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Registration Hours

Scripps, Asilomar Conference Grounds

Sunday, July 26
6:00 PM–8:00 PM

Monday, July 27
8:00 AM–8:30 AM
10:00 AM–10:30 AM
3:30 PM–4:00 PM

Tuesday, July 28
8:00 AM–9:00 AM
10:30 AM–11:00 AM
3:30 PM–4:00 PM

Opening Session Schedule

Monday, July 27 | Chapel

9:00 AM–9:05 AM

Introduction and Thanks

Eric Sandoval, Sandra Coveny, and Healy Hamilton
Conference Committee Cochairs, Acting President

9:05 AM–9:15 AM

Introduction of 2015 International Scholars

Sasha Yumakaev
Esri Conservation Program Coordinator

9:15 AM–9:20 AM

Introduction of 2015 Train the Trainer Scholars

John Schaeffer,
Juniper GIS

9:20 AM–9:25 AM

Welcome

Healy Hamilton,
SCGIS President

9:25 AM–9:55 AM

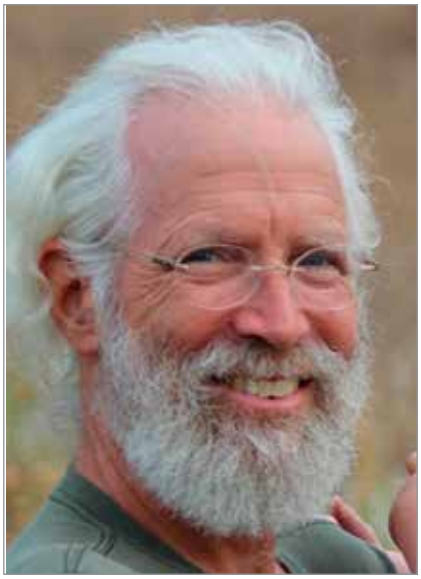
Keynote Presentation

Michael P. Hamilton, PhD

9:25 AM–9:55 AM

Announcements and Closing

Eric Sandoval, Sandra Coveny, Conference Committee Cochairs, and Healy Hamilton, Acting President



Keynote Presenter

Michael P. Hamilton, PhD

Dr. Michael Hamilton is an ecologist, conservation biologist, and naturalist—with a day job as resident director of the Blue Oak Ranch Reserve, a unit of the User Conference Natural Reserve System, situated midway up Mount Hamilton near San Jose, California.

Michael's specialty is starting and running successful biological field stations including people management (similar to hoteliers), approving research projects, conducting land stewardship, and improving research facilities to be more user-friendly and energy efficient. In addition, he has initiated a wide range of eco-informatics projects from designing sensors and databases to wireless networks and web portals.

For most of his career, he's collaborated with engineers and other scientists to experimentally design and deploy ecological sensing widgets and apps including wireless sensors and mobile robots that can continuously monitor climate; fresh water and marine ecosystems; Mediterranean, temperate, and tropical ecosystems; and soils and track different wildlife species across landscapes, and over seasons. More recently, he is teaming with ecohydrologists to understand how water and chemicals move through ecosystems in watersheds, using active sensing systems, micro UAVs, surface flow hydrological models, and isotope analysis.

Much of what Michael does incorporates geographic information system (GIS) technology, remote sensing and spatial analysis with applications to conservation ecology, species distribution models, environmental risk assessment, hydrology, pollution, fire science, and natural resources planning.

Michael is also an avid bird watcher, field botanist, teacher, and naturalist captivated by just about anything in the natural world. He enjoys photography and likes to write. His studies and teachings have taken him to most continents and dozens of countries.

Session Matrix

Monday, July 27

7:30 AM–9:00 AM	**Breakfast** Crocker Dining Hall			
8:45 AM–10:30 AM	**Opening Session and Keynote** Chapel			
10:30 AM–11:00 AM	**Coffee and Snacks** Scripps			
11:00 AM–12:30 PM	**Chapel**	**Acacia**	**Toyon**	**Heather**
	Remote Sensing and LiDAR Methods	**Mapping and Conserving Coastal Habitats**	**Remote Sensing Methods For Critical Habitat Modelling**	**Climate Change and Remote Sensing in Urban Communities and Rural Watersheds**
	Using LiDAR to Quantify Vegetation Growth and Stream Shade Change	Case Study - Mapping Mangroves and Coastal Wetlands	High Resolution Mapping of Chimpanzee Habitat Suitability ++	Temporal and Spatial Prediction Analysis of Nitrogen Load in Qingshan Lake Watershed Under the Condition of Future Climate Change
	The Techniques for Automated Extraction of Talus Surfaces for Natural Disasters Management *	Using ArcGIS to Empower Locally-led, Sustainable Mangrove Management in NW Madagascar *	Spatial Analysis of Rare Species Distribution in Lipetsk Region of Russia for Optimization of the Protected Area Network *	Climate Change Risks Assessment in Rupa Lake, Nepal
	Mapping Functional Riparian Corridors Using Hydraulic Geometries and LiDAR	Kite Aerial Photography on Tetiaroa, French Polynesia	Saving the Ribbon of Green: Assessing Riparian Habitat Condition and Restoration Opportunities in the Great Basin using Remote Sensing Techniques	Hot Enough Yet? Analyzing Climate Thresholds for Austin, Texas
		Mapping Submerged and Emergent Coastal Habitats in a Small Tidal Creek Watershed		Remote Sensing and i-Tree for Studies on Urban Forest Trees
12:30 PM–1:00 PM	**Lunch** Crocker Dining Hall			

* Indicates Scholar Presentation
++ Indicates a Student Competion Presentation

2:00 PM–3:30 PM	**Chapel**	**Acacia**	**Toyon**	**Heather**
	Use of sUAV Data for Conservation	**Climate Change and Sea Level Rise in Coastal/Marine Environments**	**Land Classification and Mappin**	**Technical Workshop**
	High Resolution Mapping of Orchards and Invasive Tree Species in West Central Vermont	Sea Level Rise and Submergence of Sundarban Islands a Time Series Study of Estuarine Dynamics	Conflicts of Interests in Rural Areas of Izola Municipality, Slovenia *	Working with Spatial Analyst and Raster GIS
	Can a Stock GoPro camera Produce Accurate Photogrammetric DEMs? ++		Mapping the Major Vegetation Classes for the Cerrado Biome Using Remote Sensing: A Study Case of the Chapada dos Veadeiros Region	
	Summoning a Drone - Data Mules for Remote Sensor Networks and Rapid Response	Resilience, Migration, and Conservation of Hudson River Tidal Wetlands	Mapping Land Cover Odzala National Park, Republic of the Congo ++	
	Open Source Technologies and Remotely Sensed Data in Protecting Elephants		Mapping Fire Scars in the Transition Zone between the Amazon Forest and the Cerrado Biome Using Landsat 5 Thematic Mapper Images - A Study Case in Mato Grosso, Brazil	
3:30 PM–4:00 PM	**Coffee and Snacks** Scripps			
3:30 PM–6:00 PM	**SCGIS Board Meeting**			

Session Matrix

Monday, July 27 (continued)

4:00 PM–5:30 PM	**Chapel**	**Acacia**	**Toyon**	**Heather**
	Habitat Suitability Modeling	**Remote Sensing Methods For Critical Habitat Modelling II**	**Conservation Planning and Design**	**Technical Workshop**
	Distribution of Tree Squirrels in California: A Species Distribution Modeling Approach To Analyzing Data ++	Trait-Based Australian Mammal Distribution Patterns and Extinction Risks	Three Years, 100,000 Acres: Bay Area Conservation Lands Network Progress	Telling your story with Esri Story Maps
	Non-Breeding Movements and Habitat Use of Whooping Cranes Using Satellite Telemetry ++	Spatial Distribution and Habitat Selection by Maras *	Development of a Terrestrial Sensitivity Map for the Kingdom of Saudi Arabia	
	GIS Enabling Collaboration in Endangered Species Recovery	A Multiscale View of Shortgrass Prairie Bird Abundance and Distribution	Impacts of Implementing and Planning Development, Mining and Infrastructure in Dornogobi *	
		Biophysical Characterization of an Iconic Pine from Landscape-level Forest Data	Zonation in Wangchuck Centennial National Park *	
5:30 PM–6:00 PM	**Break**			
6:00 PM–7:00 PM	**Dinner** Crocker Dining Hall			
7:00 PM–9:00 PM	**Map Gallery and Wine Reception** Chapel			

* Indicates Scholar Presentation
++ Indicates a Student Competion Presentation

Session Matrix

Tuesday, July 28

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<tr><td rowspan="5">9:00 AM–10:30 AM</td><td>Chapel</td><td>Acacia</td><td>Toyon</td><td>Heather</td></tr>
<tr><td>Forest Conservation and Corridor Design</td><td>Fishing Communities and Sustainability</td><td>The Landscape Change Analysis</td><td>Technical Workshop</td></tr>
<tr><td>Online Monitoring System of Reforestation Activities Using GIS New Technology *</td><td rowspan="2">The Role of GIS in Conservation of Fisheries Resources in Lake Tanganyika, Tanzania *</td><td>Analysis of Land Cover Changes 1990 - 2013 in Imenti Forest ++</td><td rowspan="3">Creating Map Books with Data Driven Pages</td></tr>
<tr><td>Using GIS Landscape Analysis to Identify Feasible Wildlife Corridors in the Kavango Zambezi Transfrontier Conservation Area in Zimbabwe *</td><td>Analysis of Land Cover Change in the Cross River Gorilla Landscape *</td></tr>
<tr><td>Strengthening Forest and Ecosystem Connectivity in RIMBA Corridor Sumatera Indonesia *</td><td>Prediction and Verification of Fish Spawning Aggregation Sites in Mexico*</td><td>Assessing Multi-decadal Land Cover-Land Use Change in Wildlife Protected Areas in Tanzania Using Landsat Imagery

Mapping Plantations: Detecting Plant Species using Landsat Images*</td></tr>
<tr><td>10:30 AM–11:00 AM</td><td colspan="4">Coffee and Snacks
Scripps</td></tr>
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Session Matrix

Tuesday, July 28 (continued)

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<tr><td>11:00 AM–NOON</td><td>Chapel</td><td>Acacia</td><td>Toyon</td><td>Heather</td></tr>
<tr><td></td><td>Water Resources</td><td>Community Knowledge and Indigenous Societies</td><td>Landscape Threats and Habitat Destruction</td><td>Open for Interest Group Meetings</td></tr>
<tr><td></td><td rowspan="2">A Drought Monitoring Tool for Customized Calculation of a Standardized Precipitation Index Value in the Navajo Nation</td><td>Conservation Isn't Hard Work...When You're Passionate</td><td>Developing Comprehensive Landcover and Anthropogenic Disturbance Footprints for Conservation Analyses</td><td rowspan="3">Please refer to matrix</td></tr>
<tr><td></td><td>Healing a Nation *</td><td>Updated Map of Threats of the Yasuni Biosphere Reserve</td></tr>
<tr><td></td><td>A Global 30m Water Occurrence Dataset</td><td rowspan="2">Forest Carbon in Amazonia: The Unrecognized Contribution of Indigenous Territories and Protected Natural Areas</td><td>Effects of Forest Plantations in Terrestrial Mammals Assembly of the Atlantic Forest in Misiones, Argentina</td></tr>
<tr><td></td><td></td><td>Quantifying Habitat Destruction from Natural Gas Mining Activities in Pennsylvania</td><td></td></tr>
<tr><td>NOON–2:00 PM</td><td colspan="4">Lunch and Annual Membership Meeting
Crocker Dining Hall</td></tr>
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* Indicates Scholar Presentation
++ Indicates a Student Competion Presentation

2:00 PM–3:30 PM	**Chapel**	**Acacia**	**Toyon**	**Heather**
	Wildlife Agencies, Enterprise GIS and Social Forces in Conservation	**Mapping and Mitigating Anthropogenic Habitat Loss**	**Anthropogenic Impacts Analysis and Mapping**	**Technical workshop**
	Toward A Hunting Footprint: African Wild Game Depletion and Dependence ++	Using Time Series Interpolated Weather Station Records to Evaluate Climate Exposure in Major Western Vegetation Types	Protecting San Joaquin Kit Fox on a Large Scale Solar Development through GIS Utilization	
	Enterprise GIS for Combating Wildlife Poaching	Mapping the Loss of Perennial Woody Vegetation to Cropland in California using 20 Years of Landsat Image Analysis	Spatial Analysis of Anthropogenic Impacts on Gorilla Migratory Pathways in Okwangwo, CRNP, Nigeria	
	SANBI's Enterprise Geodatabase - Lessons Learnt *	Mapping Invasive Plants with Remote Sensing, Fieldwork, and Citizen Science	The Spread and Distribution of Anthrax in Lower-Zambezi National Park, Zambia *	
			FracTracker Alliance: Educating for Energy Transitions Through Maps and Analyses	
3:30 PM–4:00 PM	**Coffee and Snacks** Scripps			

