Impact of remote sensing characteristics for biodiversity monitoring

A case study of Southern Myanmar mangroves

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Bibliography

Alongi, D. M. (2002). Present state and future of the world's mangrove forests. Environmental conservation, 29(03), 331-349.

Aung, T. T., Than, M. M., Katsuhiro, O., & Yukira, M. (2011). Assessing the status of three mangrove species restored by the local community in the cyclone-affected area of the Ayeyarwady Delta, Myanmar. Wetlands ecology and management, 19(2), 195-208.

Aung, T. T., Mochida, Y., & Than, M. M. (2013). Prediction of recovery pathways of cyclone-disturbed mangroves in the mega delta of Myanmar. Forest ecology and management, 293, 103-113.

Axelsson, C., Skidmore, A. K., Schlerf, M., Fauzi, A., & Verhoef, W. (2013). Hyper- spectral analysis of mangrove foliar chemistry using PLSR and support vector regression. International Journal of Remote Sensing, 34(5), 1724-1743.

Bossard, M., Feranec, J., & Otahel, J. (2000). CORINE land cover technical guide: Addendum 2000.

Donald, P. F., Round, P. D., Dai We Aung, T., Grindley, M., Steinmetz, R., Shwe, N. M., & Buchanan, G. M. (2015). Social reform and a growing crisis

for southern MyanmarâĂŹs unique forests. Conservation Biology.

Dong, J., Zhuang, D., Huang, Y., & Fu, J. (2009). Advances in multi-sensor data fusion: algorithms and applications. Sensors, 9(10), 7771-7784.

Duro, D. C., Franklin, S. E., & DubÃĭ, M. G. (2012). A comparison of pixel-based and object-based image analysis with selected machine learning algorithms for the classification of agricultural landscapes using SPOT-5 HRG imagery. Remote Sensing of Environment, 118, 259-272.

ENVI Atmospheric Correction Module / Module, E. A. C. (2009). QUAC and FLAASH UserâĂŹs Guide. Atmospheric Correction Module, Version, 4.

Everitt, J. H., Yang, C., Sriharan, S., & Judd, F. W. (2008). Using high resolution satellite imagery to map black mangrove on the Texas Gulf Coast. Journal of Coastal Research, 1582-1586.

FAO (2000). On Definitions of Forest and Forest Change. Forest Ressources Assessment Programme. Working Paper 33. Rome 2000.

Fatoyinbo, T. E., Simard, M., Washington Allen, R. A., & Shugart, H. H. (2008). Land- scape scale extent, height, biomass, and carbon estimation of MozambiqueâĂŹs mangrove forests with Landsat ETM+ and Shuttle Radar Topography Mission elevation data. Jour- nal of Geophysical Research: Biogeosciences (2005âĂŞ2012), 113(G2).

Feng, Q., Liu, J., & Gong, J. (2015). UAV remote sensing for urban vegetation mapping using random forest and texture analysis. Remote Sensing, 7(1), 1074-1094.

Foody, G. M. (2002). Status of land cover classification accuracy assessment. Remote sensing of environment, 80(1), 185-201.

Gao, J. (1999). A comparative study on spatial and spectral resolutions of satellite data in mapping mangrove forests. International journal of remote sensing, 20(14), 2823-2833.

Giri, C., Zhu, Z., Tieszen, L. L., Singh, A., Gillette, S., & Kelmelis, J. A. (2008). Mangrove forest distributions and dynamics (1975âĂŞ2005) of the tsunami-affected region of Asia. Journal of Biogeography, 35(3), 519-528.

Giri C, Ochieng E, Tieszen LL, Zhu Z, Singh A, Loveland T, Masek J, Duke N (2011): Status and distribution of mangrove forests of the world using earth observation satellite data (version 1.3, updated by UNEP-WCMC). Global Ecology and Biogeography 20: 154-159.

Green, E. P., Clark, C. D., Mumby, P. J., Edwards, A. J., & Ellis, A. C. (1998). Remote sensing techniques for mangrove mapping. International

Journal of Remote Sensing, 19(5), 935-956.

Hansen, M. C. (2013). High-Resolution Global Maps of 21st-Century Forest Cover Change. science, 1244693(850), 342.

Heumann, B. W. (2011a). Satellite remote sensing of mangrove forests: Recent advances and future opportunities. Progress in Physical Geography, 35(1), 87-108.

