area and accelerated government development programs. Resource use monitoring was conducted inside a marine protected area (MPA) network as an effort of the fisheries management program. This paper presents the result of the local community work in resource use monitoring to emphasize the importance of local community as a main actor in MPA. In situ observation and interviews were done by trained local people to collect real-time, real-position, and fishery data. Monitoring covered more than 190,620 hectares, and the results show that the distribution of the fishers are clustered. Moreover, most of the fishers found came from Raja Ampat, but fishers from outside the region, though only in small numbers, have larger catches than the local fishers. This shows community-based monitoring can be used to identify fishing areas and expose the issues that should be addressed in the management of MPAs.

GIS for Environmental Assessment of the State of Floodplain Territories in the Ukrainian Part of the Danube Delta

*Presenter: Roman Sizo, Ukraine**

Danube Delta is unique as Europe's largest remaining natural wetland. In the '60s, the floodplain area was artificially disconnected from the Danube and is currently managed by the specially designed system of dams, canals, and sluices. This provoked a number of environmental problems such as wetlands degradation, water pollution, and lost species.

All available data sources have been used to develop recommendations for the territory management, restoration proposals, and elaboration of protective measures. Sources used were contemporary and historical field studies, satellite images, historical maps, and experts' observations. On top of that, we have created a code system and classifier table capable of simplifying data collection and analysis processes.

The created database enabled us to perform an analysis of the current situation at a project territory that integrates

ecological, hydrological, economic, and social components. As a result of such analysis, we have developed recommendations and defined an area for the pilot wetland restoration project.

2:00 PM–3:30 PM

Special Technical Session: Wildlife Habitat Connectivity

Room: Timbers

Using CorridorDesigner to Design Wildlife Linkages

Presenter: Paul Beier, Northern Arizona University

A wildlife corridor allows animals and plants to migrate and maintain gene flow and reduces human-wildlife conflicts (such as collisions with vehicles). We helped design 31 wildlife linkages in Arizona and California. These science-based corridor designs for multiple species are being implemented by county, federal, and state managers and transportation agencies and conservation groups. We have packaged our GIS tools into CorridorDesigner, a set of ArcGIS tools that you can download for free at www.corridordesign.org.

This technical session will be conceptual. We'll discuss

- How to prioritize potential linkages to select the first areas in which to develop linkage designs
- Why CorridorDesigner uses least-cost modeling instead of other extensions of graph theory
- What types of focal species to select, and why you need to use multiple focal species
- How to parameterize a single-species model
- Why you should model habitat patches and how to do so in CorridorDesigner
- Some key assumptions of the least-cost models
- How to give a model room to run
- How to pick the right corridor slice
- How to create corridors for land facets, which can make your linkage design more robust to climate change
- How to evaluate alternative corridor designs

2:00 PM–3:30 PM

Paper Sessions

GIS for Marine Species

Room: Meadows

Defining Conservation Threats of Marine Species and Geographic Areas of Global Concern Using GIS: Examples from IUCN Red List Assessments of Corals, Seagrasses, and Mangroves

Presenter: Jonnell Sanciangco, Global Marine Species Assessment

The Global Marine Species Assessment (GMSA) program, in collaboration with International Union for the Conservation of Nature (IUCN) and Conservation International, has taken the initiative to review the threats of extinction of key species in marine habitats. The extinction risk and conservation management priorities for each species assessed using the IUCN Red List Categories and Criteria relied on species-specific information on life history traits, population status, major threats, and global distribution. Generalized distributions of species were obtained from a number of different sources, including preexisting GIS databases for marine invertebrates and coral reef fishes, scientific articles, field guides, species' catalogs, atlases, and information systems databases. Each distribution record was then reviewed and checked for accuracy by experts during the Red List workshops, and maps were updated accordingly to reflect the current extent of species distribution and threats for each species. Recently published articles that arose from workshops led by the GMSA team include assessments of extinction risk of habitat-forming species such as corals, mangroves, and seagrasses. In addition, particular areas of global concern are also identified. In areas where many species are threatened with extinction, such information can be used to delineate marine protected areas and biodiversity hot spots and prioritize such areas for conservation management.

Marine Connectivity Modeling for Protected Area Conversation Planning

Presenter: George Raber, University of Southern Mississippi

Planning for marine protected area conservation zones requires an understanding of marine connectivity including

ocean currents. Some species (e.g., corals) depend on dispersion of passive particles as part of their life cycle. In order to include the ocean currents as connections in the marine conservation planning, a tool is being developed within the existing framework of the Protected Area Tools (PAT). PAT is an ArcGIS extension written in Python and Microsoft Visual Studio that has a module for preparing inputs to the Marxan decision support tool. PAT is extended in this project to incorporate the ability to utilize ocean current models such as the Hybrid Coordinate Ocean Model (HYCOM) and Aviso global geostrophic currents. The ocean current model outputs are then used to modify the connections between planning units in Marxan by modifying the boundary length modifier parameter. The new functionality was created by building on the Marine Geospatial Ecology Tools (MGET) developed at the Nicholas School of the Environment at Duke University, which allow batch downloading of the individual ocean current datasets and include tools for creating averages. This presentation will include a demonstration of the capabilities of the new tool and a discussion of the limitations.

Review of the Seasonality of Leatherback Turtle Occurrence and Movements and Its Relation with Pelagic Longline Fisheries Operating in the Southwestern Atlantic Ocean

*Presenter: Philip Miller, Uruguay**

Sea turtles have a complex life cycle characterized by the alternate use of several habitats that may be situated thousands of kilometers apart. As such, sea turtles perform extensive migratory movements, both before attaining maturity and also as mature adults. This implies that sea turtles do travel across oceans in some cases, for example, from nesting beaches to coastal feeding areas situated on the other side of the ocean. During the last decade, a very important research effort has been conducted on nesting beaches, which has generated an increasing amount of knowledge regarding the reproductive biology, clutch frequency, remigration interval, fertility, and adult female population trends. Although these efforts are indeed very important, they have failed to look for a better understanding of the leatherback turtle big picture in terms of conservation, which would be to protect the turtles where they spend most of their time—the feeding grounds situated on the open ocean and coastal waters. The aim of this work is to assess the seasonal variations of the occurrence and movements of leatherback turtles in the

Session Descriptions Sunday, July 17

(continued)

southwestern Atlantic Ocean and assess their relationship with the pelagic longline fisheries operating in the area to establish the bases to properly aim research and conservation efforts while the turtles are in their feeding grounds.

2:00 PM–3:30 PM

Paper Sessions

GIS on the Web

Room: Boulder Bay

Web Mapping—What Are Your Choices?

Presenter: Jonathan Fisher, The Nature Conservancy

This session will provide an overview of several options for publishing spatial data as map services, as well as for building web maps. The focus will be on free technology, but ArcGIS Server will also be briefly covered. All the options presented can be viewed in a web browser, and alternatives that require installation of software to view (e.g., Google Earth, ArcGIS Explorer, ArcMap) will not be covered.

The choices covered will include Arcgis.com, Google Maps API, Google MyMaps, embedded Google Earth files (using a plug-in), Google Fusion Tables, Data Basin, ArcGIS Server (including Flex maps), and MapServer/OpenLayers.

The strengths and limitations of each of the options will be discussed, with the goal that attendees will be able to pick the most appropriate technology for each of their projects. This session is intended to provide a technology-neutral perspective rather than advocating certain options.

Data Basin: Spatial Data, Tools, and Social Networks to Address Conservation Challenges

Presenter: Wendy Peterman, Conservation Biology Institute

Data Basin brings users together in new ways to explore, publish, visualize, and analyze data, and in doing so advances conservation efforts across sectors, industries, and disciplines. Data Basin is an online tool that connects users with spatial data, analysis tools, and a network of scientists and practitioners. Tools are designed to meet the needs of scientists, managers, and policy makers with or without GIS training. Data Basin provides a wide range of functionalities:

(1) private workspace to organize datasets and maps; (2) extensive documentation for datasets; (3) the ability to upload data and share it publicly or keep it private; (4) visualization tools to combine datasets and make customized maps; (5) searchable collections of users, datasets, and maps; (6) working groups for collaborating; and (7) focal topics of interest to users. The Climate Center contains datasets, maps, galleries, people, groups, and analytic tools specific to climate impacts and adaptation.

ConservationTraining.org: Building Partnerships, Educating the Globe, Empowering Conservationists

Presenter: Jamie Chesser, The Nature Conservancy

Proper training is crucial to understanding conservation concepts and technology systems, and it provides necessary career and personal growth for individuals. Unfortunately, training groups and also training dollars are often one of the first budget areas to be slashed when monies are tight or scarce. Even more unfortunate are those organizations where training is not even funded, period.

Enter ConservationTraining.org. After securing a donation from Remote-Learner.net, ConservationTraining.org was launched in June 2009 by The Nature Conservancy. Since then, the site has touched over 6,000 conservation practitioners in over 180 countries around the globe.

ConservationTraining.org is an open learning community that offers online conservation and professional development training materials from some of the world's leading conservation organizations, including Conservation International, Convention on Biological Diversity, The Nature Conservancy, United Nations Development Programme, Wildlife Conservation Society, World Wildlife Fund, and others. By making these materials available, we hope to engage the broader community of conservation learners and, in doing so, hope to both improve global conservation efforts and strengthen programs on a global scale.

In this 20-minute paper presentation, attendees will learn how ConservationTraining.org can benefit them. We will discuss the educational benefits to conservationists worldwide, the opportunity for partnering and collaborating, and how interested individuals can become involved in this growing international learning community.

Western Governors' Association—Wildlife Corridor Decision Support Systems

Presenters: Gary M. Vecellio, Idaho Department of Fish and Game, and Madeleine West, Western Governors' Association

Wildlife and their habitats are what many people love most about the West, whether they are hunters, fishermen, or wildlife watchers. Many rural communities also rely on these activities to generate revenues and support their local economies. To help ensure that wildlife and local economies remain viable, states are working together through the Western Governors' Association (WGA) Wildlife Council to develop compatible, GIS-based decision support systems (DSS) that will help in protecting crucial wildlife habitats and corridors across the region.

There are 17 western states cooperating in creating DSS projects. Eight pilot projects have been launched to begin this effort and have been initially funded by the Department of Energy. They all have roughly the same goal: building publicly accessible landscape-level viewers using GIS databases to depict crucial fish and wildlife habitats useful during energy and infrastructure planning efforts. All these DSS programs strive for compatibility and similarity across political jurisdictions so that they may provide a (relatively) seamless environment for development preplanning throughout the West.

In 2010, the Idaho Department of Fish and Game began two projects that will pilot similar but different approaches to designing and implementing DSS systems. The two pilot projects are transboundary; one is with Oregon and Washington throughout the arid lands of the Columbia Plateau, and one is with Montana along the Continental Divide reaching from approximately Yellowstone to Canada.