Session Matrix

Tuesday, July 28 (continued)

4:00 PM–5:30 PM	**Chapel**	**Acacia**	**Toyon**	**Heather**
	Monitoring Habitat Conservation Land Cover Change	**Lake and River Conservation Methods**	**The Landscape and Protected Area Mapping**	**Technical Workshop**
	Landsat-based Monitoring of Annual Wetland Change in the Willamette Valley of Oregon, USA from 1972 to 2012 ++	Remote Sensing for Climate Change Effect on Lake Tahoe Ecosystem	GIS Support for Mapping BLM Lands with Wilderness Characteristics	Image Processing and Analysis in ArcGIS
		Utilizing NASA Satellite Data to Detect Harmful Algal Blooms in the Western Basin of Lake Erie	The National Map Communities of Use	
	Using Time Series NDVI to Monitor Grassland Characteristics	Riverscape Mapping of Antibiotic Resistance with Bayesian Kriging ++	The Wildlife Conservation Society's History of Assisting in Protected Area Establishment	
5:30 PM–6:00 PM	**Break**			
5:30 PM–6:00 PM	**Dinner** Crocker Dining Hal			
7:00 PM–10:00 PM	**Auction and Reception** Chapel			

* Indicates Scholar Presentation
++ Indicates a Student Competion Presentation

Session Matrix

Wednesday, July 29

7:30 AM–9:00 AM	**Chapel**
	Breakfast Crocker Dining Hal
9:00 AM–11:00 AM	**Check out–Luggage can be left in the rear of Chapel**
10:00 AM–11:30 AM	**Lighting Talks and Closing**
NOON	**Boxed lunches to go** Crocker Dining Hall

Session Descriptions

Monday, July 27

11:00 AM–12:30 PM

Paper Session

Remote Sensing and LiDAR Methods

Room: Chapel

Using LiDAR to Quantify Vegetation Growth and Stream Shade Change

Presenter: Brian Shepard, Clean Water Services

Clean Water Services (CWS), a water resources management utility that serves over 550,000 customers in the Tualatin River watershed, contracted with Quantum Spatial, Inc. (QSI), to perform height change and effective shade analyses in support of stream corridor and aquatic habitat enhancement. The results were used to create animations that help to describe the effects of the enhancement efforts as well as provide a higher level of understanding about the environmental stewardship role that CWS fulfills.

Datasets of individual tree delineations were created by utilizing point cloud geometry, spatial distribution patterns, and neighborhood analysis. Each tree was assigned a unique tree ID and forest metrics relating to tree height, canopy height, canopy cover, stem density, and crown area were generated directly from the LiDAR point cloud.

Changes in vegetation height were calculated as the difference between rasters created from 2008 and 2013 LiDAR data sets. A smoothing process to eliminate the possibility of sampling raster pixels that are not representative of vegetation canopy height was utilized for each of the vegetation height rasters. This effectively filled 'pits' in the vegetation canopy.

Effective shade and solar flux were simulated for the periods of May 1 through October 31 on both datasets to capture the complete temperature monitoring season as well as salmonid rearing seasons. The results were used to calculate average daily solar loading at the stream surface.

Techniques for Automated Extraction of Talus Surfaces for Natural Disasters Management in the Alpine Environment *

Presenter: Tomaž Podobnikar, University of Ljubljana—Slovenia

In Alpine areas many man-made structures are put at multiple risks, mostly associated with natural disasters related to the geological, geomorphological, and hydrological setting or induced by extreme weather conditions. The calculation of possible damage is important in decision-making to judge the feasibility and necessity of possible countermeasures. Therefore, decision-making needs accurate spatial data both on the geomorphic pattern (e.g., slopes distribution) and on the vulnerable man-made structures. The accurate DEM in Alpine areas are crucial for monitoring the incipient mass movements and erosional patterns. Furthermore the accurate DEM allows the development of GIS geomorphometric techniques for extracting not only the topography but also the natural and man-made topographic features. The results of these techniques can then be combined with auxiliary socio-economic data (e.g., function of buildings). In this work I will focus on the (semi)automated data extraction aspects of the processing chain using GIS tools. The second part will focus on talus surfaces (i.e., cones) extraction on the basis of innovative variables development, robust techniques for spatial analysis using appropriate DEMs. I will discuss options to use all this knowledge for improvement of the DEM quality applying data integration. I will close the presentation with the open questions towards reliable GIS-based models for conservation GIS applications.

Mapping Functional Riparian Corridors Using Hydraulic Geometries and LiDAR

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

Alluvial streams and their floodplains and riparian zones are integral components of the natural landscape and are important for ecosystem function, maintaining aquatic and terrestrial biodiversity, providing water for people, and absorbing and regulating effects of climate change. Acquisition of riparian conservation easements designed to provide adequate room for natural, dynamic riparian processes to occur is a key conservation management action. Unlike regulatory zones, which rarely afford adequate protection, perpetual voluntary

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conservation easements represent opportunities to conserve the full extent of the existing and future functional riparian corridor. In order to facilitate effective riparian conservation through easements, two planning needs emerge: (1) effective and efficient corridor delineation and (2) incorporation of mapped corridors into watershed-scale assessments of relative conservation priority. We present preliminary methods for modeling functional riparian corridor extent of alluvial streams of the Russian River (Sonoma County, CA), using regional curves of hydraulic geometry, DEMs from airborne LiDAR, and field verification. The model can run for individual reaches or whole watersheds and produces spatially explicit corridors that vary in width with topography and drainage area. The outputs can be used to define the boundaries of conservation easements and can be combined with other datasets to assess relative conservation priority within watersheds.

11:00 AM–12:30 PM

Paper Session

Mapping and Conserving Coastal Habitats

Room: Acacia

Case Study—Mapping Mangroves and Coastal Wetlands

Presenter: Andy Long, MapWorks Learning

Mapping the Mangroves provides formal and informal education and gives citizen scientists and the larger scientific community the ability to engage with and explore mangroves and their ecosystems. The open curricula and GIS tool provide opportunities for all to learn about applications of GIS in the field and usage in conservation. MTM has been successful in gathering data from around the world using Ushahidi, a crisis mapping tool. Sensors were created using Raspberry Pi and Arduino to measure environmental factors and are part of an open curriculum. Curricula were developed to ensure that anyone interested in data collection can build and deploy low-cost, high-impact technologies to monitor and protect coastal ecosystems. An open-source environmental science curriculum was also developed and relies on the MTM project to collect, store, and display data. We hope to create linkages to globally based Open Data initiatives. We envision creating connections to other biomes and mapping platforms that engage communities around management of natural areas, threats, opportunities and restorative plans. Country-level managers and university partnerships will help increase the accuracy of civic contributions and further garner community engagement. The translation of the tool, curricula and all resources encourages people to participate more fully as global citizens. It also inspires them to create a shared identity and helps communities to evolve, perceive and live sustainably.

Using ArcGIS to Empower Locally Led, Sustainable Mangrove Management in NW Madagascar *

Presenter: Zo Andriamahenina, Madagascar Blue Ventures Conservation

Madagascar's mangroves are vital to poor and increasingly vulnerable coastal communities but are being rapidly degraded and deforested. The Ambaro-Ambanja Bays (AAB) contain Madagascar's second largest mangrove ecosystem wherein deforestation is amongst the country's highest. Since 2013, the Blue Forests project has engaged coastal communities in AAB to pursue improved mangrove resource management. A primary challenge has been creating spatially meaningful and recognised resource-use and management zones. Building on previous deforestation analysis involving satellite imagery and socioeconomic analysis, GIS aided directly in engaging community members in workshops and field missions, delineating mangrove resource-use and traditional rights and delineating the boundaries of municipal-level community mangrove management zones (i.e., conservation, restoration and extraction). Delineating resource-use and management zones was made possible through digitising, storing, styling and disseminating all information using ArcGIS, resulting in a data-base of vector boundaries supplemented by mangrove-status information and reflecting community input. This database facilitates resource management and helps to secure legal user rights from the national government. The larger goal is to make this information readily available through ArcGIS Online, allowing replication and comparison to satellite-derived information within Madagascar and beyond.

Session Descriptions

Monday, July 27 (continued)

Kite Aerial Photography on Tetiaroa, French Polynesia

Presenter: Lucas Wilgers, University of Redlands

Kite aerial photography (KAP) was used to construct a high-resolution coverage of Tahuna Iti, a ground-nesting bird island on Tetiaroa Atoll. High-flight (200m) and low-flight (80m) series were compiled and mosaicked to provide comprehensive coverages of the island. KAP coverages will provide a baseline to evaluate ongoing changes in the shoreline morphology, as well as form the basis of monitoring the ground-nesting bird colony in the coming years.

Mapping Submerged and Emergent Coastal Habitats in a Small Tidal Creek Watershed

Presenter: Joanne Halls, University of North Carolina, Wilmington

Tidal creeks are small areas characterized by having low freshwater input; marine and brackish salinity; and subtidal, intertidal, and supratidal habitats. Most people are familiar with large riverine systems (e.g., Cape Fear River), but it is these smaller tidal watersheds that cover a much greater proportion of the North Carolina coastline. As population increases, there is growing concern with water quality and increased sedimentation rates. Therefore, the purpose of this study was to produce a map of benthic and emergent habitats in a tidal creek located in southeastern North Carolina. An intensive field effort was conducted and DigitalGlobe WorldView-2 imagery has been analyzed using a variety of image processing techniques. Several results have been obtained: (1) supervised classification produced the highest map accuracy (94%); (2) sand, water, scrub/shrub, and docks/rubble were greater than 94% accurate; (3) saltmarsh habitats (high and low density cord grass, Spartina alterniflora, and black needle rush, Juncas roemarianus), mud, and oyster beds were between 80% and 85% accurate; (4) pan-sharpening and atmospheric correction did not consistently improve map accuracy; (5) LiDAR DEM data improved habitat map accuracy; and (6) deriving water depth from the WordView-2 imagery improved mapping the benthic habitats. The project mapped small features at the species level and is the first to produce maps of the benthic and emergent tidal creek habitats in coastal North Carolina.

* Indicates Scholar Presentation
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11:00 AM–12:30 PM

Paper Session

Remote Sensing Methods for Critical Habitat Modeling I

Room: Toyon

High Resolution Mapping of Chimpanzee Habitat Suitability ++

Presenter: Samuel Jantz, University of Maryland

Major threats to current chimpanzee populations include habitat loss from resource extraction activities and land conversion, hunting, disease and the illegal pet trade. Clearing of tropical forests has rapid and devastating impacts, leaving chimpanzees in isolated, small populations that face edge effects and an elevated risk of extinction. Although these threats affect each chimpanzee sub-species to varying degrees in different regions, all threats are related to increasing human populations and resource demands. There is an urgent need to monitor the status and trends of human induced land cover change at the local scale to aid decision makers in developing effective strategies to protect chimpanzees and to measure conservation success. Spatially explicit maps of chimpanzee habitat suitability can help address this need; however, previous efforts were either at a coarse resolution or only covered a small extent of the entire chimpanzee range. Here, we present our ongoing efforts to combine recently released datasets derived from the Landsat 7 ETM+ satellite, as well as topographical data derived from the Shuttle Radar Topography Mission, with a coarse resolution habitat suitability model covering the entire chimpanzee range. This approach will enable us to produce habitat suitability maps at a scale relevant to decision makers over the entire chimpanzee range and monitor change in suitability as new imagery is acquired.

Identification of Valuable Habitats by GIS Modelling in Lipetsk Region of Russia*

Presenter: Dmitrii Sarychev, Russia, Crane Working Group of Eurasia (CWGE)

Identification and analysis of rare species distribution and their habitats are highly important for biodiversity conserva-

tion. GIS and Remote Sensing offer the most effective way of such identification. In this research, Lipetsk Region of Russia is used as a model region for spatial analysis of the rare species distribution and for optimization of the protected area network. Nesting sites of Red List bird species were chosen as biological indicators of the valuable habitats. Environmental criteria of known valuable habitats were estimated using proximity and geostatistical analyses of imagery data (Landsat, SRTM) and thematic maps. A special GIS model was developed by Graphical Modeler of QGIS. The model incorporates all the criteria and spatial data for identifying potentially valuable habitats. The potentially suitable nesting habitats of about 60 rare bird species were identified, and an integrated map of valuable habitats was produced as a result. Preliminary estimations show that only 45 percent of all valuable habitats are protected, and there are three major unprotected territories with another 34 percent of the valuable habitats that are important for inclusion in the protected area network of Lipetsk Region. The developed workflow can be used as a tool for conservation strategy optimization in other regions of Russia.