Heumann, B. W. (2011b). An object-based classification of mangroves using a hybrid decision tree–Support vector machine approach. Remote Sensing, 3(11), 2440-2460.

Horning, N., Robinson, J. A., Sterling, E. J., Turner, W., Spector, S. (2010). Remote Sensing for Ecology and Conservation. A Handbook of Techniques. Oxford University Press, New York.

Horning N., Leutner, B. & Wegmann, M. (2016). Land Cover or Image Classification Approaches. In: Wegmann, M., Leutner, B. and Dech, S. (2016). Remote Sensing for Ecologists: Using Open Source Software.Exeter: Pelagic Publishing, UK.

Huang, C., Davis, L. S., & Townshend, J. R. G. (2002). An assessment of support vector machines for land cover classification. International Journal of remote sensing, 23(4), 725-749.

Jacobsen, K. (2005). High Resolution Satellite Imaging Systems-an Overview. Photogrammetrie Fernerkundung Geoinformation, 2005(6), 487.

Jensen, J. R. (2004). Introductory Digital Image Processing: A Remote Sensing Approach. Prentice Hall, Upper Saddle River, NJ, 7458.

Kempeneers, P., Sedano, F., Seebach, L., Strobl, P., & San-Miguel-Ayanz, J. (2011). Data fusion of different spatial resolution remote sensing images applied to forest-type mapping. Geoscience and Remote Sensing, IEEE Transactions on, 49(12), 4977-4986.

Klemas, V. (2011). Remote sensing of wetlands: case studies comparing practical techniques. Journal of Coastal Research, 27(3), 418-427.

Knight, A. T., Cowling, R. M., Rouget, M., Balmford, A., Lombard, A. T., & Campbell, B. M. (2008). Knowing but not doing: selecting priority conservation areas and the researchâĂŞimplementation gap. Conservation Biology, 22(3), 610-617.

Kuenzer, C., Bluemel, A., Gebhardt, S., Quoc, T. V., & Dech, S. (2011). Remote sensing of mangrove ecosystems: A review. Remote Sensing, 3(5), 878-928.

Kuhn, M., & Johnson, K. (2013). Applied predictive modeling (pp. 61-92). New York: Springer.

Lee, T. M., & Yeh, H. C. (2009). Applying remote sensing techniques to monitor shifting wetland vegetation: A case study of Danshui River estuary mangrove communities, Taiwan. Ecological engineering, 35(4), 487-496.

Leutner, B. and Horning, N. (2015). RStoolbox: Tools for Remote Sensing Data Analysis. R package version 0.1.3. http://CRAN.R-project.org/package =RStoolbox.

Leutner B. & Wegmann, M. (2016): Pre-Processing Remote Sensing Data. In: Wegmann, M., Leutner, B. and Dech, S. (2016): Remote Sensing for Ecologists: Using Open Source Software.Exeter: Pelagic Publishing, UK.

Lund, H. G. (2005). Definitions of Old Growth, Pristine, Climax, Ancient Forests, Degradation, Desertification, Forest Fragmentation, and Simiar Terms (definitions of Forest State, Stage, and Origin). Forest Information Services.

Maling, D. H. (1989). Measurements from maps. Oxford: Pergamon.

Macintosh, D. J. 1996 Mangroves and coastal aquaculture: doing something positive for the environment. Aquaculture Asia I (2),3âĂŞ8.

McCarthy, S. (2014). Democratic change and forest governance in the Asia Pacific: implications for Myanmar.

Mountrakis, G., Im, J., & Ogole, C. (2011). Support vector machines in remote sensing: A review. ISPRS Journal of Photogrammetry and Remote Sensing, 66(3), 247-259.

Mutanga, O., Adam, E., & Cho, M. A. (2012). High density biomass estimation for wetland vegetation using WorldView-2 imagery and random forest regression algorithm. International Journal of Applied Earth Observation and Geoinformation, 18, 399-406.

Myers, N., Mittermeier, R. A., Mittermeier, C. G., Da Fonseca, G. A., & Kent, J. (2000). Biodiversity hotspots for conservation priorities. Nature, 403(6772), 853-858.

Pettorelli, N., Vik, J. O., Mysterud, A., Gaillard, J. M., Tucker, C. J., & Stenseth, N. C. (2005). Using the satellite-derived NDVI to assess ecological responses to environmental change. Trends in ecology & evolution, 20(9), 503-510.

