

Final Report

Title:	Geospatial Solutions for Land-Use Sustainability and Biodiversity Conservation		
Sponsoring Agency	NIFA	Project Status	COMPLETE
Funding Source	Mcintire Stennis	Reporting Frequency	Final
Accession No.	221789	Project No.	IND011523MS1
Project Start Date	10/01/2009	Project End Date	09/30/2014
Reporting Period Start Date	10/01/2009	Reporting Period End Date	09/30/2014
Submitted By	Christy Rich	Date Submitted to NIFA	02/18/2015

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Recipient Organization

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Performing Department

Forestry & Natural Resources

Non-Technical Summary

Land-use maps derived from object-oriented classification approach can significantly reduce "salt-and-pepper" effects and increase classification accuracy. The resultant land-use maps are close to human-interpreted ones that are widely used in land-use planning and management. This project also will test a series of theories about the relationships between land use and biodiversity conservation in the temperate zone. The success of this project will generate new knowledge that can contribute to the revelation of underlying principles about how land use impacts biodiversity conservation and ecosystem function, and apply these principles to generalized concepts of landscape ecology. The findings from this proposed project is expected to contribute to advancing theory and practice of ecosystem conservation. Countries in the temperate zone, including the United States, will ecologically and economically benefit from the findings of this research.

Accomplishments**Major goals of the project**

The overall objective is to improve the procedures and applications of remote sensing in sustainability of land use and conservation of biodiversity at local and regional scales. Specific objectives are twofold: 1. Develop Object-Oriented Approach for Indiana Land-Use Analysis to develop protocols and interfaces for straight-forward and consistent application of object-oriented remote sensing techniques for accurate evaluation of land-use changes and urbanization processes, and their implications in landscape fragmentation with high-resolution aerial digital orthophotos in north-central Indiana. The goal is to develop automatic object-oriented algorithms (AOOA) for accurate landscape characterizations. 2. Apply geospatial technology to assess the impacts of urbanization and land-use change on plant biodiversity to assess the processes of exurban growth or urban sprawl with a newly developed landscape index called Shared Edge Length (SEL), and examine the impacts of urbanization and land-use change on biodiversity at a various scales in North America and eastern Eurasia. The goal is to advance landscape ecology theory and improve biodiversity conservation in the changing world.

What was accomplished under these goals?

Object-Based Image Analysis (OBIA) algorithms have been developed for landscape characterization in north-central Indiana and are introduced in two publications in the International Journal of Remote Sensing in 2011 and 2013 (Li and Shao 2011, Li and Shao 2013).

A model of urbanization simulation has been developed with the neighbor decay cellular automata approach and is published in the International Journal of Geographical Information Science in 2014 (Liao et al. 2014).

What opportunities for training and professional development has the project provided?

The teaching materials for a graduate-level course of remote sensing at Purdue University have been enriched by incorporating the new remote sensing algorithms and GIS model generated from the NIFA-funded project.

How have the results been disseminated to communities of interest?

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Dai, L.M., L. Qi, B.J. Lewis, G.F. Shao, D.P. Yu, and L. Zhou. 2014. The design and use of forest management decision support systems in China. In: Computer-based Tools for Supporting Forest Management: The Experience and Expertise World-wide. J.G. Borges, E-M. Nordström, J. Garcia-Gonzalo, T. Hujala, and A. Trasobares A (eds.). Sveriges lantbruksuniversitet. P84-94.

Shao G.F. 2012. Satellite data. In: Encyclopedia of Environmetrics Second Edition, A.-H. El-Shaarawi and W. Piegorisch (eds). John Wiley & Sons Ltd, Chichester, UK, pp. 2390-2395.

Shao G.F. 2012. Remote sensing. In: Encyclopedia of Environmetrics Second Edition, A.-H. El-Shaarawi and W. Piegorisch (eds). John Wiley & Sons Ltd, Chichester, UK, pp.2187-2193.

Shao, G.F. 2011. Accurately Assessing Habitat with Remote Sensing: User's Perspective. In: Remote Sensing of Protected Land, Y.Q. Wang, ed, Taylor & Francis, pp. 145-155.

What do you plan to do during the next reporting period to accomplish the goals?

{Nothing to report}

Participants**Actual FTE's for this Reporting Period**

Role	Non-Students or faculty	Students with Staffing Roles			Computed Total by Role
		Undergraduate	Graduate	Post-Doctorate	
Scientist	0.8	0	0	0	0.8
Professional	0	0	0	0	0
Technical	0	0	0	0	0
Administrative	0	0	0	0	0
Other	0	0	0	0	0
Computed Total	0.8	0	0	0	0.8

Student Count by Classification of Instructional Programs (CIP) Code

{NO DATA ENTERED}

Target Audience

Forest remote sensing professionals.

Products

Type	Status	Year Published	NIFA Support Acknowledged
Journal Articles	Published	2013	YES

Citation

Wang, X.C., G.F. Shao, H. Chen, B.J. Lewis, G. Qi, D.P. Yu, L. Zhou, and L.M. Dai. 2013. An application of remote sensing data in mapping landscape-level forest biomass for monitoring the effectiveness of forest policies in northeastern China. Environmental Management 52(3): 612-620.

Type	Status	Year Published	NIFA Support Acknowledged
Journal Articles	Published	2014	YES

Citation

Liao, J.H., L.N. Tang, G.F. Shao, Q.Y. Qiu, C.P. Wang, S.N. Zheng, and X.D. Su. 2014. Neighbor decay cellular automata approach for simulating urban expansion based on particle swarm intelligence. International Journal of Geographical Information Science. 28(4): 720-738.

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Type	Status	Year Published	NIFA Support Acknowledged
Book Chapters	Published	2014	YES

Citation

Dai, L.M., L. Qi, B.J. Lewis, G.F. Shao, D.P. Yu, and L. Zhou. 2014. The design and use of forest management decision support systems in China. In: Computer-based Tools for Supporting Forest Management: The Experience and Expertise World-wide. J.G. Borges, E-M. Nordström, J. Garcia-Gonzalo, T. Hujala, and A. Trasobares A (eds.). Sveriges lantbruksuniversitet. P84-94.

Other Products**Product Type**

Software or NetWare

Description

Free to Download an Excel Program to Calculate Shared Edge Length (SEL) Introduced by Martin et al. (2008) from <http://web.ics.purdue.edu/~shao/>

Changes/Problems

{Nothing to report}