Saving the Ribbon of Green: Assessing Riparian Habitat Condition and Restoration Opportunities in the Great Basin Using Remote Sensing Techniques

Presenter: Kurt Fesenmyer, Trout Unlimited

Riparian vegetation in the Great Basin cools streams, stores water, and serves as habitat for rare species. We describe the application of remote sensing tools for characterizing riparian condition and identifying restoration opportunities. We used object-oriented land cover classification to map riparian vegetation in NAIP imagery. When paired with surveys of redband trout, we found that mapped woody vegetation and a spatial model of stream temperature to be better predictors of trout occurrence and abundance than habitat data from the field. By linking a simple measure of habitat condition to fish populations and serving the results in a webmap, we provide easy access to the key information required for effective restoration prioritization. We also characterized riparian vegetation at multiple spatial and temporal scales to track riparian zone recovery in response to changes in grazing management using historical and contemporary aerial photographs and Landsat satellite imagery in Google Earth Engine. All results confirm that changes in grazing regime can result in dramatic increases in riparian vegetation. We conducted a similar Landsat imagery analysis for the range of Lahontan cutthroat trout and linked the species' annual population variability to riparian condition. In all applications, we demonstrate how remote sensing tools can effectively monitor and characterize riparian zone vegetation and efficiently guide conservation in a large, inaccessible landscape.

11:00 AM–12:30 PM

Paper Session

Climate Change and Remote Sensing in Urban Communities and Rural Watersheds

Room: Heather

Temporal and Spatial Prediction Analysis of Nitrogen Load in Qingshan Lake Watershed Under the Condition of Future Climate Change

Presenter: Yi-Fan Zeng, Beijing Normal University—School of Environment

With the help of GIS (geographic information system), a nitrogen load model has been constructed for Qingshan Lake Watershed based on SWAT model. Qingshan Lake Watershed was divided into 46 sub-basins and 189 hydrological response units. The model was calibrated and verified with hydrological data (daily flow measurement during 2005-2011) and daily nitrogen concentration measurement during July and August 2011. Further, use model under the condition of future climate change to predict temporal and spatial nitrogen load distribution characteristics in the future (2030). The results show that: (1) On the temporal scale, annual average runoff increased by 12.43% in the future and monthly variation characteristics of nitrogen loss in the future are distinct. NO3-N is the main form of erosion, 62.5% of the yearly total loss concentrated on the period of July to September; (2) At the spatial scale, nitrogen loss is still mainly concentrated in the central basin and southeastern basin where farmland is the dominant land-use type. The loss of NO3-N load in northwest areas (covered mostly by natural forest) still keep lower, but there will be a large increase relatively, the amount is 13.5%. The results of the study can contribute to the management and study of nitrogen pollution in watersheds.

Session Descriptions

Monday, July 27 (continued)

Climate Change Risks Assessment in Rupa Lake, Nepal

Presenter: Kamal Thapa, YONSED

Our study is of delineated boundaries of Rupa Lake watershed and its sub watersheds. Watershed areas were determined by tracing the drainage divides on the best available topographic maps and satellite image. Similarly, a Bathymetry survey of Rupa Lake was carried out to ascertain physical vulnerability. GIS map processing was done using ArcGIS software.

Hot Enough Yet? Analyzing Climate Thresholds for Austin, Texas

Presenter: Jessica Leonard, Geos Institute

Austin, Texas, has experienced many temperature and precipitation extremes in the last decade. As climate change accelerates, we can expect more days of extreme heat, fewer overnight freezes, and more frequent periods of drought than there have been historically. Most people experience climate through the extremes. Crops are affected when temperatures drop below freezing, and we change our behavior when the day's high is over 100° F.

Using GIS and Python scripting, we assessed recent and future change in the extremes for the community of Austin, Texas. We analyzed data on maximum and minimum daily temperature and daily precipitation from weather stations and downscaled climate models to calculate the number of days per year that meet certain thresholds. We modeled change in frequencies (days per year) for three future 30-year time periods, as compared to the modeled frequency (days per year) for the historic 30-year period.

The information provided to the community on extreme heat, low temperatures, extended drought, and wildfire can be used to help plan and adapt to climate change. Many of the long-term impacts can be avoided if emissions are reduced, creating a more positive future for residents of Central Texas.

Remote Sensing and i-Tree for Studies on Urban Forest Trees

Presenter: Shobha Sriharan, Virginia State University

This paper presents the application of remote sensing for demonstrating the urban forest trees among the land cover features on the campus of Virginia State University. The quantification of urban trees was done by using i-Tree, a free suite of software utilities developed by the USDA Forest Service and numerous cooperators. The hypothesis of this study is that a tree database system is necessary for developing a sustainable urban tree program. Therefore, research was conducted to classify the woody species locations among other land cover features, by using ERDAS IMAGINE 13.0 software. The identified area on classified image was visited using GPS (Global Positioning System) to collect data on the trees. The data collection included location of the site, species, height, trunk diameter, crown diameter, and other parameters of trees by using low-tech instruments such as measuring tape, diameter tape, calipers, compass, and telescoping and measuring rod. These data were input into the i-Tree software and geographic waypoints in ArcMap. The results of this study will help in the formation of the tree inventory and management database for an urban community such a university campus. This in turn will help in decision making by the personnel in the Campus Maintenance for the tree care, long-term planning for new building as well as green area. The authors acknowledge the NIFA Grants "Urban Forestry" (2012-38821-20153) and "Climate Change" (2011-38821-30892).

2:00 PM–3:30 PM

Paper Session

Use of sUAV Data for Conservation

Room: Chapel

High Resolution Mapping of Orchards and Invasive Tree Species in West Central Vermont

Presenter: Bill Hegman, Middlebury College

This session will present our recent project to create high resolution imagery for use in building an orchard database as well as our current research to identify and track invasive tree species in west central Vermont. This work started in 2014 to

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++ Indicates a Student Competion Presentation

explore the options available for gathering and using high resolution imagery for student and faculty research in conservation and geography. During the summer of 2014, high resolution imagery was collected for approximately 120 acres of newly planted apple orchard where no current imagery was available. Ground control and post processing were very important because of the high accuracy needed to map individual trees, irrigation lines and drainage tile. Current research in 2015 is centered on identifying invasive maple species. While the overall spatial accuracy is less critical, spectral resolution, image processing and enhancement, study area extent, and the timing of data collection pose new challenges. This talk will also briefly cover the identification and selection of our flying and imaging platforms including lessons learned about open source vs proprietary systems and practical limits on flying platforms including copters, fixed wing systems, and kites. Low-cost cameras and imaging platforms will also be covered along with post processing and georectification options.

Can a Stock GoPro Camera Produce Accurate Photogrammetric DEMs? ++

Presenter: Kaitlyn Chow, California State University, Monterey Bay

Sediment retention basins, a common BMP, are often monitored with DEMs to quantify the volume of trapped sediment. Recently Agisoft Photoscan added a "fisheye" correction feature that can produce DEMs from wide-angle, aerial photography. Our study is the first to test this software feature using a stock GoPro camera mounted on an inexpensive UAV. The study addressed three questions: (1) How well does automated fisheye correction compare to manual correction?, (2) How many ground control points (GCPs) are required to achieve reasonable DEM accuracy?, and (3) Is a stock GoPro camera a viable photogrammetry tool? A survey was flown at an altitude of 23 m with a GoPro mounted on a Phantom II UAV. 19 GCPs were precisely located by 3" total station. Additional total station shots were made for testing DEMs produced from photogrammetry. (1) Mean DEM vertical accuracy (compared to 115 total station points) was 18 ± 16 mm for manual and 44 ± 5 mm for auto rectified photos. A Kruskall-Wallace ANOVA indicated a difference between the methods ($p < 2.2x10\text{-}16$). (2) There was no benefit in performance as GCP number was increased from 4 to 19. (3) Stock GoPro cameras are a viable tool for inexpensive, low-altitude photogrammetry. A benefit of the fisheye is wide aerial coverage at a relatively low altitude. Basin volumes for the total station (568 m3), manually rectified (565 m3), and auto rectified (550 m3) were comparable.

Summoning a Drone—Data Mules for Remote Sensor Networks and Rapid Response

Presenter: Chris Nicholas, Consultant

This talk discusses harvesting large amounts of field sensor data (audio and camera trap imagery) by hobby-class autonomous drones in very remote areas, using both GSM and packet radio mesh networking for communications. It addresses a critical gap faced by conservationists and enforcement to monitor remote areas, collect data and respond rapidly with appropriate, low-cost technologies.

This work is a collaboration between the winning team of the United Emirates "Drones for Good" competition (wadi.io), the Rainforest Connection (rfcx.org) kickstarter campaign to detect illegal logging, and amateur HAM radio operators.

Built almost entirely from open-source software, hobbyist hardware and handheld VHF radios, an overview of the hardware, software, and field trial experiences will be presented.

Open Source Technologies and Remotely Sensed Data in Protecting Elephants

Presenter: Rosemary Alles, Pennsylvania State University

Elephants are disappearing in Africa. GeoSpatial technologies based on remotely sensed data are increasingly used to study African elephants in an effort to protect the species from poaching and Human Elephant Conflict. Although advances in technology have made the visualization of remotely sensed biospatial data increasingly easier to achieve, there remains a need for seamlessly integrated GIS capable of the (rapid) assimilation of data featuring functionality capable of rich statistical analysis as well as location based visualization.

We evaluate open source Geo Spatial technologies based on remotely sensed data in the context of real-time monitoring systems capable of GIS; we analyze the utility of several such systems with reference to feasibility, functionality and usability; we develop a prototype using an open source, full-stack, Geo Spatial platform integrated with the R-statistical package; the integration with R offers potential for rich statistical analysis.

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The prototype will demonstrate visualization, the management of data including UAV acquired imagery, performing spatial and statistical analysis, useful for understanding and predicting the behavior of elephants and scaling for use on cloud based, mobile, UAV and stand-alone platforms. The prototype uses remotely sensed data from GPS collared elephants in Cameroon.

We assess the prototype in the context of organizations interested in affordable state-of-the-art GIS for remotely sensed biospatial data.

2:00 PM–3:30 PM

Paper Session

Climate Change and Sea Level Rise in Coastal and Marine Environments

Room: Acacia

Sea Level Rise and Submergence of Sundarban Islands a Time Series Study of Estuarine Dynamics

Presenter: Atanu Kumar Raha, Techno India University, Kolkata

The Sundarban mangrove ecosystem in the deltaic complex of the Rivers Ganga, Brahmaputra and Meghna is shared between Bangladesh (62%) and India (38%) and is the world's largest coastal wetland. Enormous loads of sediments carried by the rivers are used to contribute to its expansion and dynamics. The total area of Indian Sundarban region is about 9630 sq. km., out of which the Reserved Forest occupies nearly 4260 sq. km. At present, out of 102 islands of the Indian Sundarban region, 54 are inhabitted with a population of about 4.5 million (2011 census) and the rest of the 48 islands are Reserved Forest with mangrove vegetation. A few studies were conducted in the past to monitor the changes in a few islands of Sundarban estuary, which had been identified as most vulnerable in terms of coastal erosion, submergence and flooding due to surge and sea level rise. In the present study, nine southern-most islands of Indian Sundarban estuary, facing the Bay of Bengal, were studied for the period 1999 till 2013, through time-series analysis of satellite imageries. The study showed that a few islands were undergoing gradual erosion. It also revealed continuous emergence of a few more new islands. The present study has tried to establish that other factors like destruction of mangrove vegetation, sediment deposition, natural subsidence and lack of fresh water flow can have more impact on the dynamics of Sundarban Islands than the single factor of sea level rise.

Resilience, Migration, and Conservation of Hudson River Tidal Wetlands

Presenter: Nava Tabak, Scenic Hudson

Rapid local sea level rise (SLR) along the Hudson River Estuary threatens one of the largest concentrations of freshwater tidal wetland along the United States Atlantic seaboard. We used GIS and the Sea Level Affecting Marshes Model (SLAMM) to predict future migrations and habitat changes in tidal wetlands along 160 miles of tidal river. While SLAMM is becoming a widely used tool in the assessment of saline and brackish coastal wetlands, we adapted the model to reflect the unique freshwater tidal conditions, SLR projections, habitat classifications, and data availability specific to our study area. By varying rates of SLR and wetland sediment accretion, we examined a range of possible future scenarios of coastal change and wetland persistence. Models showed the potential for both considerable wetland migration into upland areas and dramatic shifts in wetland composition. SLR rate was the strongest driver of model predictions, though at rapid SLR rates accretion rates will also be influential. We use the results to identify priority conservation areas, targeting currently undeveloped and unprotected uplands that are likely to host future tidal wetlands, as well as existing wetland complexes exhibiting high resilience under a range of possible future conditions. Our model results can also be used to identify restoration sites for increasing tidal wetland resilience.