RapidEye, A.G. (2015). Satellite Imagery Product Specifications, Version 6.1, Black- Bridge.

Rocchini D., Leutner, B. & Wegmann, M. (2016). From Spectral to Ecological Information. In: Wegmann, M., Leutner, B. and Dech, S. (2016). Remote Sensing for Ecologists: Using Open Source Software.Exeter: Pelagic Publishing, UK.

Rodriguez-Galiano, V. F., Ghimire, B., Rogan, J., Chica-Olmo, M., & Rigol-Sanchez, J. P. (2012). An assessment of the effectiveness of a random forest classifier for land-cover classification. ISPRS Journal of Photogrammetry and Remote Sensing, 67, 93-104.

San Tha Tun, Win Hteik, Kyaw Thuya (2014). Survey of Mangroves in Aucklan Bay and Adjacent Areas, Kyun-Su and Boke-Pyin Townships, Tanintharyi Region. FFI Myanmar, Tanintharyi Conservation Programme, Report No. 4.

Shapiro, A. C., Trettin, C. C., KÃijchly, H., Alavinapanah, S., & Bandeira, S. (2015). The Mangroves of the Zambezi Delta: Increase in Extent Observed via Satellite from 1994 to 2013. Remote Sensing, 7(12), 16504-16518.

Son, N. T., & Chen, C. F. (2013). Remote sensing of mangrove forests in Central America. SPIE Newsroom.

Sunderland, T., Groves, J., Shanley, P., & Campbell, B. (2009). Bridging the gap: how can information access and exchange between conservation biologists and field practitioners be improved for better conservation outcomes?. Biotropica, 41(5), 549-554.

UNEP (2014). The Importance of Mangroves to People: A Call to Action. van Bochove, J., Sullivan, E., Nakamura, T. (Eds). United Nations Environment Programme World Conservation Monitoring Centre, Cambridge. 128 pp.

UNDP Myanmar (2014): Local Governance Mapping. The State of Local Governance: Trends in Tanintharyi. Yangon.

Valiela, I., Bowen, J. L., & York, J. K. (2001). Mangrove forests: one of the world's threatened major tropical environments. BioScience, 51(10), 807-815.

Wang, L., Sousa, W. P., & Gong, P. (2004). Integration of object-based and pixel-based classification for mapping mangroves with IKONOS imagery. International Journal of Remote Sensing, 25(24), 5655-5668.

Wang, L., SilvÃąn-CÃąrdenas, J. L., & Sousa, W. P. (2008). Neural network classification of mangrove species from multi-seasonal Ikonos imagery. Photogrammetric Engineering & Remote Sensing, 74(7), 921-927.

Wang, L., & Sousa, W. P. (2009). Remote Sensing of Coastal Mangrove For-

est. In Remote Sensing and Geospatial Technologies for Coastal Ecosystem Assessment and Management (pp. 323-340). Springer Berlin Heidelberg.

Weber, S. J., Keddell, L., & Kemal, M. (2014). Myanmar Ecological Forecasting: Uti- lizing NASA Earth Observations to Monitor, Map, and Analyze Mangrove Forests in Myanmar for Enhanced Conservation.

Webb, E. L., Jachowski, N. R., Phelps, J., Friess, D. A., Than, M. M., & Ziegler, A. D. (2014). Deforestation in the Ayeyarwady Delta and the conservation implications of an internationally-engaged Myanmar. Global Environmental Change, 24, 321-333.

Wegmann, M., Leutner, B., Dech, S. (2016). Remote Sensing and GIS for Ecologists: Using Open Source Software. Exeter: Pelagic Publishing, UK.

Woods, K. (2015). Commercial Agriculture Expansion in Myanmar: Links to Deforestation, Conversion Timber, and Land Conflicts. Forest Trends.

Zhang, J. (2010). Multi-source remote sensing data fusion: status and trends. International Journal of Image and Data Fusion, 1(1), 5-24.

Zhang, X., & Tian, Q. (2013). A mangrove recognition index for remote sensing of mangrove forest from space. Current Science, 105(8), 1149.

Zoeckler, C. Delany, S. & Barber, J. (2013). Scoping Paper: Sustainable Coastal Zone Management in Myanmar. ArcCona Ecological Consultants, Cambridge, UK.