The pilot projects have very similar objectives and deliverables but take slightly different approaches to reaching these objectives. Technical components to be built and analyzed within the combines of the two pilots are (1) important and/or imperiled species habitats categorized according to their importance, (2) identification and disclosure of corridors important for seasonal and genetic interchange among populations, and (3) potential effects of climate change on the species and habitats portrayed so the output is useful in providing a proactive tool to enable species conservation through time.

Integral throughout all phases of pilot project development are public and nongovernmental organization involvement, cooperation with state and federal agencies, and public outreach to inform and guide product development. As of May 2011, all pilot projects are approaching the end of phase one (year one) and adjusting their guiding principles regarding ultimate success and compatibility as they prepare for phase two.

Currently, the pilots are all adjusting GIS-related methods to achieve better regional compatibility. Challenges currently being addressed among pilot approaches include (1) scale of data analysis and display, (2) edge-matching of biological datasets across state boundaries, (3) filling data gaps, and (4) investigating regional multistate viewing platforms.

2:00 PM–3:30 PM

Technical Session

Room: Metcalf Bay

Strategic Conservation Planning Using the Habitat Priority Planner

Presenter: Chrissa Waite, The Baldwin Group @ NOAA Coastal Services Center

Geospatial data and maps can be powerful visual tools for supporting strategic conservation planning. The Habitat Priority Planner is a free and user-friendly GIS tool developed by the NOAA Coastal Services Center that allows stakeholder groups to work with data and maps for setting conservation priorities. While exploring the functionality of the Habitat Priority Planner tool, this workshop will show how a local conservation collaborative used this tool to help identify and prioritize habitats for protection. This interactive workshop will use a combination of lectures, demonstrations, discussions, and group activities to help participants learn how to establish conservation goals and criteria with a spatial context.

Session Descriptions Sunday, July 17

(continued)

4:00 PM–5:30 PM

Special Technical Session: Wildlife Habitat Connectivity

Room: Timbers

The Connectivity Analysis Toolkit: New Methods for Analysis of Habitat Linkages and Centrality

Presenter: Carlos Carroll, Klamath Center for Conservation Research

Conservation biologists have long recognized that natural areas linked to networks are often more effective than isolated areas at preserving biodiversity. However, corridor mapping tools included in commercial GIS software may not be flexible enough to incorporate new knowledge on patterns of animal movement and ecological processes. This session is designed to introduce the conservation GIS community to the Connectivity Analysis Toolkit (CAT), a new freely available software that provides tools for both habitat linkage mapping and landscape-level centrality analysis. Centrality refers to a group of landscape metrics that rank the importance of sites as gatekeepers for flow across a landscape network. Computational advances now allow such metrics to be applied to landscapes of continuous habitat gradients rather than patches in a matrix of unsuitable habitat. The toolkit's connectivity analysis methods can complement methods commonly available in GIS and allow planners to better evaluate alternative assumptions on how to represent wildlife movement and ecological processes. The toolkit allows users to develop and compare three contrasting centrality metrics based on input data representing habitat suitability or permeability to determine which areas across the landscape as a whole would be priorities for conservation measures that might facilitate connectivity and dispersal. The toolkit also allows application of these approaches to the more common question of mapping the best habitat linkages between a source and a target patch. The newest version of the toolkit adds methods for analyzing connectivity across time as habitat shifts under changing climates. These methods can be applied to both conservation plans focused on a single species, such as recovery plans, and multispecies planning efforts. The methods can be applied at a range of scales from local watersheds to large regions.

4:00 PM–5:30 PM

Paper Sessions

Coastal, Marine, and Aquatic Conservation

Room: Meadows

Application of GIS for Data Preparation and Modeling for Coastal and Marine Conservation Planning in Madagascar

*Presenter: Rija Rajaonson, Madagascar**

GIS analysis is the basis for the systematic conservation planning either before (data preparation) or after (results analysis). GIS software is used for refining and maintaining environmental databases as well as performing data analysis and modeling to support the management of information from various sources. This paper will demonstrate the general work flow when preparing data for conservation planning for marine conservation projects for Madagascar. A simple analysis will be performed on the results to identify the priority zones based on expert opinion, focal species, and vulnerability to climate change.

The Bay Area Aquatic Resources Inventory

Presenter: Jamie Kass, San Francisco Estuary Institute

This talk will focus on the development, quality control, and data dissemination of the Bay Area Aquatic Resources Inventory (BAARI). The BAARI is the landscape level of a large-scale wetland monitoring effort and database, representing all tidal and upland aquatic habitat in the nine-county Bay Area with ~40 classification attributes, and will necessarily rely on continuous public input to ensure its future accuracy. Features were digitized from aerial imagery using ancillary data, including both national and local datasets, and expert opinion. Currently, data is displayed through www.californiawetlands.net, which features an interactive map of detailed information for wetland restoration projects in the bay, California Rapid Assessment Monitoring (CRAM) site scores, and shortly the entire symbolized BAARI dataset. This was a large-scale project with hundreds of thousands of features, and I will also talk about lessons learned in creating such an unwieldy environmental dataset.

Influence of Environmental Flow Recommendations for Bays and Estuaries on Riparian Corridors

Presenters: Nicole Davis, Center for Coastal Studies, and Elizabeth Smith, International Crane Foundation

Riparian corridors are strongly influenced by stream flow and geomorphology, as they are transitional zones between water bodies and upland areas. As ecotones, they support higher biodiversity than adjacent habitat, provide movement corridors, and increase stream integrity. Characterization of riparian corridors along tidally influenced, coastal rivers in south Texas is lacking and thus identified as an information gap associated with environmental flow recommendations. The goals of this study were to determine if the riparian community located along the Mission River within a conservation easement of the Mission-Aransas National Estuarine Research Reserve (MANERR) differed longitudinally across the tidal gradient and/or laterally across the floodplain and if current environmental flow recommendations for the Texas bays and estuaries support an ecologically sound riparian community. The woody riparian vegetation within above- and below-tidal sites were characterized, and environmental parameters influencing riparian communities were evaluated using publicly available GIS data. Riparian corridor width models were developed to provide an efficient tool for estimating the extent of riparian habitat by incorporating available digital imagery data on stream flow, landscape, environmental, and ecological factors. A significant difference in the dbh of major woody riparian vegetation (Kruskal-Wallis Anova on Rank Test; $p < 0.001$) existed laterally across the floodplain; however, no significant difference was determined for mean density ($p = 0.877$) and total basal area ($p = 0.965$) longitudinally across the tidal gradient. The diversity, abundance, and distribution of sampled woody species across the floodplain suggest that the riparian corridor along the Mission River is ecologically sound and highly influenced by the stream flow regime of the Mission River.

4:00 PM–5:30 PM

Paper Sessions

GIS in Climate Change

Room: Boulder Bay

Climate Change and Sustainable Living Conditions in Nigeria

Presenter: Chuks Ossai, PANDSI

Climate change is one of several unprecedented, large-scale environmental changes that are affecting the African continent, Nigeria inclusive. These changes reflect the overload of several of the earth's biophysical and ecological systems caused by the combined impact of growing human population and economic activities. Environmental changes are now affecting the whole planet and disrupting earth's life-supporting mechanisms, but the extent to which this affects human well-being and health varies substantially in different parts of the continent. Many research activities have been carried out in recent years in Nigeria to improve understanding of climate change patterns as well as their effects on human health and the environment. Thanks to this extensive effort, these changes can now be better understood and scenarios for the future developed that allow the policy community to identify adequate strategies for response and adaptation with the help of satellite, remote-sensing, and GIS technology and techniques.

The people of Nigeria have over the years engaged in a primitive and wasteful exploitation of their natural resources—forest and farmland, for example—to meet immediate exigencies while remaining impervious to exhortations for properly coordinated and structured enhancement of resources toward sustainable development including the dangers of global warming as a result of climate change, exacerbated by the people's contributions and actions that have vastly affected our sustainable living conditions.

The situation is that the Sahara Desert is encroaching on the nation's landscape at the rate of 0.6 kilometers annually, and more than 30 million tons of soil is being washed away annually through soil and gully erosion, especially in the eastern part of the country. We are still losing about 350,000 hectares of our forest cover annually, while most urban centers in the country are grappling with pollution and environmental problems resulting in global warming.

Session Descriptions Sunday, July 17

(continued)

Prediction of Wetland Expansion/Reduction for Coastal Species on Barrier Peninsulas in Relation to Sea-Level Rise

Presenter: Elizabeth Smith, International Crane Foundation

Five barrier strandplain peninsulas extend generally parallel along the mainland on Texas' central coast. Blackjack Peninsula is located within the Aransas National Wildlife Refuge and supports a majority of the wintering territories of the endangered whooping crane. Elevation on the peninsulas ranges from 0 to 16 meters; however, each peninsula is predominantly less than 5 meters. Whooping crane territories typically occupy a range of coastal environments from shallow bay shorelines and emergent marshes to inundated salt flats and high marshes as well as recently burned upland areas and fresh marshes. Generally, wetlands comprise from 46.3 percent to 20.7 percent of the total peninsular areas, following a north-to-south decreasing gradient. Hierarchical cluster analysis indicated that wetland composition on the larger peninsulas was very similar (91 percent), although the smallest peninsula exhibited more estuarine wetlands and was less similar (72 percent). We then evaluated the shift of coastal wetlands along an elevation gradient in relation to three sea-level rise (SLR) scenarios to determine whether potentially available habitats for coastal species would increase or decrease within eight quadrants around each peninsula. Digital elevation model data was used to clip National Wetlands Inventory data by 0-, 1-, 2-, and 3-meter contours within each quadrant. Areal extents of wetlands were summarized by quadrant and compared within and among peninsulas using Bray-Curtis similarity indexes and nondimensional scaling. Overall, the two northernmost peninsulas (Seadrift-Port-O'Connor and Blackjack) have the greatest palustrine wetland extent that will convert to estuarine wetlands with 1-, 2-, and 3-meter SLR. In addition, several areas were identified on the other peninsulas that will potentially support species dependent on coastal environments as sea levels increase and flood current upland and palustrine landscapes. This GIS-based approach will be used to increase public awareness about habitat shifts associated with sea-level rise and conservation of current and future coastal environments.

Analysis of Change in Mass Balance of Imja Glacier Using Remote-Sensing Techniques

Presenter: Kabindra Joshi, Mississippi State University

Glacier retreat is an indicator of climate change and is more rapid in the Himalayas. Decrease in winter accumulation area and increase in summer ablation area of a glacier could cause rapid changes in the health of the glaciers and lead to the formation of glacial lakes. Imja Glacier in the Mount Everest region of Nepal is one such retreating glacier, which created the Imja glacial lake. The formation of such lakes has always posed the threat of glacial lake outburst floods (GLOF) in high Himalayan areas. The potential GLOF from this lake could threaten the safety of local people and the trekkers visiting the base camp of Mount Everest. Therefore, monitoring the glacier and the glacial lake is essential in developing disaster management plans. In these rugged landscapes of the Himalayas, multitemporal satellite images are ideal to study the glaciers. Digital elevation models developed from Aster satellite images were used in this study to measure the change in the mass balance of Imja Glacier over the period. Landsat and Aster images were used to measure the changes in the surface area of the Imja glacial lake. We observed significant changes in the mass balance of the Imja Glacier. The results also indicated that the Imja lake has expanded from 0.286 sq. km in 1975 to 1.053 sq. km in 2010, a 268 percent increase in three decades.