* Indicates Scholar Presentation
++ Indicates a Student Competion Presentation

2:00 PM–3:30 PM

Paper Session

Land Classification and Mapping

Room: Toyon

Conflicts of Interests in Rural Areas *

Presenter: Špela Guštin, Slovenia, University of Ljubljana, Faculty of Arts, Geography Department

Rural areas fulfill many different functions and serve a wide range of stakeholders (farmers, second home owners, environmentalists, decision makers, etc.). Their values and interests often clash and create conflicts. Conflict data are hard to capture because multiple stakeholders are involved and no official database exists. One possible method of data acquisition is a newspaper content analysis. To assess the spatial and temporal pattern and intensity of conflicts in rural areas (case study: Izola municipality, Slovenia) we examined closely a regional newspaper for the period 2008-2014. Conflicts had a geographic reference so text could be converted to GIS data and mapped. By mapping the seemingly unrelated events, patterns emerged. Conflicts differed by location, intensity, duration, proposer of change, and reason for conflict development. The most common reasons for conflicts were illegal buildings in attractive areas with sea view and new infrastructure developments in suburban areas. The investors proposed changes that later caused the majority of conflicts. Depending on location and type of conflict we can divide rural areas of Izola municipality into three subregions, i. e., densely populated historic urban core, contested rural areas, and rural areas with agricultural production. In the future, we can expect the growth in number and complexity of rural conflicts in the studied area, as well as new types of disagreements among the (not yet known) stakeholders.

Mapping the Major Vegetation Classes for the Cerrado Biome Using Remote Sensing: A Case Study of the Chapada dos Veadeiros Region

Presenter: Fernanda Ribeiro and Gabriel Daldegan, University of California, Santa Barbara

The Cerrado is one of the world's important biodiversity hotspot, at risk to be reduced small fragments. It's the second largest biome of South America and is considered the most diverse savanna in the world. Its vegetation is divided into three major classes: grassland, forest and savanna. Mapping the Cerrado classes and converted areas is very important to understand and develop studies to monitor its land use change and prioritize areas for conservation. This study analyzed the region of the Chapada dos Veadeiros using Landsat TM+ imagery of wet and dry seasons for the year 2007. Our main objective is to classify the major vegetation classes of the Cerrado and its converted areas. Another goal is to identify the spectral behavior of these classes to their pattern, and later, compare the Landsat classification with another data set based on a SPOT 5 image. We've found some confusion between grassland and savanna and grassland and converted areas on the dry season classification. And a confusion between clouds and converted areas and forest and savanna were observed on the wet season classification. This can be due to the presence of dry matter and soil and a similar vegetation structure. Using Decision Trees to classify Cerrado classes and its seasonal variability is effective. Using Landsat TM+ to map the major vegetation classes is a difficult task, for which a finer spatial resolution would increase the accuracy of the classification.

Mapping Land Cover Odzala National Park, Republic of the Congo ++

Presenters: Sarah Tengan and Kerry Lynn Thompson, Brigham Young University Student

A lack of accurate baseline habitat and threat maps for Odzala National Park (1,350,000 hectares) in the Republic of the Congo is hindering proper assessments needed to carry out strategic management within and around the park. Based on the habitats within the park and the encroaching threats surrounding the park, a classification scheme was developed specific to Odzala's management needs. Recent Landsat 8 OLI scenes were used to map land cover classes that included, but were not limited to, dense forest, savanna, riparian floodplains, and human habitat. Training sites for each land cover class were derived from high resolution satellite image interpretation and a priori field knowledge. With the training sites and two supervised classification algorithms, Spectral Angle Mapper (SAM) and Maximum Likelihood, two separate land cover classifications were created—one for each algorithm. The two classifications were compared, and an accuracy assessment using a stratified random sample provided a quantitative

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Monday, July 27 (continued)

report and error matrix with the estimates of the overall and class-specific user's and producer's accuracy. This is the first time Odzala has been mapped with a classification scheme specifically designed for Odzala using 30x30 m imagery. This detailed land cover map is helping improve the management and protection of the park by equipping patrols and managers with the information they need to carry out management activities and detect future change in Odzala.

Mapping Fire Scars in the Transition Zone between the Amazon Forest and the Cerrado Biome Using Landsat 5 Thematic Mapper Images—A Case Study in Mato Grosso, Brazil

Presenter: Gabriel Daldegan, University of California, Santa Barbara

Fire has been used for opening natural areas along the human occupation all over the Earth. In Brazil, the two most extensive biomes, the Amazon Forest and the Cerrado, suffer from many fire events every dry season. Both biomes are known worldwide by their ecological importance, but due to the intensive anthropic occupation along the last decades, they have been experiencing high deforestation rates, having most of their natural landscape converted to agriculture and pasture. With the free access to the entire Landsat program dataset catalogue, a vast number of studies are using this imagery to do researches in the conservation field, and one of them is the study of fire events. This study has focused on two Landsat 5 Thematic Mapper scenes (Path 226, Rows 68 and 69) acquired during the dry season in the state of Mato Grosso-Brazil to perform a decision tree classification in order to delimitate and measure fire scars. The decision tree approach allowed fire scars present in the study area to be mapped. However, 47% of the area mapped were confusing, mostly with agriculture bare soil. The median size of the fire scars was 2.16 hectares, yet the sum of the polygon smaller or equal to this area covered only 0.9% of the total burned areas mapped, and about 66% of them were still detectable in the images for more than one month.

* Indicates Scholar Presentation
++ Indicates a Student Competion Presentation

2:00 PM–3:30 PM

Technical Workshop

Room: Heather

Working with Spatial Analyst and Raster GIS

Presenter: John Schaeffer, Juniper GIS

ArcGIS Spatial Analyst is an extension that is designed to work with "Raster" or cell-based data, particularly land surface data such as slope, aspect, elevation, and watershed and vegetation/habitat data. Working with raster data and Spatial Analyst allows different types of analysis than that available from more familiar vector GIS techniques and is very useful in conservation applications. While the software application is somewhat advanced, the concepts that will be demonstrated are applicable to non-GIS users as well as new and advanced users.

4:00 PM–5:30 PM

Paper Session

Habitat Suitability Modeling

Room: Chapel

Distribution of Tree Squirrels in California: A Species Distribution Modeling Approach to Analyzing Data ++

Presenter: Rosemary Garcia, CSU, Los Angeles

Past species distribution maps have been dependent on museum specimens and are not frequently revised. In this study, we describe a new method for establishing the current range and determining suitable habitat of a native and introduced species of tree squirrel in California using ArcMap and MaxEnt. The method involves the collection of location data from wildlife rehabilitation facilities, museum collections, online species databases, and citizen reports. We provide geographic range for the Eastern Fox Squirrel (Sciurus niger) and the Western Gray Squirrel (Sciurus griseus) in California. Large sample sizes over a specified geographic area allow for detailed mapping of the distribution of each species.

Current data show three large populations of S. niger within California. The first and second populations extend north, south, and east of from both San Francisco and Los Angeles, and a third major population extends in all directions from Sacramento. Other isolated populations also exist within the state. The preliminary model suggests paths that S. niger may use to eventually connect the current populations, along with other established but isolated populations. Sciurus griseus has been displaced from areas now dominated by S. niger. The distribution map for S. griseus shows that there are populations in the paths of range expansion for S. niger, which suggests future displacement of S. griseus.

Non-Breeding Movements and Habitat Use of Whooping Cranes Using Satellite Telemetry ++

Presenter: Hillary Thompson, Clemson University, Department of Forestry and Environmental Conservation

In the late 1940s, the endangered wild population of Whooping Cranes (Grus americana) was about 15 individuals that bred in Canada and wintered in coastal Texas. To safeguard this species from extinction, another migratory population of 100 cranes was reintroduced in 2001 that bred in Wisconsin and initially wintered in coastal Florida. Wintering habits of Whooping Cranes are well-known for the wild population, but relatively less is known about the reintroduced population. Unlike the wild population, the reintroduced population is using a variety of habitats across the southeastern United States. The winter range of this population has also expanded in recent years to include areas between Florida and southern Indiana.

For a migratory species that occupies a large range including remote areas, satellite telemetry is an important tool to learn more about their spatial ecology. The objective of this study is to identify wintering use areas, migration distances and routes, stopover locations, and winter home range sizes. Analyses include satellite telemetry data from 70 individuals from 2002-2014. We also identify and describe habitat characteristics of wintering and stopover sites using a remotely-sensed national land cover data set. This research will aid in the management or protection of wintering areas and stopover sites used by this population. Remotely-sensed land cover and telemetry data are an essential part of understanding non-breeding ecology of Whooping Cranes.

GIS Enabling Collaboration in Endangered Species Recovery

Presenter: Martin Slimin, New Zealand Department of Conservation

Whio (Blue Duck) are one of New Zealand's rarest birds.

The Whio Forever project is a collaboration with Genesis Energy (one of New Zealand's largest power generators), the Department of Conservation and community groups. The project identified from the outset that quality data able to be contributed to and accessed by all parties was key to securing the whio population. This led to the development of a spatially enabled information system with a web based viewer and mobile data collection.

The spatial nature of the application developed by the Whio Forever project enables the practitioners to quickly identify the location of vulnerable birds and the emergence of predation threats which are the primary cause of population decline. The map based interface allows these decisions to be made in real time, without the need for advanced ecological or statistical analysis skills.

The mobile application had to meet a wide range of user needs from rangers working for long periods in arduous and disconnected environments, community based efforts requiring a highly intuitive app, and contractors where the data entry requirement must not hinder the efficiency of field work in any way. Spatial technology was used in less traditional ways, utilising GPS to automate large amounts of collection and present the used with the appropriate data collection forms based on the proximity to certain assets.

4:00 PM–5:30 PM

Remote Sensing Methods for Critical Habitat Modelling II

Room: Acacia

Trait Based Austrailian Mammal Distribution Patterns and Extinction Risks

Presenter: Jessica Berryman, Salt Lake Community College

Trait based research, which attempts to ascertain habitat selection based on intrinsic factors, may be beneficial in predicting

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species' extinction risks. In this study, I utilized GIS to investigate the relationship between environmental factors and extinction risk based on life history strategies. Specifically, I conducted a metadata analysis of seven life history traits and the conservation status of 236 Australian species in order to identify life history strategy clusters and determine if there was a difference in extinction risk based on the clusters. I then compared the environmental data at each historical occurrence point for species within the life history strategy cluster with the highest extinction risk to other life history strategy clusters to determine if there was a relationship between environmental factors and extinction risk. Seven life history strategies were found in Australian mammals based on body size, diet type and locomotion type. Medium-sized, omnivorous, ground-dwelling mammals had a significantly higher extinction risk and were found in significantly different environmental conditions than other mammal groups. Environmental constraints may be the cause of this group's increased number of extinctions. Utilizing GIS to compare environmental variables and life history information may enable wildlife managers to focus their efforts on species within specific life history strategies clusters with the greatest extinction risk.

Spatial Distribution and Habitat Selection: Primary Concerns for Maras's Conservation*

Presenter: Virginia Alonso Roldán, Argentina Centro Nacional Patagónico (CENPAT), Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET)

Mara (Dolichotis patagonum) is an endemic mammal of the Argentine semi-deserts, Near Threatened according to IUCN. Identifying the main factors influencing habitat selection by mara is essential to develop effective conservation actions. Using GIS, it was possible to map activity signs at different scales (microhabitat, habitat, landscape) working in extensions from 200 to 2000 ha. Also vegetation cover was measured, and roads, windmills and fences were mapped to extract landscape metrics and distances to human-made structures and neighbor warrens. Spatial explicit and generalized mixed models were fit to assess the importance of social, ecological and spatial processes in habitat selection by mara and the scales at which these processes are operating. Results showed that similar factors influence habitat use at different scales, preferring sites with bare soil and close to fences, indicating that habitat modification due to human infrastructure would not threaten this species. However, habitat selection by mara differed depending on the landscape structure, preferring open areas in shrubland or shrub-grass mosaic sites and areas close to bushes in grassland areas. At landscape level warren distribution presented aggregated patterns, pointing to social processes as strong influences in mara habitat selection. Conservation actions for this species should protect heterogeneous landscapes from agriculture and areas with more than one known settlement.

A Multiscale View of Shortgrass Prairie Bird Abundance and Distribution

Presenter: Rob Sparks, Nature Conservancy

We developed hierarchical models for McCown's Longspur and Loggerhead Shrike in the Colorado Shortgrass Prairie Bird Conservation Region (BCR). We extended a generalized multinomial mixture model to estimate abundance, availability and detection probability using 4 years of data from the Integrated Monitoring in Bird Conservation Regions (IMBCR) program. Our objectives were to (1) model landscape effects of habitat, (2) model the effects of local vegetation and (3) predict the distribution of the species. At the landscape scale there was strong support for percent grass cover in the top model for both species. The relationship between percent grass cover and abundance was linear for both Loggerhead Shrike,$\boldsymbol{\beta}$ = 3.28, SE = 1.21 and McCown's Longspur, $\boldsymbol{\beta}$ = 4.08, SE = 0.97. At the local scale the top model for McCown's Longspur on availability showed strong support for a negative effect of shrub cover. Loggerhead Shrike's top model on availability supported a positive effect for shrub cover at the local scale. These results suggest that multiple scales are important to consider when developing habitat relationship and distribution models. The distribution map was created using ArcMap 10.2 and can be used by managers to create abundance summaries for any area of management interest and display areas of high and low abundance within the BCR. In addition GIS allowed us to overlay each species predicted distribution to map hotspots where their distribution overlapped.