International Climate Change Seminar: The Role of GIS

Presenter: Karen Beardsley, University of California, Davis

Starting in 2010, the Information Center for the Environment at UC Davis hosts a three-week international seminar in May on climate change and natural resources management. The seminar is sponsored by the US Forest Service/International Programs and includes 20–25 participants from around the globe. Themes include impacts of climate change, adaptation and mitigation of natural resources management under climate change, and institutional responses to climate change. Participants study climate change issues at multiple levels of government, starting in Washington, D.C., and ending in California (Davis, Yosemite, and Lake Tahoe). GIS is introduced to the participants during the seminar, and participants hear lectures from scientists who use geospatial technology. This presentation will give an overview of the seminar concepts and focus on the role of GIS in climate change science.

National Wetlands Inventory's Strategic Response to Climate Change

Presenter: Elaine Blok, US Fish and Wildlife Service

For more than 30 years, the Fish and Wildlife Service's National Wetlands Inventory (NWI) has been providing wetlands information for the nation. Wetlands, vital to all citizens, are vulnerable to climate change. Secretary of the Interior Salazar recognized that open access to accurate, up-to-date geospatial wetlands information is critical to meeting the challenge of climate change. In addition to climate change, emerging conservation issues that affect wetlands include sea-level rise; diminishing water quality and quantity; infrastructure, energy, and suburban development; invasive species; and pollution. In order to effectively address these issues, decision makers must know the location, status, and trends of wetlands and understand the societal and wildlife values of different types of wetlands and related habitats. The NWI has developed a new strategic plan that considers program mandates; the needs of partners, cooperators, and data users; and its opportunities and challenges. The NWI's revised vision, mission, and goals will be discussed as we look for ways to build strength through partnerships.

due to the ecosystem services representing the benefits that living organisms derive from ecosystem functions that maintain the earth's life support system and include nutrient cycling, carbon sequestration, air and water filtration, and flood amelioration (A. Yoshida, H. Chanhda 2010).

Finally, suitable land uses for cassava and sugarcane were proposed based on the Food and Agriculture Organization (FAO) framework and experts' opinions. The result shows that the research model developed in this research paper was very important for suitable methods for Laos to promote the sustainable land use and economic development of this region located on the upper Mekong River of Laos.

4:00 PM–5:30 PM

Technical Session

Room: Metcalf Bay

Land Use for the Risk Area of the Opium Poppy Cultivation Region in Laos

Presenter: Hemmavanh Chanhda, Zhejiang University, China

A suitable land-use model for the risk areas of the opium poppy cultivation region in Laos is one kind of model strengthening support for the main target of a socioeconomic development strategy until the year 2020 of the Laotian government.

Three research models were developed in the paper: Land-use changes were traced during 10 years from 1992 to 2002 based on satellite image interpretation; principal component analysis (PCA) was used to quantitatively study driving forces of the opium poppy cultivation region; and ecosystem services values (ESV) were used to analyze the impact of the land-use changes

Session Descriptions Monday, July 18

9:00 AM–10:30 AM

Special Technical Session: Wildlife Habitat Connectivity

Room: Timbers

How and Why to Model Landscape Connectivity Using Raster Gradients

Presenter: David M. Theobald, Colorado State University

Understanding how our actions influence landscape connectivity requires analyzing detailed data across broad extents. This in turn places large demands on data and computational resources. I will discuss the technical details of how to model connectivity when representing landscapes as a gradient of values (rather than patches) and show how these compare directly to other common methods (including least-cost corridor and graph theory).

the Ob River) there is already a catastrophic situation. We started to use the GIS (as well as environmental expertise, the results of field studies, expert opinions, legal basis, etc.) to address this problem. Besides, it is necessary to carry out the work on clarifying the boundaries of existing protected areas of regional importance (zakazniks and nature monuments) in the near future. Since we are dealing with spatial data, whether it's areal species distribution, the distribution of natural factors, or sources of threats, you must have a special tool to present and analyze a big set of different data. That is why GIS is so important in environmental work. Creating a database on protected areas of the Altai region will let you bring data on rare species of plants and animals and their habitats to analyze and evaluate potential threats to them and, depending on the situation, take measures to preserve forest ecosystems (as well as rare and endangered species) and negotiate with authorities, argue about zakazniks' problems, etc.

Using the Mpumalanga Biodiversity Conservation Plan in Protected Area Expansion and Land-Use Decision Making in Mpumalanga Province, South Africa

*Presenter: Mervyn Lotter, South Africa**

The Mpumalanga Biodiversity Conservation Plan (MBCP) identifies priority areas for protected area expansion, priority areas for the conservation of freshwater biodiversity, and priority biodiversity areas that need to be maintained in a natural state, and therefore informs the land-use decision-making process. In particular, Listing Notice 3 of the new Environmental Impact Assessment regulations requires the identification of important geographic areas. The MBCP is based on a systematic conservation planning approach that follows a series of steps and requires key biodiversity and spatial information layers. These layers and their targets are analyzed in Marxan to identify the most efficient portfolio of planning units necessary to meet biodiversity targets. The output is a map of biodiversity options or flexibility. Systematic conservation planning is an iterative process, and through the various revisions of the MBCP, it will be further refined and improved to become an even more useful core biodiversity planning instrument for Mpumalanga Province, South Africa.

9:00 AM–10:30 AM

Paper Sessions

GIS in Protected Areas

Room: Meadows

Building (and Mapping) Databases for Protected Areas of the Altai Region on the Basis of GIS

*Presenter: Alexander Shchur, Russia**

In the Altai region, there is a state nature reserve, Tigireksky; a natural park, Aya; 35 state nature reserve complexes (zakazniks); and 52 natural monuments of regional importance. Twenty-six zakazniks are wholly or partially included in the State Forest Fund. Because of the dire situation in the forest zakazniks, caused by human impact (mainly the felling of trees), there is now a need to create a specially protected part of the zakazniks—most valuable in the biological sense—with a more strictly protected regime than the rest of the conservation area. In pine forest zakazniks (pine forests around

TPL's ParkScore Project

Presenter: Breece Robertson, The Trust for Public Land

The Trust for Public Land (TPL) believes that no city resident should live more than a 10-minute walk from a park. Close-to-home opportunities for outdoor recreation and the experience of nature are essential for physical and mental well-being.

TPL is the only national conservation organization working to create and restore urban parks, greenways, and natural areas. Accomplishments range from protecting Cahuenga Peak—the setting for the Hollywood sign—to creating a greenway along the Miami River to acquiring dozens of community gardens in New York City. TPL is launching a nationwide campaign to draw attention to the critical need for urban parks and put new parks on the ground where they are needed most.

The ParkScore Project is TPL's name for a GIS-based method for evaluating how well parks in an urban community are meeting the needs of residents. A ParkScore evaluation identifies which neighborhoods are underserved by parks and how many people are able to reach a park with a 10-minute walk. The model can be adjusted to recognize the special needs of certain demographic groups, such as children. The ParkScore Project can help a community identify where it should invest in new parks and compare park systems in different cities.

Analyzing Habitat Preference of Argali Sheep (*Ovis ammon*) and Siberian Ibex (*Capra siberica*) in Mongolia

Presenter: Nanette Bragin, Denver Zoo

Mongolia is a country with a park system of protected areas, preserving native flora and fauna. To inform decision makers about the status of endangered species and park land health, two species of concern, the Argali sheep (*Ovis ammon*) and Siberian ibex (*Capra siberica*), in the Ikh Nart Reserve in Mongolia were studied. A habitat suitability index model was developed to study the Argali and ibex habitat preference and discern if the reserve and core zone offer optimal habitat. A total of 57 animals were examined, creating 95 percent and 50 percent home range kernels and minimum convex polygons. The percentages of use of six vegetation classes were rated from 0 (most preferred) to 6 (least preferred). The three most preferred vegetation classes for Argali and ibex are dense rock, low-density shrub, and short grass forb. The core zone was designed appropriately offering the same proportion of vegetation classes that Argali and ibex prefer.

9:00 AM–10:30 AM

Paper Sessions

GIS for Cultural Resources Protection

Room: Boulder Bay

Monument Conservation by GIS

Presenter: Saumitra Mukherjee, Jawaharlal Nehru University, India

It is possible to conserve the monuments by studying the spectral response of the rocks and its correlation with similar formation for replacement. A thin section of rocks and its superposition with the spectral response as a GIS layer makes the task more scientific and accurate. In New Delhi, India, the Humayun's Tomb conservation was done based on this GIS hypothesis. Sandstones, composed largely of quartz, feldspar, and lithic fragments, tend to form resistant ridges naturally; hence, these were considered for the construction of Humayun's Tomb. The color and texture of sandstone depends on the degree of cementation and type of cement. Silica cement is more resistant than calcite cement or iron oxide cement, both of which are more resistant than clay or gypsum cement. The high porosity texture of Humayun's sandstone is generally associated with high infiltration, low runoff, and widely spaced fractures. High infiltration also favors the possibility of unwanted vegetation growth with deep root systems. Humayun's Tomb sandstones display fracturing prominently, because they tend to be resistant and brittle. V-shaped gullies were found in cross sections, becoming U-shaped when highly weathered. The color of these sandstones ranges from light pink to dark brown.

Spatial Model of the First Bulgarian Capital Pliska Based on Remote-Sensing and Ground-Based Data

*Presenter: Stefan Stamenov, Bulgaria**

In a global world of rapid changes and development, the question of cultural heritage preservation is more topical than ever. GIS technologies can be successfully put to work in archaeology for the conservation of sites, structures, and all kinds of artifacts worldwide. The use of GIS technologies in archaeology allows us to map, analyze, visualize, and model information of archaeological sites and the regions in which these sites are located.

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The purpose of this paper is to present a spatial model of the First Bulgarian Capital, Pliska, using remote-sensing data and GIS technologies. It is an innovative work, since despite the wide use of GIS in Europe during the last 10 years, the application of GIS for archaeological research in Bulgaria is now starting to develop.

The medieval town of Pliska existed from the end of the seventh century till the middle of the eleventh century. From the beginning of its existence until the end of the ninth century, it was the capital of Bulgaria. We find the name Pliska last mentioned in Bulgarian Apocryphal Chronicle from the eleventh century. It appears again in 1688 on a geographic map printed in Amsterdam, and in 1767, the name is mentioned by the German traveler Karsten Nibur. In 1878, the Hungarian scientist Felix Kanic visited the ruins of Pliska, where he read the name Burdizo on a stone column and decided that this should be the name of the town. In 1884, the Czech historian Constantine Irechek corrected this vision, thus becoming the first scholar who connected the ruins with the town Pliskova/Pliska, mentioned in Byzantine chronicles from the tenth and eleventh centuries.

The archaeological exploration of Pliska started in 1899 and, with some interruptions, continues today. The medieval town was divided into two parts. The outer town is a region of approximately 23 square kilometers surrounded by an earthen rampart and a ditch, and the inner town is a stone fortress occupying an area of 48 hectares. Because of its smaller size and the importance of its structures, the inner town tends to be much better explored, and as a result, we know its history in more detail. The outer town, which is spread on a vast territory and comprises many sites and structures, has been relatively less excavated and studied. A village called Aboba has existed in the southern part of the outer town since the seventeenth century and was renamed Pliska in the first half of the twentieth century. The existence of a contemporary village on the territory of a medieval town obviously does not help preservation of the archaeological site. Today, the territory of the outer town is also used for agriculture. All these put forward the necessity of creating a spatial model of this archaeologically important area for the purpose of conservation.

This spatial model would serve as a base for building a geographic information system of the outer town. The thematic geodatabase created for this purpose includes

panchromatic and multispectral high spatial resolution satellite images, large-scale topographic maps, data from terrain studies and GPS measurements, and photos and descriptions of the archaeological structures and artifacts. It also includes supplementary thematic information about the geology, soils, relief and geomorphological structures, land cover, land use, and modern infrastructure of the area. The geodatabase will be used for conducting spatial analysis for documenting the archaeological remains in the area, reconstructing the structure of the medieval town, and planning future research and conservation activities. The geodatabase also allows the changes and relations between land use, geology, and archaeological remains to be explored and analyzed. The functional capabilities GIS provides are very useful in preventing turning regions into endangered archaeological structures areas. The presented results are obtained by computer-aided visual deciphering and interpretation of WorldView-1 panchromatic satellite images with very high spatial resolution, correlated with field observations, which include GPS measurements and photo documentation. The spatial analysis is supplemented by information about the land cover detected on the satellite image and information from published archaeological surveys.

The spatial model and the further actualization of the geodatabase, combined with remote-sensing data, is an essential part of the application of nondestructive exploration methods in the medieval town of Pliska. Creating this type of map will be useful for conservation and preservation of this archaeological area, whose cultural importance has already been acknowledged by giving it the official status of a reserve area.

Distribution of Important Natural Resources with Conservation Needs in the Ancestral Territory of Tikuna Native Community at San Martín de Amacayacu, Amazonas, Colombia

*Presenter: Catalina Lopera, Colombia**

Distribution patterns of individual and population species are important because they can show inter- and intraspecies relationships, environmental influences, and the conservation state of species. The aims of this study are to provide a map of natural population distributions of important plant species considered in danger or a priority for the members of the Tikuna indigenous community in San Martín de Amacayacu in the Amazon forest in Colombia. The principal methods are

fieldwork to mark with GPS seed adult trees, young trees, and regeneration spots. It will also mark important surrounding objects of the environment like streams, agricultural spots, and nearby houses or human settlements. Then this information will be organized in a database and represented in maps, which will be used for condition and conservation analysis.

9:00 AM–10:30 AM

Technical Session

Room: Metcalf Bay

Online Sharing and Conservation Planning at 10.1

Presenter: Charles Convis, Esri

ArcGIS.com and ArcGIS 10.1 offer significant new enhancements for online conservation, arising from the proposed new national conservation planning infrastructure. Many aspects of this new program will have been presented at the preceding Esri International User Conference. This workshop will show some of the different new public functions and open standards elements related to this project and discuss the vision and road map for its development.

11:00 AM–12:30 PM

Paper Sessions

Wildlife Corridors

Room: Timbers

Linking GIS Models with Animal Behavior: Example of Snow Leopards in Mongolia

Presenter: Rodney Jackson, Snow Leopard Conservancy

The endangered snow leopard ranges over 2.5 million square kilometers along the fragmented mountain chains of 12 central Asian countries. Besides inhabiting some of the world's most rugged terrain, they are rare, secretive, and sparsely distributed, though often coming into conflict with humans due to predation of livestock. The cats' future hinges on conservationists establishing a network of reserves linked at the landscape level, where critical corridors are embedded with snow leopard-

friendly herder communities willing to coexist harmoniously with this and other large predators like the wolf.

Such a multifaceted approach to conservation requires the melding of robust technologies and grassroots community partnerships to predict and rank vital breeding or population patches. Using a variety of GIS tools, we attempt to define travel corridors between snow leopard breeding and population centers in western Mongolia. Predictive models for least-cost pathway analysis and current flows are examined to obtain the best-fitting option. The Snow Leopard Conservancy (SLC) will share this information with local communities with the goal of identifying and protecting key corridors within their natural setting. Far-flung collaborations and locally driven nature stewardship can increase the potential for successful conservation. This paper discusses alternative corridor modeling options used, along with a realistic understanding of matching GIS tools with the targeted species behavior; the limitations of remotely acquired datasets; and related lessons learned during the process of data gathering, quality assessment, and results interpretation.

Analysis of the Corridor Area for Tiger Conservation in the Dangku Landscape, Sumatra, Indonesia

*Presenter: Dudy Nugroho, Indonesia**

Dangku Nature Reserve is a nationally protected small conservation area (300 square kilometers) located in Southern Sumatra, Indonesia. Based on our camera trapping survey, carried out over the last two years, we have established that there are at least five Sumatran tigers utilizing the area as part of their home range. However, as estimates indicate that an individual tiger needs upwards of 100 square kilometers for a range, we believe that those tigers must need to utilize the other forested areas as part of their home range. Within this potential home range lies not only Dangku Nature Reserve but also three small provincially protected forest patches and a larger privately owned forest restoration area; however, these forest patches are located in a landscape dominated by industrial lands, such as oil palm plantations, forest plantations, and oil and gas companies, creating a mosaic of forest and land-use types.

The focus of this project is to determine the best way of accommodating the movement of the wild tigers between

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these small patches so that they can maintain a viable home range size, while maximizing the carrying capacity of the forested areas. To do this, we need to try to establish forested areas of corridors that can be used by the tigers to allow them to move between the patches of protected forest while remaining within forest. This is very important to reduce the risk of human-wildlife conflict and increase movement of both tigers and prey between protected areas; this is essential for tigers to enrich their genetic variability.

The first step of this project was to identify all the stakeholders and key players within this landscape. The next phase was to establish the boundaries of all areas (conservation areas, companies, villages, etc.), which will then be digitized and mapped. Working in collaboration with all the companies managing land within the landscape, we will determine the most suitable conservation area (high conservation value area) that may fall within their concessions or plantations. We will be working with the local communities to try and make sure that all the villages and settlements in the area are buffered to reduce the possibility of tigers moving through areas inhabited by humans, again mitigating tiger-human conflict. Finally, all information will be overlaid on a basemap to produce, it is hoped, a viable and functioning forested corridor for the tigers, with the tiger in turn playing a key role as a flagship, umbrella species, as other species living in the landscapes will also use these corridors.

From Bugoma to Budongo Forest Reserves: Securing the Chimpanzee Corridor in the Agricultural Landscapes of Western Uganda

*Presenter: Phillip Kihumuro, Uganda**

Many species are being lost the world over, and the cause of this among others is habitat destruction and degradation. Chimpanzees are IUCN Red-Listed and face a great danger from competing land uses. In the western part of Uganda's Albertine rift between two major forest blocks (Bugoma and Budongo), the Chimpanzee Sanctuary and Wildlife Conservation Trust focuses on the conservation and protection of wild chimpanzees in private forests and supporting neighboring human communities for coexistence and mutual benefits. Specifically, we aim to enhance conservation education, undertake forest conservation and

restoration activities, facilitate community development approaches, conduct relevant research activities, and initiate and strengthen partnerships for conservation. We have made progress by mapping 26 private forests so far and started monitoring the wildlife populations in addition to mitigation of human-wildlife conflict through sensitization and community development. All this has been aided with the help of GIS tools, and we hope to continue monitoring our progress.

Incorporating Climate Change into Conservation Planning: A Case Study of Species' Range Wide Priority Setting

Presenter: Rob Rose, Wildlife Conservation Society

Coauthor: Mary Blair, American Museum of Natural History

Climate change presents a potentially important threat to biodiversity and is expected to cause parts of species' current range to become less suitable and other parts to become more suitable, resulting in shifts in species' distributions. Conservation organizations are challenged to incorporate this threat into conservation prioritization methodologies. Most work to date has focused on identifying which species are most at risk and what adaptation strategies can be implemented. Here, we will address a different issue—namely, which parts of species ranges are the most susceptible. This issue is important for conservation management strategies like that of the Wildlife Conservation Society's (WCS) Range Wide Priority Setting (RWPS). RWPS is a model for conservation planning intended to apply to widely ranging species, focusing on identifying geographic regions within a species' range for conservation prioritization. However, climate change is not currently considered within the RWPS framework. Our aim is to explore methods for informing RWPS by defining priority areas in a species' range within the context of climate change. We present a case study in which we develop an approach that incorporates climate change scenarios into an RWPS for the jaguar (*Panthera onca*). Out of 51 jaguar conservation units (JCUs), model projections show 13 JCUs clearly decreasing and 12 likely decreasing in suitability, with 10 likely staying the same in suitability and 1 likely increasing in suitability. Our aim is to put forward a new methodology for incorporating the potential effects of climate change into strategic planning for species conservation.

11:00 AM–12:30 PM

Paper Sessions

Wildlife Species Conservation

Room: Meadows

Camera Trapping of the Coyote (*Canis latrans*) and Other Mammal Species on the Wind River Ranch, Watrous, New Mexico

Presenter: Brenda Folefac Fonju, New Mexico Highlands University

There is a continuous destruction of biodiversity in the southwestern region of the United States, which has reinforced the need for research and monitoring. Coyotes (*Canis latrans*) extend throughout North America, surviving on a wide variety of food resources including the desert cottontail (*Silvilagus audubonii*), whose population also covers most of the southwestern United States. Methods used to assess richness and abundance of species include direct and indirect techniques. Eighteen camera traps were used on the Wind River Ranch (WRR) and Fort Union Ranch at 98 stations in the grasslands, pinyon juniper, and riparian habitats. Sites were allocated as baited (with one of two bait types) and unbaited. We recorded 176 photos of 13 mammal species in 110 nights during the winter and summer seasons of 2007 and 2008. A Spearman's correlation tested the hypothesis that the number of new species photographed will not vary with additional trap-nights (TNs) indicated ($p = .0001$), thus rejecting the null hypothesis. Seventy-seven nights, or 1,386 TNs, were used to photograph the 13 mammal species, although there are 24 mammal species large enough to be identified by cameras at the ranch. There was a significant difference in the number of target species (coyotes and cottontails) photographed by habitat type and by season (hypothesis 2b) and no difference in the total number of species photographed by habitat and by season (hypothesis 2a). When testing hypothesis 3a, more species were photographed at baited sites than at unbaited (control) sites ($p = .0002$). There was no difference between two types of bait used at the baited sites (hypothesis 3b).