* Indicates Scholar Presentation
++ Indicates a Student Competion Presentation

Biophysical Characterization of an Iconic Pine from Landscape-level Forest Data

Presenter: Sara A. Goeking, US Forest Service, Rocky Mountain Research Station

Whitebark pine (Pinus albicaulis, or WBP) is an ecologically important high-altitude species in the Western U.S. because it provides habitat and food for many wildlife species. Concerns about the long-term viability of WBP have arisen in the face of high mortality due to a combination of altered fire regimes, disease, drought, and insects. Most previous studies of WBP targeted pure stands, yet the U.S. Forest Service's spatially representative Forest Inventory and Analysis (FIA) dataset shows that WBP is more widespread in mixed forest types. This study used FIA plot data to characterize WBP's distribution relative to both local-scale and landscape-level biophysical variables. Multivariate models evaluated the relationship of WBP regeneration, growth and mortality to stand structure, stand composition, and PRISM climate data, which was used to quantify both mean climatic conditions and deviations from normal conditions. The results demonstrate that metrics of WBP viability are often comparable between mixed stands and pure stands; that the importance of precipitation and temperature may vary seasonally; and that climate variability may be more important than mean conditions. This study expands the characterization of WBP's biophysical range and may be useful for ecological restoration objectives.

4:00 PM–5:30 PM

Conservation Planning and Design

Room: Toyon

Three Years, 100,000 Acres: Bay Area Conservation Lands Network Progress

Presenter: Stuart Weiss, Creekside Center for Earth Observation

Conservation plans should be dynamic like the world itself. In 2010, the Bay Area Open Space Council launched the Conservation Lands Network (CLN 1.0), a vision for biodiversity across 10 counties in a biodiversity hotspot. CLN 1.0 established coarse filter vegetation targets based on mountain ranges and valleys and fine-filter species targets, and built off existing protected lands (>1,000,000 ac.) using Marxan. 800,000 additional acres were targeted, with CLN 1.0 comprising ~50% of the region. The CLN, via an on-line ArcGIS Explorer tool, is mandated for use by key funders. In 2014, CLN 1.0 Progress Report was completed. In three years, ~100,000 new acres were protected. Additions of vegetation types, stream miles, and other conservation targets were compiled. New analyses included contiguous protected areas (33 contiguous areas >5,000 ac., up to 203,000 ac.) and lands at development risk (20,000 ac. protected). GAP analysis of water resources determined that 28% of recharge and 30% of runoff (707,000 and 1,000,000 acre-ft respectively) were protected by 2013, with eventual CLN goals exceeding 50%, an analysis that resonated in the current California drought. CLN 1.0 Progress Report sets the stage for CLN 2.0, where goals will be re-evaluated and Marxan rerun. Refinements will include explicit targeting of recharge and runoff, a more sophisticated look at development risk, and consideration of climate change resilience.

Development of a Terrestrial Sensitivity Map for the Kingdom of Saudi Arabia

Presenter: Karim Hussein, Saudi Aramco

Saudi Aramco is Saudi Arabia's national oil and gas company. The company's Environmental Protection Department is developing a Kingdom-wide Terrestrial Sensitivity Map where many terrestrial spatial entities will be considered in the analysis process, such as species distribution areas, and protected areas. Each terrestrial spatial entity will be given a weight to reflect its importance for biodiversity conservation. While sensitive ecosystems will have a high weight, other less important terrestrial entities will have a moderate weight. Esri ModelBuilder will be used to automate sensitivity map production for future iterations. The model will be flexible enough to integrate future spatial entities and to generate an updated version as needed. Esri ArcGIS Spatial Analyst will be used to interpret all terrestrial ecology layers in order to produce a terrestrial categorized map with a predefined index of Extreme Sensitivity Areas, High Sensitivity Areas, Medium Sensitivity Areas, and Low Sensitivity Areas. Each category will have criteria for allowed, restricted or prohibited landuse activities, which will help in protecting terrestrial sensitivity areas from severe damage. EPD professionals will use the terrestrial sensitivity map to evaluate and potentially modify all Saudi Aramco potential operational

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activities through built-in geoprocessing tools. This presentation describes the usage of ESRI ModelBuilder and Spatial Analyst to mitigate terrestrial environmental impact.

Impacts of Implementing and Planning Development, Mining and Infrastructure in Dornogobi *

Presenter: Tsogtsaikhan Battsengel, The Nature Conservancy, Mongolia

Mongolian Gobi is a habitat for many migratory species such as khulan (wild ass), Mongolian gazelle, black tailed gazelle, argali and ibex. These wild animal habitats are heavily threatened by human impacts. Migratory species movement depends on grazing and biomass and devoid of human impact. This maps shows human less threatened areas for species. In the example below, I have modeled 4 main factors of human impact such as mining, human settlements, infrastructure and herder density. Each human impact factor has different impact distance and weight on animal habitat. These were calculated for each factor using Moving Window. In order to compare and correlate to future planned developments, the map was produced for 2000, 2014, 2030 and 2040 years.

Zonation in Wangchuck Centennial National Park *

Presenter: Nado Nil, Wangchuck Centennial National Park (WCNP) Bhutan

Wangchuck Centennial National Park was declared in 2008 by the government as the largest national park in the country. The management of park started immediately after declaration and in initial stage management had to focus on putting basic infrastructures and human resource in the field. Conservation related and regulatory services within the jurisdiction of park were also taken up soon after declaration. Demarcation of boundary in the field was completed and series of surveys were conducted since its declaration till date.

The management plan required park area to be divided into zones depending on use, presence of wildlife species, condition of forest, and significance of area for conservation. But zonation of park could not be materialized as the management had to focus on other priority activities in the initial stage. After several years into management, we have basic infrastructures and human resource in the field; therefore, the management is advancing towards scientific management and detailed research. Zonation within the park has become crucial to target the conservation activities and regulate man made activities inside park area. During the zonation exercise different criteria will be taken into consideration. The criteria that will be accounted include resource use, habitat use by flagship species, proximity from settlement, forest condition, etc. Once the zonation is completed park area will be classified into three zones, namely, core zone, multiple use zone and buffer zone.

4:00 PM–5:30 PM

Technical Session

Room: Heather

Telling Your Story with Esri Story Map

Presenter: David Asbury, Esri

Join us and learn how to tell geographically-based stories with Esri Story Maps. A Story Map is a simple yet powerful way to inform, engage and inspire your community. Combining maps with striking images, audio/video, and textual narrative, Story Maps can be put to work to present plans, to showcase successes, and to highlight issues. Story Maps serve not only as tools for education and outreach, but also to keep supporters, stakeholders and media contacts engaged and informed about your work. Esri Story Maps are built on ArcGIS Online – harnessing data and analyses you've created and curated in spreadsheets, desktop GIS, and other sources – and can be easily shared over the web. Come learn how to create compelling interactive experiences using our out-of-the-box templates. You'll also learn how to crack open the code and build something truly unique.

* Indicates Scholar Presentation
++ Indicates a Student Competion Presentation

Session Descriptions

Tuesday, July 28

9:00 AM–10:30 AM

Forest Conservation and Corridor Design

Room: Chapel

Online Monitoring System of Reforestation Activities Using GIS New Technology *

Presenter: Angela Tarimy, Madagascar Finnish Association for Nature Conservation

The monitoring system of forests restoration will show in real time annual forests restoration sites and future potential sites to link forests fragments as corridors in Andasibe Madagascar.

Feasible Wildlife Corridor Identification in KAZA TFCA Using Landscape Analyses * Presenter: Tatenda Noreen Muchopa, Zimbabwe Painted Dog Research Trust

The main objective of the project is to extract useful layers from SPOT imagery (2.5m per pixel SPOT images 2010: May, June, July) such as vegetation, terrain, elevation, and watersheds to map the location of existing and possible wildlife corridors. This will be done using map calculations in ILWIS 3.3 and ArcGIS landscape analysis software applications. Using satellite imagery analyses will give a more accurate and most up to date representation of the actual location of these suspected corridors as compared to relying only on historical accounts of where they are located. The results will be used to inform local wildlife management authority, Rural District Councils and land use planners to help minimize adverse effects of land use change and infrastructure development and promote the implementation of best land use practices for wild dog conservation in accordance to the KAZA TFCA objectives.

Using GIS Landscape Analysis to Identify Feasible Wildlife Corridors in the Kavango Zambezi Transfrontier Conservation Area in Zimbabwe *

Presenter:

Strengthening Forest and Ecosystem Connectivity in RIMBA Corridor Sumatera Indonesia *

Presenter: Ernawati Apriani, World Wildlife Fund - Indonesia

The Integrated Ecosystem Area RIMBA—the RIMBA Corridor is one of five ecosystem corridors that have been mentioned in President Decree No. 13/2012. This area covers 3,8 million hectares over 19 districts in parts of Riau, Jambi and West Sumatera province. The RIMBA Corridor contains Kerinci Seblat NP, Bukit Tiga Puluh NP and Berbak NP and other conservation areas. But fragmentation, fire and human encroachment has caused such a loss of natural capital that the future options for communities to sustain and grow their livelihoods throughout the corridor is seriously threatened. The GIS analysis has been done to collect information about the driver of forest lost and degradation and to collect information about the carbon benefit of the area. Due to the area of RIMBA Corridor being very large, the GIS analysis was also used to look for the priorities area for pilot location of project interventions.

9:00 AM–10:30 AM

Paper Session

Fishing Communities and Sustainability

Room: Acacia

The Role of GIS in Conservation of Fisheries Resources in Lake Tanganyika, Tanzania *

Presenter: Peter Limbu, The Nature Conservancy, Tanzania

The Greater Mahale Ecosystem (GME) in west Tanzania is inhabited by more than 20 villages. GME approximates 54,000 women, men and children live and depend (40% of protein and more than 50% of income from) on the lake. The area is affected by high population growth, which puts pressure on fisheries and terrestrial resources. TNC through Tuungane project has facilitated establishment of local institutions that co-manage sustainable use of fisheries resources within village waters called Beach Management Units (BMU). BMUs protect fisheries resources. Lack of capacity to develop GIS maps led to illegal fishing and destruction of fish breeding sites. Attending this SCGIS training has resulted into capacity development where, GIS coordinates from fish breeding sites are now being developed into maps, which are shared with villagers to reduce illegal fishing practices. GIS Maps developed after attending this training, have helped to predict sites potential for accumulation of soil sediment and advise/

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warn respective communities in advance. It was concluded from this training that GIS has helped to resolve community frictions while helping to predict conservation risks and take precautionary steps as communities advance sustainable use of fisheries resources

Prediction and Verification of Fish Spawning Aggregation Sites in Mexico *

Presenter: Stuart Fulton, Mexico Comunidad y Biodiversidad A.C. (COBI)

Many fish species, including groupers and snappers, aggregate in large schools to spawn. Fishers are often the first to discover these spawning sites, but targeted fishing of spawning aggregations often leads to stock overexploitation. Studies have found that spawning aggregations often occur at geomorphologically similar areas such as underwater promontories. Building on fishers´ traditional ecological knowledge, we have trained fishers to complete bathymetric surveys and underwater visual censuses with SCUBA to document and monitor the health of the spawning aggregations in three fishing communities in the Sian Ka´an Biosphere Reserve, Mexico. In collaboration with fishers, we then proposed the establishment of no take zones to protect the sites from further exploitation. This study highlights the importance of stakeholder involvement in conservation projects and highlights the predictability of multi-species fish spawning aggregations sites using bathymetric mapping techniques.