Sensibility Index for Bat Cave Refuges in Arid Zones of Northern Venezuela and Bonaire Island Using GIS as an Important Tool

Presenter: Ariany Garcia-Rawlins, Instituto Venezolano de Investigaciones Cientificas

Bats provide important ecosystem services as pollinators, seed dispersers, and predators of many insects. In Venezuela and the rest of the Caribbean, semiarid areas are subject to high anthropogenic pressure, mainly due to urban development and tourism. The bats that take refuge in caves in these environments, grouped in big colonies, are most affected. It is vital to know how their sensitivity varies in time in terms of intrinsic characteristics. For this purpose, we built a GIS database containing the geographic location of each of the 13 caves monitored, their identification, the species caught in them, and temperature and relative humidity in the interior; we then built a layer of points for caves. We created other layers with information for roads, towns, and tour centers; with the help of a buffer layer around the caves, all this information enabled a sensitivity index to be created for each of the shelters on the basis of the proximity of each cave to these potential sources of disturbance, coupled with other biological factors specific to each species, variable in time. We considered three levels of sensitivity based on these characteristics (low, medium, and high); dominating were the medium values. In general, high sensitivity values varied throughout the year in different caves, but in several locations, August and September had high values for the index.

Shrub-Dominated Mediterranean Ecosystems Are Important Habitats for Bird Communities in an Urban Interface in Southern California

Presenter: Jennifer Rechel, USDA Forest Service

Mediterranean ecosystems worldwide, including in Southern California, are important biodiversity hot spots due to their temperate climates, proximity to coasts, high primary productivity, high numbers of endemics, high species richness, and important wintering grounds for migratory birds. In Southern California, proximity to human population centers, increased expansion of urban areas into wildlands including national forests, and subsequent higher fire risks impact biodiversity. In the San Gabriel Mountains, Angeles National

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Forest, north of Los Angeles, bird populations were studied for 13 years of a 20-year project (1997–2011) on 106 field plots to determine their response to differing degrees of urban disturbance in three major vegetation types: chaparral, oak woodlands, and conifer forests. Species richness, relative abundance, and diversity were calculated for all birds, resident birds, and migratory birds. A geographic information system (GIS) was used to map and compare the predicted occurrence of birds in the three vegetation types in and adjacent to the wildland urban interface at elevations ranging from 400 meters to 1,800 meters. Resultant maps showed that lower- and mid-elevation chaparral and oak woodlands at distances greater than one kilometer from the urban disturbance had the highest species richness and diversity values. However, those areas nearest and adjacent to the urban disturbance had moderate species richness and diversity and more invasive plant species but not more invasive bird species. These results highlight the use of GIS in preserving shrublands and associated avian populations and habitats in Mediterranean landscapes as important contributions to global biodiversity.

11:00 AM–12:30 PM

Paper Sessions

Collaborative Processes for Conservation

Room: Boulder Bay

Geoenabling Rainforest Conservation and Communities in Brazil

Presenter: Steven Eglinton, London Underground

At the Iracambi Research Center, they are working on the cutting edge of sustainable development.

Their job is to find better ways of managing both forested and cleared land and work with the local community to figure out ways that both forests and people can flourish. The four main areas are GIS and land management, forest restoration, environmental education and community outreach, and the search for alternative income sources, focusing on the medicinal plants native to the forests.

I will outline the techniques and strategy of how I devised

how to show the mining activity and my tutoring of Esri GIS at Iracambi in the rainforest, and I will also discuss how GIS is used in other ways at this unique research institute.

Maps and other information resources help identify the critical areas for conservation and the environmental degradation hot spots (erosion, deforestation), train potential users in how to use this material, and provide local planning agencies with the technical assistance that will allow them to make rational decisions on conservation management and planning.

The local institutions are involved in land-use planning with geographic information, based on the Iracambi GIS, for planning biodiversity and land management activities, helping identify the causes of and solutions to the problem of land degradation, and using teaching aids in Iracambi's environmental education program.

Using a Collaborative Process as a Basis for Developing Landscape-Scale Assessment Information

Presenter: Lara Miller, The Nature Conservancy

Increasing information available across geographic boundaries is a critical step in improving the ability of resource managers to address broad-scale ecological condition issues and necessary management. In 2009, The Nature Conservancy assisted the Forestry Division of the New Mexico Energy, Natural Resources, and Minerals Department (Forestry Division) with the development of a statewide natural resources assessment. The New Mexico Statewide Natural Resource Assessment was specifically created to help the Forestry Division complete a state strategy and response plan, required by the 2008 Farm Bill. However, the methods and collaborative process used in creating the statewide assessment data may be useful as a template for other organizations working at a landscape scale or across jurisdictional boundaries. In this presentation, we will describe the methods and the benefits of a stakeholder-driven process used to create the New Mexico Statewide Natural Resources Assessment.

Greenprints—Creating Community-Driven Conservation Plans

Presenter: Breece Robertson, The Trust for Public Land

The Trust for Public Land is using its Greenprint to help local governments and communities identify lands for conservation and recreation. This presentation will provide an overview of

the Greenprint process using the Lake Region in Maine as a case study. This presentation will cover some of the tools being used to help objectively evaluate the best conservation opportunities in an urban setting.

Lake Region Maine Greenprint Case Study

In 2010, the Trust for Public Land (TPL) and Loon Echo Land Trust (LELT) collaborated with local municipalities to collectively assess priorities, opportunities, and strategies for open space, park, recreation, and conservation goals. The project includes the 316-square-mile area that encompasses the seven towns in the Lake Region of Maine: Bridgton, Casco, Denmark, Harrison, Naples, Sebago, and Raymond.

The Greenprint was used to identify the region's priorities for the use, protection, and sustainability of land and natural resources. The region's priorities are to protect water resources, plant and animal habitats, working forests and farms, scenic views, trails, recreation, and small-town character.

A mapping site provides online interactive access to project results. The maps are a culmination of the regional priorities, which were developed through extensive stakeholder meetings; data collection; GIS analysis; and interviews with partners, advisers, and constituents.

The mapping site allows interactive access to the results of the Lake Region Community Greenprint. For instance, you can use this site to

- Explore resource priorities across Maine's Lake Region.
- Zoom to a specific town.
- Query parcels for size, forest cover, elevation, proximity to priority areas, and conservation value.
- Create a custom map.

11:00 AM–12:30 PM

Technical Session

Room: Metcalf Bay

Conservation GIS and Google's Geo Services

Presenter: Dave Thau, Google Earth Engine

This session will cover a variety of ways you can integrate Google's APIs and software for robust analysis and visualization

of GIS data. Attendees will learn how to easily analyze and visualize large datasets in the cloud using services like Google Fusion Tables, Google Earth, and Google Maps as well as some new projects like Google Earth Engine.

2:00 PM–3:30 PM

Paper Sessions

Conservation Planning

Room: Timbers

The GIS Challenges of Transboundary Ecoregional Conservation Planning: Lessons Learned in the Northern Appalachians

Presenter: Gillian Woolmer, WCS Canada

The tools of geographic information systems (GIS) are well suited to conservation planning, a pursuit that requires the overlay and analysis of often large volumes of geographic information, including the locations and distribution of multiple conservation targets and threats. During any conservation planning process, challenges related to the use of GIS can be expected, particularly for large planning areas that span multiple administrative jurisdictions. Challenges likely to be encountered relate to (1) the complex nature of spatial data, including data sources, access, licensing, quality, and compatibility; (2) the need to develop adequate capacity for GIS for the duration of the planning process; and (3) making spatial information generated by the GIS base planning process available to partners and stakeholders. By understanding the nature of the GIS challenges to be expected, conservation managers and GIS professionals can plan for the resources necessary to successfully achieve the goals of the planning process. In this presentation, we will share the GIS experiences, challenges, and lessons learned from a multiyear, multiple-partner conservation planning effort for the transboundary Northern Appalachian/Acadian Ecoregion of North America.

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Historic Imagery to Enhance Conservation Planning in Central Pennsylvania

Presenters: Joseph A. Bishop et al., Pennsylvania State University

ClearWater Conservancy, of central Pennsylvania, recently completed the Conservation Action Planning process, where many conservation targets were identified in the Spring Creek watershed. The Spring Creek watershed is located in central Pennsylvania within the Ridge and Valley physiographic province. The surrounding physiography produces a trellis drainage pattern where small headwaters often run down rocky sandstone ridges to join the mainstems in the limestone valleys. Land-use patterns are also influenced by the topography of the region, with the ridges mostly as forest and the limestone valleys primarily as agriculture and urban land uses. Through expansion of The Pennsylvania State University and nearby communities, the Spring Creek watershed is under increasing pressure from urbanization, and land-use patterns have changed considerably over time.

Aerial photography was interpreted to track land-use change, mapping the recent history of the Spring Creek watershed. We collected current and historic digital aerial photography from seven dates (1938, 1949, 1957, 1971, 1993, 2000, and 2006) and interpreted each to map land-use conditions across time. Studies have shown that land-use condition has direct relationships to water quality measures. As land condition changes and developed areas expand, the effects of urban and suburban areas that result in increased impervious surfaces have a direct relationship on erosion, storm water runoff rates, and in-stream energy. This in turn affects the biological integrity of the streams. For example, thresholds of as little as 10 percent imperviousness produce detrimental effects on trout populations. By 2006, the proportion of impervious surface in the Spring Creek watershed had surpassed this estimate, reaching 13.3 percent. However, Spring Creek is still capable of supporting wild trout populations, most likely due to the substantial amounts of groundwater input. The trends highlighted by these detailed interpretations are being used to target conservation prioritization throughout the watershed.

Building Strength by Leveraging Expert Knowledge to Model Conservation Priority of Natural Lands in the Western Reserve Region of Ohio

Presenter: Elizabeth Mather, Western Reserve Land Conservancy

The Western Reserve region of Ohio encompasses nearly 4.3 million acres of land in northeastern Ohio and 165 miles of Lake Erie shoreline. This region is home to more than 4 million people, high-quality watersheds, and exceptionally diverse habitats. But this unique landscape is facing intense development pressures from urban sprawl.

Western Reserve Land Conservancy strives to protect the land and water resources of our region to positively impact our collective quality of life to create a habitat that serves people. To effectively implement our land protection program, we first need to identify the best natural areas and the best working lands by employing GIS analysis to identify large critical resource areas and connecting corridors for protection. One of the issues we have faced with employing this approach is accurately predicting the conservation value of areas for which we have incomplete information. To help address this issue, we are employing a Bayesian Belief Network (BBN) informed by expert opinion and supported by GIS data layers that are consistent and complete across our region.

The BBN approach allows the incorporation of expert opinion in place of missing data. We can have experts assign probability values to simple parts of a more complex model (e.g., probability of high or low conservation value for forest blocks in different size classes, stand heights, etc.) and link those opinions in a probabilistic BBN framework that can be represented spatially. In this way, we can develop regional maps that actually depict the consensus of what a group of local experts "believes" are high conservation value. We can then test the accuracy of that belief system using ecological field data. When good correspondence is found, then the model may be useful in setting organizational priorities.

The execution of this model is the first step in developing a conservation plan that will identify conservation priorities across our whole region. Subsequent steps will allow us to look at connectivity to existing protected land and feasibility of protection based on parcel size, community support, and other societal factors. This presentation will discuss the employment of the BBN approach and our results to date.