9:00 AM–10:30 AM

The Landscape Change Analysis

Room: Toyon

Analysis of Land Cover Changes 1990-2013 in Imenti Forest ++

Presenter: Joyce Kimani, University of Port Harcourt

Imenti forest, one of the water towers found in the central highlands of Kenya, is threatened with degradation. This rapid assessment sought to identify changes in the land cover in Imenti forest water tower, within the gazetted forest and in a 5 km buffer strip. Satellite images of 1990, 2000 and 2010 were used to generate land cover maps and their associated changes based on the 6 classes of the Intergovernmental Panel on Climate Change namely forestland, cropland, grassland, wetlands, settlements, and otherlands. ArcGIS 10.2 software was used to digitize the specific areas. The shapefiles were overlaid on other physical features like rivers, forests and administrative boundaries. Intersections were done for land cover maps at different epochs to find areas of change and their geometry calculated. The change areas wereexported and used to calculate change areas per sub-location and per riparian reserve. The results were able to show sub-locations that had experienced forestland conversion to other types of land use. The loss of Forest within the riparian reserves was also noted. Predictions on the time it would take to degrade the entire forest were done. This information will help the community in monitoring the forest trend and also to put up enough measures to protect this forest, which is an important water catchment for this community

Analysis of Land Cover Change in the Cross River Gorilla Landscape *

Presenter: Francis Okeke, Wildlife Conservation Society, Odinakachukwu

The principal goal of this study is to detect changes in land cover (specifically, deforestation) from 1986 to 2010 in the Cross River Gorilla landscape using multi-temporal remotely sensed images. Spectral enhancements (Principal Component Analysis and Tasseled Cap Transformation) were utilized to improve interpretability, reduce information redundancy before using unsupervised ISODATA classification technique. The accuracy assessment shows an average overall accuracy and Kappa values of 93.1% and 0.91, respectively for 1986, 2000 and 2010. This result is slightly above the minimum mapping accuracy of 90% required by most VCS AFOLU methodologies. From the analysis of multi-temporal change for two time periods (1986-2000 and 2000-2010), it is apparent that the deforestation rate has significantly increased in the 2000-2010 period (2.22%) from the rate seen in the 1986-2000

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period (0.09%). Overall, the result shows a staggering loss of 21.15% of the forest in the Afi-Mbe-Okwangwo landscape from 1986 to 2010. The outcome of this study will help to evaluate options for different land uses including REDD+ activities that will contribute to local development, biodiversity conservation, and climate change mitigation by state and federal ministries of forestry/environment.

Assessing Multi-decadal Land Cover-Land Use Change in Wildlife Protected Areas in Tanzania Using Landsat Imagery

Presenter: Devolent Mtui, Tanzania Wildlife Research Institute

This research sought to understand the extent to which changes have taken place in the different types of land covers, potentially detrimental to wildlife conservation, in Tarangire and Katavi National Parks, in Tanzania. Two main questions were asked: have the areas of different types of land cover in the national parks changed over the past 27 years; and were the changes consistent between inside and outside the parks? Maximum Likelihood classification procedures were used to derive eight land cover classes from Landsat TM and ETM+ satellite images: woody savannah, savannah, grassland, open and closed shrublands, swamps and water, and bare lands. Post-classification comparison technique was used to identify and determine the extent and direction of changes for all land cover classes. The results show only two land cover classes, barren land in Tarangire, and open shrubland in Katavi, exhibited significant increases and decreases, respectively, over the past 27 years. The open shrubland were replaced by the savannah and woody savannah, while the bare land increased due to degradation of savannah woodlands possibly due to human encroachment by cultivation. These changes should be monitored to prevent detrimental effects on wildlife populations.

Mapping Plantations: Detecting Plant Species Using Landsat Images *

Presenter: Jane Evgeniya Elkina, Transparent World, Russia

This work represents experience in identification and classification of plantations in Brazil and Indonesia. We used satellite imagery to both digitize manually and identify plantations using machine learning techniques utilizing artificial neural networks. One of the problems we faced was having to use freely available Landsat imagery for plant species recognition rather than higher resolution sources. The project resulted in making a map of plantations and building a database containing spectral reflectance of images, plantation shape types, and other direct and indirect indicators for detecting types of plants in Brazil (potentially applicable to other regions). Additionally, this work was incorporated in the Global Biodiversity Information Facility (GBIF) project to share our field data with broader research community.

9:00 AM–10:30 AM

Technical workshop

Room: Heather

Creating Map Books with Data Driven Pages

Presenter: John Schaeffer, Juniper GIS

Data Driven Pages, new in ArcGIS 10.0, is Esri's tool for creating map books. With Data Driven Pages, the user can create a series of map pages based on data within the map; usually a polygon grid or a set of polygons along a linear feature. This presentation will explain the commands and settings needed to create map books and will demonstrate how to create map books with different examples. The presentation will also show how to use dynamic text for page numbering and, if time permits, some ArcPy mapping commands.

Session Descriptions

Tuesday, July 28 (continued)

11:00 AM–Noon

Paper Session

Water Resources

Room: Chapel

A Drought Monitoring Tool for Customized Calculation of a Standardized Precipitation Index Value in the Navajo Nation

Presenters: Victoria Ly and Andrew Nguyen, NASA DEVELOP

The Navajo Nation, located in the southwestern United States, has been increasingly impacted by severe drought events and regional changes in climate. These events are coupled with a lack of domestic water infrastructure and economic resources, leaving approximately one-third of the population without access to potable water in their homes. Current methods of monitoring climate and drought are dependent on national-scale monthly drought maps calculated by the Western Regional Climate Center (WRCC). These maps do not provide the spatial resolution needed to examine differences in drought severity across the vast Nation. To better understand and monitor drought regime changes in the Navajo Nation, this project produced a tool to calculate Standard Precipitation Index (SPI) values for a user-selected area within the study site and supplies the geodatabase of historical climate information necessary to calculate these values. The tool and geodatabase use Tropical Rainfall Monitoring Mission (TRMM) and Global Precipitation Measurement (GPM) observed precipitation data and Parameter-elevation Relationships on Independent Slopes Model (PRISM) modeled historical precipitation data. These products allow resource managers in the Navajo Nation to utilize current and future NASA Earth observation data for increased decision-making capacity regarding future climate change impact on water resources.

A Global 30m Water Occurrence Dataset

Presenter: Andrew Cottam, Joint Research Centre

Life on Earth as we know it is impossible without water. Its importance to biological diversity, human well-being and the very functioning of the Earth-system cannot be overstressed, but we have remarkably little detailed knowledge concerning the spatial and temporal distribution of this vital resource. Earth observing satellites operating with high temporal revisits yet moderate spatial resolution have provided global datasets documenting water body distribution on the Earth's surface but these datasets have focused largely on permanent water. In this paper, we provide a first global synthesis of surface water 'occurrence' which maps the distribution of water both spatially and temporally over 30 years at 30m resolution. We document permanent water surfaces (i.e., surfaces which have been detected as water in every satellite image over the 30 year period), seasonal water surfaces and always-dry surfaces in a set of products that can be used for a wide range of applications. Given the high spatial resolution of the products, there could be a large range of applications in the conservation domain: water resource management; protected area management (e.g., Ramsar site monitoring); modelling species distributions based on surface water; wetland ecological studies, etc. The datasets will be published under a full free and open data policy and be made available to the conservation community.

11:00 AM–Noon

Paper Session

Community Knowledge and Indigenous Societies

Room: Acacia

Conservation Isn't Hard Work When You're Passionate

Presenter: Roland Pomana, Nga Whenua Rahui

Much of the diversity of endemic species and ecosystems in New Zealand is found on private land. It is these areas which are most at risk of modification. To help conserve biodiversity on private land, several government funded conservation pro-

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grammes have been created, one of which is the Nga Whenua Rahui Fund, set up in 1991 to help protect biodiversity on Maori owned land. Twenty-four years on Nga Whenua Rahui have been the quiet yet determined achiever, having under its protection 180,000 hectares of indigenous forests, wetlands, dune lands and tussock lands throughout New Zealand. Nga Whenua Rahui has created an atmosphere in which Maori can be involved in conservation on their own land. Maori landowners regard not only the retention of ownership but interaction with their land in its original state as the core of their identity and survival of their culture. The Nga Whenua Rahui Fund gives Maori landowners a unique opportunity to apply their own conservation and cultural ethics to the lands offered for protection. Let Roland take you on an interactive journey as they share the Nga Whenua Rahui Story, including the hidden formula for success.

Healing a Nation *

Presenter: Scott Bailey, New Zealand Nga Hau e Wha o Papararangi

For millions of years, the Earth has provided man with the resources for survival – soil, oceans, plantations and of course, the all important component for human existence oxygen. Yet, man in its infinite wisdom, believes the earth's commodities are expendable.

What conservationists have fully understood for decades is man relies on nature. When nature thrives, so does man. When nature crumbles, the same can be true for man.

With a constantly growing population, waste in all forms is becoming a growing concern. Pollution not only deteriorates the environment but drastically affects human and animal health.

As man has evolved, we have become exposed to the new paradigm of convenience. We consume products without questioning its origins.

There are some cultures around the globe which have held onto the teachings of their ancestors. This ancient knowledge reveals the healing nature and medicinal value of various plant species.

The indigenous (Maori) people of New Zealand have also passed down the same knowledge of their ancestors, specifically the healing power of the forest. A very small group of New Zealand Maori still practice this ancient knowledge, called "Rongoa."

This paper will not only examine the critical importance of saving our natural environment but will also demonstrate the potential healing ability of Mother Nature and how GIS can assist.

Forest Carbon in Amazonia: The Unrecognized Contribution of Indigenous Territories and Protected Natural Areas

Presenter: Wayne Walker, Woods Hole Research Center

Carbon sequestration is a widely acknowledged and increasingly valued function of tropical forest ecosystems; however, until recently the information needed to assess carbon storage within Amazonian Indigenous Territories (ITs) and Protected Natural Areas (PNAs) in a global context remained either lacking or out of reach. Here, as part of a novel north-south collaboration among Amazonian indigenous and NGO networks, scientists, and policy experts, we link newly compiled spatial data on pantropical aboveground forest carbon, Amazonian ITs and PNAs, and risks to their integrity. We show that the nine-nation network of nearly 3,000 ITs and PNAs stores more carbon aboveground (47,363 Mt) than all of the DRC and Indonesia combined (40,797 Mt), and despite their ostensibly secure status, a conservative risk assessment considering only ongoing and planned development projects puts nearly 20% of this carbon at risk. Our analysis suggests that the carbon stored across these landscapes is of a magnitude not previously appreciated and is sufficient to either destabilize or contribute to the stabilization of the planet's atmosphere depending on the impact of ongoing and planned development projects. International recognition of and renewed investment in this globally vital network are therefore critical to ensuring their continued contribution to maintaining cultural identity, ecosystem integrity, and climate stability.

Session Descriptions

Tuesday, July 28 (continued)

11:00 AM–Noon

Paper Session

Landscape Threats and Habitat Destruction

Room: Toyon

Developing Comprehensive Landcover and Anthropogenic Disturbance Footprints for Conservation Analyses

Presenter: Meg Southee, Wildlife Conservation Society Canada

Ontario's Northern Boreal contains one of the world's largest peatland complexes with globally important carbon stores that are significant for climate regulation. It is a stronghold for caribou, wolverine, polar bear and over 50 species of freshwater fish. Unfortunately, this region has little in situ scientific data and is facing increased pressures from infrastructure development, resource extraction and climate change. Using ArcGIS and Python, a comprehensive landcover and anthropogenic disturbance footprint (LADF) was developed for 44 million hectares to generate an Index of Native Fish Integrity (INFI) for the watersheds of five major rivers. Our goal in developing this index is to model the cumulative impacts of development and climate change scenarios on freshwater fish communities in this vast northern region. This presentation will outline the processing methodologies used to consolidate and merge multiple raster and vector datasets and the lessons learned from generating an all-inclusive LADF product. The LADF product was constructed from the Earth Observation of Sustainable Development (EOSD) landcover product-derived from Landsat 7 imagery-and assorted GIS datasets, including digital forest resource inventories, NASA forest age grids, forest fires, mines, towns, linear infrastructure, dams and reservoirs. The processing methodologies presented here will be reused to generate LADF products for future scenarios focused on boreal birds in this northern area.

Updated Map of Threats of the Yasuní Biosphere Reserve *

Presenter: Diana Marisol Paredes Olmedo, Wildlife Conservation Society, Ecuador

The biodiversity of Yasuní Biosphere Reserve (YBR) is under pressure by a number of anthropogenic factors including road construction for oil exploitation, illegal logging and commercial hunting. In 2006, WCS developed a general map of the environmental problems of Yasuní Biosphere Reserve to display the number and spatial distribution of six threats to conservation.

The map reflects the severity of different types of human activities that are causing habitat alteration and have direct impact on wildlife populations, such as commercial hunting, subsistence hunting, population pressure, oil wells and logging. The assessment of pressures in the YBR was based on a grid-based spatial model that incorporated information on the distribution of human activities

For this analysis, I will use cost distance analysis and map algebra to generate a map of updated environmental problems containing areas with higher human population density, road construction areas, places where illegal extraction of wood occurs, influence of oil exploitation, and commercial hunting.

The range of severity will range along a scale from 0 to 100, with 0 being the lowest and 100 the highest disturbance. All models will be classified by the spatial patterns compared to previous years. The current map visualizes spatial patterns of threats on conservation and can serve as a tool to assess disturbance levels on wildlife populations and to identify areas where you need to strengthen surveillance.