The Role of Geographic Information Systems (GIS) in Evaluating Potential Wind Site Farms

Presenter: Patience Assam, University of Salford

Many countries around the world are incorporating renewable energies into their policies and plans to reduce negative impacts of fossil fuels consumption on the environment. However, the need to meet geographic, physical, environmental, and economic purposes is of much importance to both planners and developers. Wind farms have emerged as one of the fastest growing renewable energies over time.

The aim of this work is to use some criteria with the aid of geographic information systems (GIS) to locate suitable areas where wind farms could be installed in Northwest England. The methodology used for this work is the multiple decision analysis, and criteria based on relevant previous studies/ relevant literature were implemented.

Finally, maps from different sources were overlaid to identify suitable locations within the Northwest Region. Cumbria and North Yorkshire were identified as regions with the most suitable areas for locating wind farms, while Derbyshire was identified as the least suitable area. The final results show that the least suitable areas make up about 3 percent of the total study area.

2:00 PM–3:30 PM

Paper Sessions

Habitat Mapping

Room: Meadows

Developing a Vegetation Departure Calculator for the Contiguous United States

Presenter: Chris Zanger, The Nature Conservancy

The Vegetation Departure Calculator (VDC) provides a comprehensive look at vegetation conditions across the contiguous United States. The VDC was developed using ArcGIS and exported to a Microsoft Excel spreadsheet for ease of sharing among partners. The VDC includes a Pivot Table that allows users to interactively summarize and compare current vegetation conditions in many different ways (geography, agency, protected status, ecoregion, portfolio

status, etc.) using consistent and comprehensive data. Vegetation departure is a measure of the difference between current vegetation conditions and presettlement vegetation conditions and is frequently called ecological departure.

Development of the Florida Cooperative Land Cover Map

Presenter: Amy Knight, Florida Natural Areas Inventory

The Florida Cooperative Land Cover Map is a project to develop an improved statewide land-cover map from existing sources and expert review of aerial photography for focal communities. The project was funded by Florida's State Wildlife Grants program in support of the Florida State Wildlife Action Plan, which identified improved habitat mapping as a priority data gap. In Florida, there is a wealth of habitat-related GIS data that varies in purpose, classification, extent, resolution, and accuracy. No single system is adequate for all purposes, and statewide data has historically had serious limitations for conservation analyses. This project combines ecologically based (and often ground-truthed) local datasets with remotely sensed statewide data to maximize the strengths of each. Tasks included mining local data sources, conducting congruency analyses among data sources, reviewing aerial photography for focal natural communities, crosswalking data sources to a common classification scheme, and combining data sources according to confidence level. The final map is a hybrid of 22 different sources classified hierarchically into 189 classes. The mapping for 9 priority focal communities was significantly improved. This data informs many conservation efforts in Florida, from land acquisition to species habitat management.

Fire Survey in Tsitongambarika Forest and Its Surroundings

*Presenter: Andriamandranto Ravoahangy, Madagascar**

Tsitongambarika Forest is the main extensive lowland and midland forest in southeastern Madagascar. Its area covers around 60,000 hectares (ha), in which 9,500 hectares are covered by degraded formation and savanna. It shelters at least 50 locally and regionally endemic plant and animal species. Thus, this forest is the object of slash-and-burn agriculture and fires each year. So deforestation is up to 3.41 percent during 1990–2005 period. Asity Madagascar has developed income-generating activities to limit deforestation

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and begin soil restoration in three sensible zones. Restoration planning has been edited in this case. GIS action will be important to ensure follow-up of restoration, tree plant growth modeling, and especially fire survey (consequently to slash-and-burn agriculture).

Forest cover change from 1990, 2000, and 2005 already exists and was done using Landsat imagery processing. But no data is available from 2005 to now. Forest prediction will be the future of this project, so this training is very important. I've heard that corridor modeling is made possible by using some ArcInfo tools.

Project Future will be focused on income-generating activities promotion and reforestation. In this, forest loss and green gas emission will be evaluated and projected.

2:00 PM–3:30 PM

Paper Sessions

Participatory Mapping for Indigenous Communities

Room: Boulder Bay

Developing Effective Land-Use Planning with Indigenous Forest Owners of Papua New Guinea

*Presenter: Cosmas Apelis, Papua New Guinea**

In these modern times, where the demand for extractive forest resources is increasing and impacts of climate change are gradually being observed in the natural environment, there is an ever greater need for wise and balanced land-use planning. In Papua New Guinea, over 95 percent of land is wholly owned by local indigenous clans. This is a unique status that is recognized by the country's constitution and solely puts the utilization rights of land and its resources within the hands of the landowner. A significant challenge is the identification of true landownership boundaries. This information can serve the rights of traditional landowners so they can actively plan for their communities.

The Nature Conservancy has been working with local communities of the Adelbert Mountain Range for over a decade to establish conservation areas and land-use management plans at the lowest planning unit—the clan-based level.

There are now 9 communities covering over 15,000 hectares (ha) that have land-use management plans, and 15 more communities are in early stages of the process. Working with the communities in a participatory manner, we used field maps, GPS units, and local knowledge to delineate the land-use zones.

This process is now being replicated and locally adapted in Manus Province, Papua New Guinea. Working with communities across Manus, we will help them establish land-use plans that strengthen their ownership rights. As part of the community engagement, a participatory 3D modeling exercise will be completed for the entire province. The combined engagement process, delineation of boundaries, and identification of locally important features will support conservation planning for Manus.

Applications of GIS to Ancestral Domain Planning of the Iraya Mangyan of Occidental Mindoro: Creating Participatory 3D Maps for Consolidating and Managing Indigenous Communities

*Presenter: Diana Josefa San Jose, Philippines**

This paper shows the applications of GIS in land use and resource planning of the ancestral domain of the Iraya Mangyan in Occidental Mindoro through the process of participatory 3D mapping. The Iraya are one of the seven indigenous groups comprising the island of Occidental Mindoro. Their ancestral domain covers an estimated total of 130,000 hectares in portions of four different municipalities of Paluan, Abra de Ilog, Mamburao, and Sta. Cruz. They are currently applying for a title for their ancestral domain. Part of their claim is the government-declared protected area of Mt. Calavite in the town of Paluan, known as one of the two remaining grazing grounds of the endangered Philippine Tamaraw (*Bubalus mindorensis*) and also as a wildlife sanctuary rich in biodiversity. This paper shows how GIS is made relevant and accessible to indigenous communities through the creation of 3D maps, which they use in identifying their boundaries and territories. Having a tangible model of their ancestral domain grants them a bird's-eye view of the extent of their territory and enables them to effectively plan for their lands and natural resources, which cuts across political boundaries of the state. The process puts an emphasis on the importance of local knowledge in conservation work. It also illustrates how indigenous knowledge can be used to augment and validate government data on land cover in forest areas. The process of community mapmaking contributes to the consolidation of Iraya

indigenous communities as they plan for the management of the lands that they inherited from their ancestors.

Challenges to the Critical Role of the Mangyan Ancestral Domain in Conserving the Watershed and Protecting the Lowland from Disastrous Floods

*Presenter: Tonyo Uybad, Philippines**

The Mag-asawang Tubig watershed is the largest drainage network on the island of Mindoro, Philippines. Four of the eight Mangyan tribes, the indigenous ethno-linguistic groups in Mindoro, inhabit the hinterlands of this watershed. Although the Mangyan are the original inhabitants of Mindoro, only in 1996 did the Philippine government enact the Indigenous Peoples' Rights Act to help the tribal communities assert their native rights to their ancestral lands. The Mangyans have developed rich practices in protecting their forests. This geologically active region, however, makes the lowland prone to flooding. Present mining activities on the critical slopes of this fragile watershed will exacerbate flooding. This paper presents the critical nature of the Mag-asawang Tubig watershed, vis-à-vis the location of the Mangyan communities, the remaining forest, mining activities, and extent of flooding in the lowland. Spatial understanding of the fragility of the island is needed for the proper management and sustainability of the island.

Participatory GIS and Resource Use Assessments: A Case Study of Greater Segera Community Conservation Trust

*Presenter: Gabriel Njenga Kairo, Kenya**

Citizen science, including the use of GIS, has made it possible for communities to participate more fully in decisions regarding their resources. The use of GIS-based platforms such as Google Earth has enabled everyday activities like calculating journey time and appropriate routes a more personal undertaking.

In this paper, I will explore the use of GIS platforms by citizens in delineating land for various uses in pastoralist and agro-pastoralist communities in central Laikipia, Kenya. Spatial and temporal analysis using GIS will be used and matched against traditional trend lines constructed out of resource use assessments by the communities themselves. Additionally, plausible future scenarios will be developed when drivers of change including climate change, changing governance, and

devolution policies are in play. The scenarios developed, it is hoped, will lead to better land-use plans for the communities and inform policy makers at the Laikipia County level and at national level.

2:00 PM–3:30 PM

Technical Session

Room: Metcalf Bay

Understanding Projections for ArcGIS

John Schaeffer, Juniper GIS

This presentation will take the mystery out of projections, coordinate systems, and datums. We'll start with an overview of projection concepts and then discuss how these concepts and issues apply to GIS. We'll also cover how to apply this knowledge correctly working with data in different projections in ArcGIS and changing projections as needed. This presentation will be useful for anyone working with GIS or GPS, especially those working with different projections in ArcGIS.

4:00 PM–5:30 PM

Paper Sessions

Habitat Planning

Room: Timbers

GIS Applications in Conservation of Mountain Gorillas in Bwindi/Mgahinga Conservation Area, Uganda

Presenter: Muyambi Fortunate, Makerere University

Mountain gorillas are found only in two localities, the Virunga volcanoes on the border of Rwanda and Uganda and in the Bwindi Impenetrable National Park. These are endangered species, with a total population of about 670 remaining today. Habituated gorillas in these two parks are daily monitored by rangers and guides by use of Global Positioning Systems (GPS). Using GPS, rangers take points at nests, on trails, and at contact positions and record vegetation types and other physical data. These GPS points are entered and analyzed

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using GIS to provide location maps, and species distribution models are carried out to show distribution of mountain gorillas in the park at a given time and overlaid with a habitat map to find out which habitat types are preferred by gorillas over time. The GPS points are stored in a Uganda Wildlife Authority database called Management Information Systems (MIST). The other outputs from GIS include the following: patrol coverage and effectiveness (spatial and temporal, patrol hours per ranger, etc.), species distribution maps (spatial and temporal), distribution and extent of illegal activity (spatial and temporal), indexes (Indexes can reveal trends/changes without prior time and cost intensive baseline inventories, e.g., number of snares per patrol hour, number of animals per kilometer), and population structure (sex and age distribution, group size). Also the use of GIS applications during gorilla censuses every five years has helped show gorilla group distribution with group sizes and signs of human disturbances. GIS and remote sensing have been used to estimate the gorilla habitat vegetation cover loss and gain.