Effects of Forest Plantations on Mammals in the Atlantic Forest *

Presenter: María Eugenia Iezzi, Argentina, Centro de Investigaciones del Bosque Atlántico (CeIBA); Instituto de Biología Subtropical (IBS)

Mammals are sensitive to environmental transformations, and the productive landscapes can affect them. We evaluated the effects of different components of the forest-plantation landscape on the mammal community in Misiones, Argentina. Using GIS, we deployed 120 camera trap stations active for 53 days on average, randomly located in a grid of 2x2 km,

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distributed in three treatments: 44 in continuous forest, 43 in fragments of native forest within the plantation landscape and 33 in pine plantations. We compared the richness and diversity of mammal community between treatments, and we used a principal components analysis (PCA) to sort the stations according to their species composition. At each station we measured structural complexity of vegetation, distance to a continuous native forest block, percentage of native forest in a ratio of 2 km, and "cost of access" (which indirectly measures the poaching pressure). The last 3 variables were generated with GIS tools. We used GLM to study the effect of these variables in the assembly of mammals. The richness and diversity were the highest in the continuous forest and the lowest in forest plantations. The variables that affected the composition of the assembly were the cost of access (poaching pressure), the structure of the vegetation and the distance to the continuous native forest block. These results allow us to make recommendations to improve the management of forest plantations and to reduce their impacts on mammal community.

Quantifying Habitat Destruction from Natural Gas Mining Activities in Pennsylvania

Presenter: Chad Freed, Widener University

This project used a field investigation, public data sources, and remote sensing data within a geographic information system (GIS) to quantify both the total land area disturbed by construction activities and the land area disturbed in selected endangered species habitats from natural gas mining in the Marcellus Shale Formation in Pennsylvania. Unconventional drilling and operating techniques, such as hydraulic fracturing, are required for natural gas extraction in shale formations such as the Marcellus throughout the country. The construction and operation of a gas well cluster requires land clearing for roads, well pads, pipelines, and alternative energy sites. Since these operations are usually in rural areas, all classifications of natural landscapes are destroyed. The niche for several endangered species were defined, and those habitats were compared to natural gas extraction locations to quantify the amount of endangered species habit destroyed. Remote sensing data of the landscape in the densest areas of drilling activity were studied from pre-drilling conditions in 2005 and compared with their condition in 2014. Geoprocessing operations in a GIS were then used to quantify general habitat and endangered species habitat destroyed by existing or future land-clearing operations.

2:00 PM–3:30 PM

Paper Session

Wildlife Agencies, Enterprise GIS, and Social Forces in Conservation

Room: Chapel

Toward a Hunting Footprint: African Wild Game Depletion and Dependence ++

Presenter: Alex McInturff, University of California, Berkeley

As human access expands into dwindling game habitats, many conservationists assent that we are in a "bushmeat crisis" that threatens both wildlife species and communities that rely on them. While many studies have explored patterns of hunting surrounding individual settlements, the social and ecological forces that drive game utilization and species extirpation operate at large spatial scales where our understanding of harvest patterns remains glaringly incomplete. We used ArcGIS to build a first-of-its-kind, spatially explicit model estimating hunting offtake in Africa, where wildlife declines have been pronounced and where many communities rely heavily on game. We completed an extensive literature review to weight socioeconomic data–including population density, poverty level, and livestock density–to estimate potential reliance on wild game. We combined this assessment with environmental factors–land cover and a novel model of ungulate biomass–to identify areas where both wildlife and human livelihoods are at risk due to dependence on wild game. ArcGIS tools allowed us to weight and combine our data, conduct statistical analyses, build and validate models, and visualize results. By sharing this product with the SCGIS audience, I hope to initiate productive discussion on the benefits and challenges of building large-scale models of fine-scale processes.

The South Africa National Biodiversity Institute's (SANBI's) Enterprise Geodatabase–Lesson Learnt *

Presenter: Sediqa Khatieb, South African National Biodiversity Institute (SANBI), South Africa

A geodatabase is a native data format for ArcGIS. It is a "container" that defines how spatial data is stored, accessed and

Session Descriptions

Tuesday, July 28 (continued)

managed by ArcGIS. Sediqa will provide a general overview of the SDE –highlighting its key features and architecture. She will then take users through the process of creating a SDE and the many challenges she and the SANBI users have incurred during this process. Sediqa hopes that by giving this talk other users can learn from her mistakes and avoid making them in the future.

2:00 PM – 3:30 PM

Paper Session

Mapping and Mitigating Anthropogenic Habitat Loss

Room: Acacia

Using Time Series Interpolated Weather Station Records to Evaluate Climate Exposure in Major Western Vegetation Types

Presenter: Healy Hamilton, NatureServe

Anthropogenic climate change is widely expected to dramatically alter the biogeography of vegetation communities across the western United States. While the science and practice of vegetation restoration must adapt to confront these changes, this need remains largely unmet because of the complexity and uncertainties of future vegetation distributions. To support the task of translating climate science into restoration planning, we can look to observed climate trends over recent decades to provide insight into geographic and seasonal patterns of contemporary climate change. Our analysis focuses on sagebrush and pinyon juniper ecosystem types of the western U.S., which represent critical habitat for threatened wildlife species. For these vegetation assemblages, we assess recent climate change relative to baseline spatial and temporal variability. These assemblages have realized distributions in both geographic space and in climatic niche space. With a changing climate, these become decoupled, forcing local populations to persist in novel conditions, migrate geographically to track their climate niche, or go locally extinct. Our analyses highlight local populations of these vegetation types that have experienced the highest variable climate conditions over the 20th century, which may represent locations for seed sources of plants pre-adapted to changing climates. We also identify populations that already stand out as hotspots of climate change or as relatively stable refugia. These analyses can help provide climate-smart guidance to restoration efforts for these iconic ecosystems of the American West.

Mapping the Loss of Perennial Woody Vegetation to Cropland in California Using 20 Years of Landsat Image Analysis

Presenter: Christopher Potter, CASA Systems 2100, LLC

The progressive loss of perennial woody vegetation to cultivated land use throughout California has the potential to compromise native wildlife habitats and natural bio-control agents for cropland pests. In this study, satellite image products from the NASA Landsat sensor were compared from 1992 to 2012 to map the full spatial extent and the detailed geographic patterns of woody vegetation loss in all valley growing regions of the state. Counties with the highest woody cover area converted to cropland were led by Riverside and Imperial in southern-most California and Siskiyou in northern-most California. Statewide, the most common crop types into which woody cover was converted were alfalfa and hay, fallow, grapes, wheat, and almonds. Spatial autocorrelation analysis carried out with ArcGIS within a 15-km diameter circular buffer zone centered on selected growing areas showed strongly clustered patterns of converted woody cover, indicating that entire woodland and shrubland corridors and connectors have been lost to cultivated land uses over the past two decades.

Mapping Invasive Plants with Remote Sensing, Fieldwork, and Citizen Science

Presenter: Mark Johnston, Science Action Center at The Field Museum

Buckthorn (*Rhamnus spp.*) is an invasive shrub that thrives in Chicago and the Midwest. It outcompetes native vegetation in woodland and prairie ecosystems, and its removal requires significant effort from land managers. To know the status

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of these efforts and to monitor the spread of buckthorn, a baseline map is needed across the region. By analyzing multispectral imagery in the late fall, it is possible to discern persistent green buckthorn leaves from dormant native vegetation. Using satellite imagery of moderate spatial resolution (Landsat-8) and very high (sub-meter) resolution, we map buckthorn across several counties in the Chicago region. Our approach uses Object Based Image Analysis (OBIA) methods to classify high-density buckthorn populations. Results are further subdivided into open and closed canopy buckthorn by fusing the output with an existing tree canopy layer. Because of the vast area covered, we solicit support from stewards and citizen scientists to ground truth results and to map removal efforts. By hosting our results online using ArcGIS for Server, users can enter their own observations and restoration efforts. Developed using Web AppBuilder for ArcGIS, the interactive map runs on desktop and mobile devices. Preliminary results from field botanists suggest that buckthorn is underrepresented. Mapped feedback is critical to improving future mapping efforts which can be dialed-up or down using the OBIA approach to increase or decrease buckthorn prediction areas. Attendees will understand how these analyses were performed and will learn about important applications for these results.

2:00 PM – 3:30 PM

Paper Session

Anthropogenic Impacts Analysis and Mapping

Room: Toyon

Protecting San Joaquin Kit Fox on a Large Scale Solar Development through GIS Utilization

Presenter: Jacqueline Tilligkeit, Althouse and Meade, Inc.

Geographic Information System (GIS) has been instrumental in environmental conservation during the planning, construction, and post-construction phases at Topaz Solar Farms in the Carrizo Plains, California. Sensitive biological resources including daily locations and dens utilized by the federally endangered San Joaquin kit fox (SJKF) were mapped, data-based, and protected. Scent dog scat surveys were conducted within the approximately 10,000 acre study area to track SJKF population size, density, and home range from 2009 to present. Trimble GeoXTs with ArcPad were used to survey for potential SJKF dens during preconstruction surveys. Maps were provided daily to the construction crew highlighting sensitive resource setbacks. SJKF were equipped with VHF collars to determine locations during construction activities and have since been upgraded to GPS collars for a long-term study to monitor kit fox use of solar array fields. Information gathered will provide a measurement of SJKF movement patterns and land use at and near this large photovoltaic solar facility.

Spatial Analysis of Anthropogenic Impacts on Gorilla Migratory Pathways in Okwangwo, CRNP, Nigeria

Presenter: Princewill Odum, University of Calabar, Nigeria

The Okwangwo division of the Cross River National Park (Nigeria) and the Takamanda National Park (Cameroun) is home to endemic and vulnerable Colony of Gorillas (Gorilla gorilla diehli). Over the years, the activities of two enclave communities (Okwangwo and Okwa I & II) have endangered and also inhibited the freedom of movement of the wildlife in the area. The aim of this paper is to analyze the impacts of the enclave communities on the gorilla migratory pathways. The sources of data include Landsat image, ordinance documents establishing the park, historic and current data on gorilla trails, and ample field work. Accurate representation of the Okwangwo division was done with a view to examine environmental changes and spatial analysis of the effects of the changes on gorilla migratory pathways. Findings show that anthropogenic impacts on gorilla migratory pathways exist in Okwangwo division with high potential for gorilla–human conflicts. This would further heighten the insecurity of both humans and gorillas, thereby thwarting conservation efforts. Protection of migratory pathways, community sensitization, regional awareness, and reinforcement of trans-border collaboration are recommended for effective conservation of wildlife in the study area.

Session Descriptions

Tuesday, July 28 (continued)

The Spread and Distribution of Anthrax in Lower-Zambezi National Park, Zambia *

Presenter: David Squarre, Zambia Wildlife Authority (ZAWA)

The first ever outbreak of anthrax that affected wild animals in Lower Zambezi National Park occurred in 2012. This outbreak exclusively affected wild animals. It caused more mortalities of wild fauna as compared to poaching and other illegal/legal anthropogenic activities. The animals affected included elephants, buffalo, hippo, impala and kudu. Initially the first cases of the disease were restricted in a defined location but with time the disease spread to a wider geographical space. The purpose of this paper is to use GIS to illustrate a step wise distribution and the rate of spread of the disease across this ecosystem. Furthermore this paper seeks to model and simulate the geographical dissemination of the disease. The use of GIS enabled mapping of hot spots and the direction of spread of the disease. As a result of the use of GIS, the plausible drivers in the spread of the disease were postulated.

FracTracker Alliance: Educating for Energy Transitions through Maps and Analyses

Presenter: Kyle Ferrar, FastTracker Alliance

FracTracker Alliance shares maps, data, and analyses to communicate impacts of the oil and gas industry and use this context to positively shape our energy future. Impacts of the industry extend far beyond the on-site process of extracting hydrocarbons. Compressor stations, fracking sand extraction, pipelines, and trains carrying explosive oil moving through our communities all pose physical and environmental risks. Environmental justice issues relating to nearby impacted communities are crucial to factor in. Information is power, however!

In the green energy movement, FracTracker's role is at the crux of research and policy. We effectively accomplish our goals through collaboration with other organizations through synthesis and distribution of information generated from various sources of raw data, communicating risks and hazards that accompany fossil fuel extraction and energy production. Our priority is public education so that civic decisions reflect knowledge of important energy issues. Our outreach to networks of advocacy groups often distributes our information to both the public and directly to policy makers.

In this presentation we'll talk about collaborative projects where FracTracker has worked with partners to help elevate the discussion of risks and used maps and analyses as an organizing principle to begin to shift the discussion from fossil fuel extraction as an inevitability to one as a stimulus for inquiry, education, and positive change.