Ungulate Population Distribution Modeling for Bamyan Plateau Landscape

*Presenter: Ayub Alavi, Afghanistan**

An ecosystem/community-based conservation program for central highland in Afghanistan is running at the landscape level in an area of 7,000 square kilometers. This area contains the first formally established national park of the country—rolling hills of urial habitat and steep canyons with limestone cliff walls that is the preferred habitat of ibex populations. Better understanding of wildlife populations and seasonal movements at the local level will help us achieve better management planning. Wild ungulate surveys to determine population distribution and local movement patterns are ongoing, and GIS is essential to analyze and interpret the resultant data.

A Management Landscape for Jaguars in the Upper Paraná Atlantic Forest Ecoregion

*Presenter: Carlos De Angelo, Argentina**

The Upper Paraná Atlantic Forest (UPAF) is among the most endangered ecoregions of the world because of its high levels of fragmentation and degradation. In this area, located on

the border of Argentina, Brazil, and Paraguay, persists the southernmost population of jaguars (*Panthera onca*) of the world. My aims were to explore the landscape-level factors that are affecting jaguar persistence in this region and develop a spatial model for predicting the conditions of its habitat from a management perspective in the UPAF. I used presence records of jaguars collected through a participatory network of volunteers distributed along the ecoregion. I combined these records with pseudo-absences to be used in generalized linear models. I used the information-theoretic approach to test different hypotheses related with the conditions that determine jaguar presence. I selected two general models representing the two main evaluated hypotheses: a landscape conditions model and a direct human pressures model. These models were used independently to develop a two-dimensional spatial model of jaguar habitat suitability.

Jaguar persistence was favored not only by the presence of native forest at present but also by the historical presence of forest (30 years ago) and negatively affected by human land uses. Direct human pressures also had an important effect on jaguars, with a positive effect of protection and negative effects of human accessibility and historical human population density. The two-dimensional model showed that less than 8 percent (~20,670 square kilometers) of the analyzed landscape presented suitable conditions to be considered as potential core areas for jaguars. Barrier areas (unsuitable) represented 60.0 percent of the study area, 3.3 percent were potential refuges (areas that need restoration: low human pressures but poor landscape conditions), and 15.1 percent were potential sinks (poor landscape conditions and relatively high human pressures). From the management perspective, the most important areas detected by the model were the 32,563 square kilometers (11.8 percent) of potential attractive-sink areas that presented acceptable landscape conditions for jaguars but high direct human pressures (i.e., potential ecological traps for this species). This analysis allowed the description of the most important factors affecting jaguars at an ecoregional scale (e.g., the historical conditions of the landscape). Additionally, it constituted a useful management tool for validating conservation strategies developed for jaguars and the UPAF.

4:00 PM–5:30 PM

Paper Sessions

Landscape Planning

Room: Meadows

A Landscape Decision Support System Combining Connectivity, Contiguity, User-Defined Criteria, and an Optimization Engine

Presenter: John Gallo, The Wilderness Society

Coauthors: Randal Greene, Feaver's Lane Enterprises, Inc., and Mark Van Bakel, Kate Emmings, and Nuala Murphy, Islands Trust Fund

A customizable spatial decision support system (SDSS) (presented last year as BioVision) that combines principles of landscape ecology and conservation planning is now available as open-access ModelBuilder and Python scripts. The emerging collaboratory and online community for the application and further development of the SDSS welcomes interest and new users. The SDSS uses multicriteria and multiobjective decision analysis to provide a framework for combining user-defined criteria in a robust and transparent manner. An optimization engine is used to identify sets of sites for conservation that, taken as a whole, give the most “bang for your buck.” There is a least-cost corridor algorithm programmed into the optimization engine, as well as a contiguity analysis. The current algorithm automatically models the corridors between every pair of reserves and prioritizes paths not only within a corridor but among corridors. The principle of representation is met using the novel continuous benefit function approach rather than relying heavily on conservation targets/thresholds. The end user determines the shape of the benefit functions by setting parameter values, so targets/thresholds can still be emphasized. Consensus-based approaches to setting the weights that are subjective become a means for developing buy-in and consensus among disparate stakeholders. The SDSS is designed to update easily as new data, criteria, or parameter values become available, thereby allowing adaptation to a dynamic world. Data and results from the pilot studies, including one on the Islands of the Strait of Georgia, British Columbia, will also be presented.

Analysis of Biological Impacts Screening Tool

Presenter: Connor Bailey, Center for Native Ecosystems

The Center for Native Ecosystems (CNE) has developed the Analysis of Biological Impacts (ABI) Screening Tool that compiles the most up-to-date GIS data and species status information for the purpose of screening new development areas for renewable energy, including solar, wind, and geothermal, in Colorado. This tool marries the GIS data to a relational database that houses information about each of the data layers, species status, special areas, and positive development attributes associated with each renewable energy type so that stakeholders can identify potential conflicts early in the planning process. In addition, CNE has compiled a comprehensive literature review of the effects renewable energy development have on our species identified within our database, allowing tailored screening and advanced GIS functionality for siting of renewable energy development. The GIS data used for this project is then displayed based on a three-category system developed to rank the importance level of the species occurrence and the accuracy of the GIS data. The results are custom mapping and database outputs consisting of printed maps, digital maps, queries, and reports.

Ten Years Mapping and Monitoring Intact Forest Landscape in Tropics

*Presenter: Ilona Zhuravleva, Russia**

In 2006, Greenpeace produced a map of intact forest landscapes (IFL). It was done during several years in cooperation with different NGOs (Biodiversity Conservation Center, International Socio-Ecological Union, Luonto-Liitto [Finnish Nature League], Global Forest Watch, Forest Watch Indonesia). By intact forest landscape, we mean a seamless whole of natural ecosystems, undivided by elements of infrastructure, in which there are no visible signs of significant human activity. This assessment was based on the most up-to-date, high-resolution satellite imagery and a consistent set of global criteria that allows the first-time direct comparison of the state of forests throughout the world.

Obviously, monitoring of IFLs was needed; they were not under government protection and proceeded to be destroyed and disappear, especially in tropical countries—Indonesia

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and Papua New Guinea (paradise forests), the Democratic Republic of the Congo, the Republic of the Congo, Gabon, Cameroon (Congo river basin), and Brasilia (Amazon river basin). Tropical forests became focused areas for monitoring since 2000 also because 30 percent of IFLs grow in tropics (7 of 65 countries of the world containing IFLs).

In the paper, the results of 2000–2010 IFL monitoring will be presented (three big regions: Paradise forests, Congo basin forests, Brasilia forests). There were three steps: 2000, 2005, and 2010. The rate of IFL degradation is calculated; it differs from country to country and from year to year. There are province, change dimension, and protected area IFL assessments. The major types of anthropogenic disturbances causing loss of IFL areas will be demonstrated. IFL concept and methodology will be shown in detail.

More information on IFLs can be found at <http://www.intactforests.org/>.

4:00 PM–5:30 PM

Paper Sessions

GIS for Sustainable Development

Room: Boulder Bay

Modeling Soil Erosion Risk by Using GIS and Spatially Distributed Event-Based Techniques in Upper Njoro River Watershed, Kenya

Presenters: Peter M. Kundu et al., University of Venda

Soil erosion in the Njoro River Watershed has become a major problem that is negatively impacting agriculture and water resources in the area. The upper Njoro River Watershed was selected for study because it is the most adversely affected due to rapid land-use changes. Uncontrolled human activities have led to widespread accelerated erosion, declining land productivity, scarcity of water, and siltation of Lake Nakuru. The river basin experiences inundations and exceptional sediment transport during extreme rainfall, which cause damage to agricultural fields. Modeling erosion risk within GIS was used to assess soil erosion and sediment discharge in streams. The Modified Universal Soil Loss Equation (MUSLE) was used within GIS to determine event-based risk areas for purposes of conservation. The spatial data used in the MUSLE was derived

from a 20-meter resolution digital elevation model (DEM), soil characteristics, land-use maps, and climatic data for the watershed. Spatially distributed soil erosion maps were created as a ratio of sediment yield to sediment delivery ratio (SDR). The results showed that soil erosion ranged from 0.06 to 0.51 t/ha for 43.2 millimeters of rainfall. The spatially distributed SDR ranged from 0.09 to 0.82, while the average SDR for the whole watershed was 0.72. The results showed that event-based soil erosion classification can be adopted for prioritized soil and water conservation within the watershed.

Potential of Using Interpolated and Satellite Precipitation Estimates to Manage Agricultural Production Risk in Developing Countries

Presenter: Aloyce Kaliba, Southern University and A&M College

In developing countries, rain-fed agriculture continues to be the largest economic sector. However, rainfall variability continues to have significant effects on output. The high risk associated with rain-fed agriculture influences farmers' perceptions on investments in soil fertility, improved crop varieties, and other yield-enhancing inputs that affect response to emerging opportunities offered by globalization. Rainfall-indexed microinsurance programs are designed to manage agricultural production risk in developing countries. Rainfall-indexed microinsurance programs remove complex designs of traditional insurance programs, allow developing demand-driven products, reduce the occurrence of moral hazards, and can deliver coverage at a lower cost. There are, however, several limitations associated with rainfall-indexed microinsurance programs. One major limitation is the inherent basic risk. While rainfall indexes are usually developed based on rainfall recorded at a particular weather station, farmers prefer contracts written on rain falling on their farms. Due to these differences, developed microinsurance options may not exhibit the same movement as that of the underlying instrument. This has been a major problem in developing countries, where rainfall indexed microinsurance programs have been implemented. This problem can be minimized by using interpolated and satellite precipitation estimates. In this study, we combine interpolated and satellite precipitation estimates to estimate values of one-touch double-barrier binary rainfall-indexed option. We use Tanzania as a case study. Spatiotemporally weighted regression and closed-form solutions were used to estimate strikes and exits (for lower and excessive rainfall) and potential payouts and premium

payments for some important crops in all agro-ecological zones in Tanzania. Distribution of payouts and levels of premiums suggest that rainfall-indexed microinsurance programs are feasible. Also interpolated and satellite precipitation estimates produce consistent results on all necessary parameters needed to estimate the strikes, payouts, and premiums. However, more effort is needed collecting and managing the required data and information, conducting demand analyses, providing objective information to potential users, and developing and testing pilot programs.

SIGAM: A Water-Based GIS for Mexico

Presenter: Luis E. Marin, Grupo Ha'

We have developed the Sistema de Información Geográfico del Agua de México (SIGAM) (Water-Based GIS for Mexico). We currently have at least 60 shapefiles on a water-related topic for each one of the 32 states of Mexico. We have formed the SIGAM consortium; academia (we've signed two MOUs and are in the process of signing 15 more), industry (we have eight partners), and more than 30 scientists are now part of this effort.

The SIGAM is compatible with the ArcGIS suite. The shapefiles are free for the academic community, as well as training that we've developed to foster the use of GIS for improved water management in Mexico. We are using the SIGAM to develop DSS and DST tools for water and other sectors.

We will present two examples on how we've used the SIGAM to improve groundwater management (including allocation of groundwater resources) for the state of Morelos, Mexico.

resources and guidance in one place so that conservation planners do not have to develop their own process by trial and error, as is often the case currently. There are many more tools and approaches than can be included in a single book, and these are dynamic, constantly improving as the science progresses. Therefore we want to collaboratively build a website to accompany the book where additional and continually updated data, information, and tools can be accessed. Thirteen areas of conservation planning are explored: conservation planning across multiple scales, land cover data, selecting focal species, habitat quality for conservation of terrestrial animals, marine and freshwater conservation planning, habitat cores, conservation linkages, viability of populations and metapopulations, optimization models for reserve site selection and design, ecosystem services and economics, projected trends in land use, projected trends in climate change, and mapping biological processes to the appropriate spatial modeling tools.

Each of these topics is much larger than a single book chapter can adequately address, so we will cover the basic information and some of the best current practices included in the book. We hope to provide a web-based clearinghouse, perhaps housed by Data Basin, where there will be a gallery of case studies, relevant maps and data, GIS tools, and links to relevant sites for each of these topics. We hope to encourage the SCGIS community to help us populate these sites with information from its own work so that users will have a source for relevant information at any stage of a conservation planning project.

4:00 PM–5:30 PM

Technical Session

Room: Metcalf Bay

A Conservation Planning Online Clearinghouse

Presenter: Lance Craighead, Craighead Environmental Research Institute

This 90-minute workshop presentation is based on a book nearing completion by Esri Press. The book describes a bottom-up approach that has been successfully used by practitioners around the world. Our goal is to provide

Closing Session Schedule

Tuesday, July 19 | Ballroom

10:00 AM–10:10 AM	Acknowledgments <i>Carolyn Hughes and Kurt Menke</i>
10:10 AM–10:30 AM	Closing Remarks
10:30 AM–11:30 AM	SCGIS Membership Meeting
11:30 AM	Close



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 2011 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:

- Alexander Shchur, Gebler's Ecological Society, Russia, vabi85@yandex.ru
- André Lima, National Institute for Space Research (INPE), Brazil, andre@dsr.inpe.br
- Andriamandranto Ravoahangy, Asity, Madagascar, aravoahangy@birdlife-mada.org
- Arnold Moyo, Zimbabwe Parks and Wildlife Management Authority (ZPWMA), Zimbabwe, arnomoyo@yahoo.co.uk
- Ayub Alavi, Wildlife Conservation Society, Afghanistan, ayubalavi83@yahoo.com
- Carlos De Angelo, Research Center of the Atlantic Forest (CeIBA), Argentina, biocda@gmail.com
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- Cecilia Cronemberger, Instituto Chico Mendes de Conservação da Biodiversidade, Brazil, ceciliacronemberger@gmail.com
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- Dudy Nugroho, Zoological Society of London, Indonesia, dknugroho@yahoo.com
- Gabriel Njenga Kahiro, Zeitz Foundation for Intercultural Ecosphere Safety, Kenya, njengakahiro@gmail.com
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- Sokrith Heng, Conservation International, Cambodia, sheng@conservation.org
- Stefan Stamenov, Space and Solar Terrestrial Research Institute, Bulgaria, stamenovstefan@gmail.com
- Tonyo Uybad, Mangyan Mission, Philippines, mangyan_tons@yahoo.com

SCGIS Board of Directors 2010–2011

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

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Robert Rose
Wildlife Conservation Society, USA

Vice President

Mike Engels
International Crane Foundation, USA

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African Conservation Centre, Kenya

Lata Iyer
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The Nature Conservancy, USA

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Juniper GIS, USA

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Charles Convis, Esri Conservation Program

Sandra Coveny, PC Trask and Associates

Michelle Gudorf, Vermont Association of
Conservation Districts

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

Prashant Hedao, Auroville Tsunami Relief
Effort, India/Esri Conservation Program

Roberta Pickert, Archbold Biological Station

Kai Snyder, E&S Environmental

SCGIS Committees

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 website; handling or routing all requests from members directed to the society; and assisting in newsletter development under the direction of the newsletter editor-in-chief.

Chair: August Froelich

E-newsletter Editor: Miguel Garriga

Newsletter Editor-in-Chief of Conservation Geography: Charles Convis

Conference Committee

Purpose: This committee is assigned to host the annual conference to promote information exchange and develop a network of expertise for supporting conservation efforts worldwide. It is also 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 votes (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.

Co-chairs: Carolyn Hughes and Kurt Menke

Domestic Access Committee

Purpose: The primary objective is to handle the broad issues of data access: how and where conservation groups can share their data and metadata and how they can gain access to other available data. This will involve education addressing metadata development and distribution among data clearinghouses and data management.

Chair: Hugh Irwin

Domestic Chapters Committee

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

Chair: Vacant

SCGIS Committees (continued)

Fund-raising

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

Chair: Dave Neufeld

International Committee

Purpose: This committee is strongly tied to the primary mission and goals of the society, as evidenced by the presence of a worldwide focus. The primary objectives of the International Committee are 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: Charles Convis

International Networks Committee

Purpose: The purpose 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, there are very successful SCGIS chapters going on in Russia and Madagascar and an informal network going on in Chile. The committee is currently working on forming networks in Colombia, Kenya, the Philippines, and Cameroon. It also collaborates with other similar networks and organizations already doing conservation work in various countries.

Cochairs: Prashant Hedao and Lata Iyer

Membership Committee

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

Chair: Vacant

Database Administrator: Marcelle Caturia

Website Committee

Purpose: This committee is responsible for the management and function of the SCGIS Listserv (CONSGIS, SCGIS, SCGISBD) and website (www.scgis.org). The listserv administrator and web developer are the technical contacts for maintenance and updates. It is the duty and obligation of this committee to ensure that all information representing SCGIS is accurate and has the blessing of the SCGIS board of directors. Members of this committee are responsible for developing content, assisting in maintenance, and any other technical or conceptual tasks deemed worthy.

Chair: Kim Fisher

Test Engineer: Marcelle Caturia

Web Developer: Bryan Baker

Listserv Administrator: Peter August

Acknowledgments

The 2011 SCGIS Conference would not have been possible without the efforts of a great many individuals. It is impossible to acknowledge everyone who 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:

- Pingkham Rattanababpha and her team at Esri provided extensive organizational and logistical support for this year's event. Among other things, her hard work gave us this agenda, our signage, and fully installed laptops for the preconference workshops and registration.
- The SCGIS website committee, including Kim Fisher, Bryan Baker, and Marcelle Caturia, provided constant and reliable support throughout the conference planning process and beyond.
- Healy Hamilton and Rob Rose provided the innovative thinking that produced the Wildlife Habitat Connectivity Symposium.
- Sasha Yumakaev masterfully planned the SCGIS Scholarship Program. We are grateful for all the hard work and personal investment that makes the Scholarship Program such a success.
- Charles Convis, whose extraordinary support has made SCGIS what it is today, is responsible for categorizing all abstracts into sessions (a monumental task), was instrumental in securing this year's conference logo and T-shirt design, and served again as the famously entertaining—and persuasive—SCGIS auctioneer.
- Gillian Woolmer trained the current Conference Committee based on her years of experience planning this conference. She was an excellent resource and a patient font of wisdom throughout the entire planning process and during the conference itself. We owe her a debt of gratitude.

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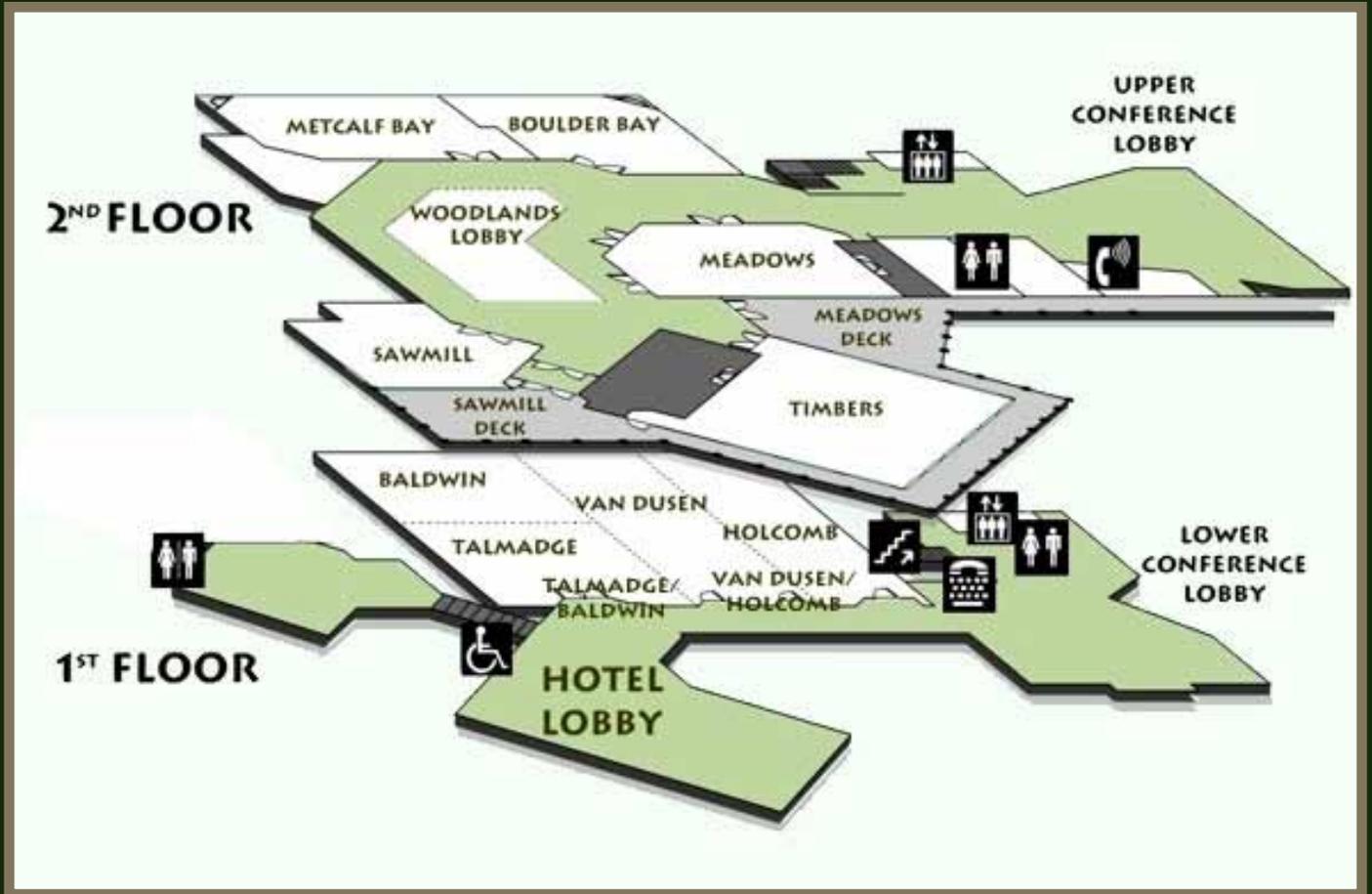
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