4:00 PM–5:30 PM

Paper Session

Monitoring Habitat Conservation Land-Cover Change

Room: Heather

Landsat-Based Monitoring of Annual Wetland Change in the Willamette Valley of Oregon, USA from 1972 to 2012 ++

Presenter: Kate Fickas, Oregon State University, Dept. of Forest Ecosystems and Society

In Oregon's Willamette Valley, remaining wetlands are at high risk to loss and degradation from agricultural activity and urbanization. With increased need for fine temporal-scale monitoring of sensitive wetlands, we used annual Landsat MSS and TM/ETM+ images from 1972 to 2012 to manually interpret loss, gain, and conversion of wetland area in the Willamette River floodplain. By creating Tasseled Cap (TC) Brightness, Greenness, and Wetness indices for MSS data that visually match TM/ETM+ TC images, we constructed a complete and consistent annual time series and utilized the entire Landsat archive. With an extended time series we were also able to compare annual trends of net change in wetland area before and after the no-net-loss policy under Section 404 of the Clean Water Act in 1990 using a Theil-Sen Slope estimate. The majority of both gain and loss in the study area was attributed to gains and losses of agricultural land. After 1990 policy implementations, the rate of wetland area lost slowed for some wetland categories and reversed into trends of gain in wetland area for others, perhaps representative of the success of increased regulations. Accuracy of land use classification through manual interpretation was at 80%. This accuracy

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increased to 91.1% when land use classes were aggregated to either wetland or upland categories, indicating that our methodology was more accurate at distinguishing between general upland and wetland than finer categorical classes.

Using Time Series NDVI to Monitor Grassland Characteristics

Presenter: Adam Dixon, World Wildlife Fund

Temperate grasslands are the most threatened large scale ecosystem on the planet. Complicating matters, the conservation status of grasslands can be difficult to determine across landscapes since they range from natural and semi-natural to completely non-natural species compositions - all of which can provide important habitat and ecosystem services. Remote sensing with traditional spectral analysis has been difficult given physiognomic constraints in the structure of herbaceous vegetation. Grass and forb canopy is not as easy to observe from satellite imagery as trees. However temporal resolution may present an alternative pathway to monitoring change and species composition across grassland landscape. We will present a method to differentiate natural and non-natural herbaceous vegetation using a vegetation index and the growing season. The aim is to scale our methods and provide evidence that in some not-so-distant future, we can develop a national grassland monitoring network.

4:00 PM–5:30 PM

Paper Session

Lake and River Conservation Methods

Room: Acacia

Remote Sensing for Climate Change Effect on Lake Tahoe Ecosystem

Presenter: Shobha Sriharan, Virginia State University

A prolonged drought and climate change have affected the ecosystem around Lake Tahoe. Average atmospheric temperatures at Tahoe have risen more than two degrees and spring snowmelt occurs a week earlier than in the 1950s1. As a result, warmer water provides a more hospitable environment to algae and invasive species. Lake Tahoe's water is almost 1.5 to 2 degrees Fahrenheit warmer than it was 44 years ago2. There will be more flood-causing storms where rain falls on snow2. This phenomenon has already been documented throughout the West (Nature)3. Streams and rivers will flow with greater intensity during these rainstorms, causing more fine sediment to flow into the lake. To study the impact of these events on Lake Tahoe and the surrounding areas, remote sensing technology was applied for change detection of ecosystem. Using Landsat images of 2004, 2009, and 2014, image analysis was conducted by preparing the subsets of watersheds, area of interests (AOIs), and performing unsupervised and supervised classification with software, ERDAS IMAGINE 2013. More detailed change detection was carried with Landsat 8 imagery of Lake Tahoe November 4, 2014. Change detection was interpreted by combining spectral bands and indicating relative abundance and activity of green vegetation. The supervised classification of this imagery showed decrease in snow levels on the mountains surrounding Lake Tahoe, and increase in vegetation and soil areas. Support from USDA NIFA Grant (2011-38821-30892).

Utilizing NASA Satellite Data to Detect Harmful Algal Blooms in the Western Basin of Lake Erie

Presenters: Aase Mitchell, Andrew Nguyen, NASA DEVELOP

Harmful algal bloom events, or HABs, have increased in Lake Erie and are negatively impacting drinking water supplies, fisheries, and property values drawing various stakeholders to take steps towards mitigation efforts and to better understand its effects on nearby communities. Remote sensing is proving to be a useful tool for HAB detection and can be applied in areas of the world where in-situ data is either inaccessible or extremely costly. To validate the precision of remote sensing in detecting HAB events, we applied two indices to satellite imagery obtained over Lake Erie. The indices were compared against in-situ data to assess satellite accuracy statistics. These indices included Floating Algal Index (FAI) and Normalized Difference Turbidity Index (NDTI). Both indices were applied to visual and near-infrared products from NASA Earth Observing System's Landsat 5 Thematic Mapper (TM), Landsat 8 Operational Land Imager (OLI), and Terra Moderate-Resolution

Session Descriptions

Tuesday, July 28 (continued)

Imaging Spectrometer (MODIS), as well as data from the Hyperspectral Imager for the Coastal Ocean (HICO) aboard the International Space Station (ISS). The National Geospatial-Intelligence Agency (NGA), National Center of Water Quality Research (NCWQR), the University of Toledo, and the Great Lakes and St. Lawrence Cities Initiative utilizes these methods and end-results to evaluate the potential of applying these indices within Lake Erie and other regions of the world.

Riverscape Mapping of Antibiotic Resistance with Bayesian Kriging ++

Presenter: Angela Klock, University of Washington

The distribution of antibiotic resistant bacteria in rivers is largely unknown but nowhere is this information more critical to understanding ecosystem function and protecting public health than in urban streams. The environmental factors that drive the distribution of antibiotic resistant gram-negative coliforms were evaluated along the main corridor and tributaries of the Green-Duwamish River watershed of the Puget Sound. Sixty five samples of water, biofilms and sediments were collected and tested with culture-based methods for resistance to ampicillin, chloramphenicol, and tetracycline from a mixed population of organisms.

Antibiotic resistance was spatially-explicit and largely partitioned between environmental and enteric coliforms and stream compartment at each site and by functional process zone along longitudinal river distance. Prediction maps were generated for explanatory variables of stream morphometry and water physicochemistry and then compared to probabilistic distributions of resistance with Bayesian Kriging. These results indicate that antibiotic resistance among gram-negative coliforms is controlled primarily by in-stream processes constrained at the niche and reach scale and by environmental forcing at the watershed scale.

4:00 PM–5:30 PM

Paper Session

The Landscape and Protected Area Mapping

Room: Toyon

GIS Support for Mapping BLM Lands with Wilderness Characteristics

Presenter: Alison Gallensky, Rocky Mountain Wild

The Bureau of Land Management (BLM) is currently undertaking a major effort to locate and map wilderness quality lands, referred to as Lands with Wilderness Characteristics. The identification of these lands lays the groundwork for the protection of prairie grasslands and sagebrush steppes that are among the most endangered ecosystems in the United States.

Rocky Mountain Wild is assisting multiple conservation organizations in mapping and documenting these areas to provide input to the BLM. We have assisted these organizations as follows: creating mapping processes that combine the use ArcGIS for analysis and cartography, iPad tablets for field work, Google Earth for data sharing, and GeoJot for report preparation; identifying the boundaries of areas that may have wilderness characteristics; providing spatial data for use in the field such as area boundaries and roads; and using data provided by the field workers to determine the boundaries of the Lands with Wilderness Characteristics and creating maps of these areas.

These efforts have resulted in the identification of over two million acres of roadless lands and over one million acres of Lands with Wilderness Characteristics in 2013 and 2014. The use of GIS has focused the field work and streamlined the preparation of reports for the BLM. This practical approach to mapping and analysis is useful to anyone interested in increasing the productivity of on-the-ground mapping efforts through the use of GIS.

The National Map Communities of Use

Presenters: Tracy Fuller and Carol Giffin, U.S. Geological Survey

The U.S. Geological Survey is developing a new way to connect with The National Map (TNM) users in order to improve our understanding of how TNM products and services are

* Indicates Scholar Presentation
++ Indicates a Student Competion Presentation

being used. This presentation will describe our new approach to engage customers through Communities of Use (COU) and seek feedback that will guide the development and delivery of TNM products and services. The Abstract strategic vision of the U.S. Geological Survey's National Geospatial Program (NGP) is to satisfy the needs of users by providing geospatial services and products that users can incorporate into their decision making and operational activities. To attain that vision, the NGP must better understand who the users are and how they are using NGP products such as lidar, hydrography, and digital map data. For example, these data may be applied to support flood and landslide mapping, Quaternary fault mapping, water flow, and vegetation research. The NGP has identified four priority COUs: Water Resources, Geologic Mapping, Geologic Hazards, and Natural Resources Conservation. The NGP intends to gather information from these targeted user communities to improve NGP products and services, or create new ones, to meet the operational needs of users. This presentation will focus on the near-term activities to engage the Communities of Use and related efforts such as the U.S. Interagency Elevation Inventory and the 3-Dimensional Elevation Program (3DEP).

The Wildlife Conservation Society's History of Assisting in Protected Area Establishment

Presenter: Danielle LaBruna, Wildlife Conservation Society

One of the top four global NGOs working to save wildlife, the Wildlife Conservation Society was founded in 1895. Soon thereafter, in 1907, WCS started playing an international role in protecting lands and waters to conserve animals and their habitats. For decades, this history was preserved only in the memories of our staff and a single textual report, so in 2014, we created a spatial database to track our influence on protected area (PA) establishment. Using the methods of staff interviews, online research and digging through reports to gather data, we built a geodatabase of polygons and points (where polygons were not available) representing over 250 protected areas on 5 continents. These include protected areas that WCS has helped to propose, establish, expand or upgrade the protection of. Protected areas range from the terrestrial to the marine, from large National Parks to small locally-recognized community conservation areas. This talk will highlight some of these protected areas as examples of the global evolution of PA establishment and discuss some of the challenges associated with creating a spatial database "from scratch."

4:00 PM–5:30 PM

Technical Workshop

Room: Heather

Image Processing and Analysis in ArcGIS

Presenter: Miriam Schmidts, Esri

Support for image processing and analysis within the ArcGIS platform has significantly advanced over the recent ArcGIS releases. ArcGIS now provides advanced imagery tools that allow you to process, visualize, analyze, and interpret imagery data. Also, with the introduction of ArcGIS Pro at version 10.3, ArcGIS now contains a native 64-bit application for multi-threaded processing. This workshop will introduce you to using ArcMap and ArcGIS Pro for enhanced display and dynamic processing to perform image analysis, to creating and using mosaic datasets for storing large amounts of imagery, and to some of the advanced image analysis tools that ArcGIS now has to offer.

SCGIS Domestic and International Scholars

Angela Tarimy, Madagascar
Finnish Association for Nature Conservation

David Squarre, Zambia
Zambia Wildlife Authority

Diana Paredes, Educador
Wildlife Conservation Society

Dmitrii Sarychev, Russia
Crane Working Group of Eurasia

Ernawati Apriani, Indonesia
World Wildlife Fund

Evgeniya Elkina, Russia
Transparent World

Francis Okeke Odinakachukwu, Nigeria
Wildlife Conservation Society

María Eugenia Iezzi, Argentina
Atlantic Forest Research Center; Subtropical Biology Institute

Nado, Bhutan
Finnish Association for Nature Conservation

Peter Limbu, Tanzania
The Nature Conservancy

Bhuwan Dhakal, Nepal

Scott Bailey, New Zealand
Nga Hau e Wha o Papararangi

Sediqa Khatieb, South Africa
South African National Biodiversity Institute

Špela Guštin, Slovenia
University of Ljubljana

Stuart Fulton, Mexico
Community and Biodiversity

Tatenda Muchopa, Zimbabwe
Painted Dog Research Trust

Angela Tarimy, Madagascar
Finnish Association for Nature Conservation

Tomaž Podobnikar, Slovenia
University of Ljubljana

Tsogtsaikhan Battsengel, Mongolia
The Nature Conservancy

Virginia Alonso Roldán, Argentina
Patagonian National Center

Zo Andriamahenina Tsino Heritiana, Madagascar
Blue Ventures Conservation

Lyn Santos, Mexico

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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 in July.

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MTPA

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The SCGIS Advisory Council supports the Board of Directors in its duties and decision making. The Advisory Council members are elected every three years. Elections usually occur after the annual conference in July.

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Chrysalis Biology

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Esri Conservation Program

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Gillian Woolmer
Wildlife Conservation Society, Canada

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Notes

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Acknowledgments

The 2015 SCGIS Conference would not have been possible without the efforts of many great individuals. It is impossible to acknowledge everyone who has played a role in making this conference a success. However, there are a few people and groups that deserve special recognition:

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- Blue Raster for sponsoring the breaks and social hours.
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- Nasser Olwero, Kim Fisher, and the SCGIS web team. They provided constant and reliable support throughout the conference planning process and beyond.
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- Sasha Yumakaev for his masterful planning of the SCGIS Scholarship Program. We are grateful for all the hard work and personal investment that makes the Scholarship Program such a success.
- Charles Convis, whose extraordinary support and organizational skills in categorizing all abstracts into sessions.
- Jocelyn Tutak our Twitter sorcerous who makes things happen, as soon as we think about it.
- We would also like to thank the follow people who helped out in many stages of the planning for this year's conference: Michael Hamilton, Rob Rose, David Asbury, Carolyn Hughes, Bridget Conneely, Gillian Woolmer, the SCGIS Board, the donors for our auction, Asilomar staff, and the many non-profits and organizations that have promoted this event and all of the volunteers and presenters who make this conference possible.