

MIGUEL L. VILLARREAL
Mendenhall Fellow
Research Geographer
U.S. Geological Survey, Western Geographic Science Center
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CHRONOLOGY OF EDUCATION

University of Arizona, 2009

Ph.D. School of Geography and Development
Minor: Remote Sensing and Spatial Analysis

University of Arizona, 2003

M.A. Geography and Regional Development

University of California, Davis, 1994

B.A. in Fine Arts Photography

RESEARCH AND TEACHING EXPERIENCE

U.S. Geological Survey, Mendenhall Fellow (2011-present)

University of Arizona (2001-2011)

Post-Graduate Research

- **2009-2011:** *Postdoctoral Research Associate*, University of Arizona, School of Natural Resources and the Environment & U.S. Geological Survey

Graduate Research

- **2006-2009:** *Research Associate*, Office of Arid Lands Studies
- **2005:** *Research Assistant*, Office of Arid Lands Studies & National Park Service
- **2001- 2003:** *Research Assistant*, Geography and Regional Development

Course Instruction

- *Lecturer*, REM 590 Remote Sensing for the Study of Planet Earth
- *Instructor*, GEOG 414B Intro to Geographic Information Systems
- *Teaching Assistant*, GEOG 220 Biogeography
- *Instructor*, Geography 416A Computer Cartography
- *Teaching Assistant*, GEOG330 Intro to Remote Sensing
- *Teaching Assistant*, INDV102 Human Geography and Global Systems

Pima Community College, Geography Department
Adjunct Faculty, (2010-present)

Course Instruction

• **Fall 2010:** *Instructor*, GEOG 267 Geographic Information Systems

Sonoran Institute/NPS Sonoran Desert Network (2004-2005)

Graduate Intern, Landscape Dynamics Monitoring, Tucson AZ

PUBLICATIONS

In press, in review, or in preparation

Villarreal, M.L., van Riper III, C., van Riper, C.J., Johnson M.J., and S.S. Selleck. 2012. Summary: Informing collaborative conservation and management of Colorado Plateau resources. In, *The Colorado Plateau V: Research, environmental planning, and management for collaborative conservation*. van Riper III, C., Villarreal, M.L., van Riper, C.J., and M.J. Johnson (Eds.) The University of Arizona Press, Tucson, AZ. *In press*.

van Riper III, C., **Villarreal, M.L.**, van Riper, C.J., and M.J. Johnson (Eds). 2012. The Colorado Plateau V: Research, environmental planning, and management for collaborative conservation. The University of Arizona Press, Tucson, AZ. *In press*.

Norman, L.M., Feller, M., and **M.L. Villarreal**. 2012. Developing Plausible Scenarios for Ecosystem Services Assessment—Santa Cruz Watershed, Arizona and Sonora. Landscape and Urban Planning. *In press*.

Quijada-Mascarenas, A., van Riper III, C., James, D., Lopez-Hoffman, L., Sharp, C., Gimblett, R., Scott, M.L., Norman, L.M., Medellin, R. Callegary, J.B., List, R. Wallace, C., Holm, P. Glenn, E., Leenhouts, J. Esque, T., Culver, M., Webb, R., Steidl, J., **Villarreal, M.L.**, Nagler, P., Lackner, W., Sturm, M. Castillo-Gamez, R., and G. Ceballos. 2012. An ecosystem level approach for developing a monitoring program for the U. S.-Mexico border fence. In, *The Border Wall between Mexico and the United States. Venues, Mechanisms and Stakeholders for a Constructive Dialogue*, C. de la Parra, E. Peters, A. Cordova y Vazquez (Eds). Instituto Nacional de Ecología, SEMARNAT, Mexico DF, Mexico. *In press*.

Villarreal, M.L., Norman, L.M., Boykin, K.G., and C.S.A. Wallace. 2012. Biodiversity losses and conservation tradeoffs: assessing future growth scenarios for a North American transnational trade corridor. Biodiversity and Conservation. *In review*.

Villarreal, M.L., McCoy, A.M., and S.R. Yool. 2012. The influence of historical flood disturbances and land use legacies on spatial patterns of riparian tree mortality. Ecohydrology. *In review*.

Villarreal, M.L., Norman, L.M., and W.B. Labiosa. Assessing the vulnerability of human and biological communities to changing ecosystem services using a GIS-based

multi-criteria decision support tool. International Environmental Modelling and Software Society (iEMSs) 2012 International Congress on Environmental Modelling and Software Managing Resources of a Limited Planet, Sixth Biennial Meeting, Leipzig, Germany

R. Seppelt, A.A. Voinov, S. Lange, D. Bankamp (Eds.)

<http://www.iemss.org/society/index.php/iemss-2012-proceedings>. *In review*.

Villarreal, M.L., Gass, L., Childs, J.L., Norman, L.M., Sankey, J.B., and C.S.A. Wallace. Examining wildlife responses to phenology and wildfire using a landscape-scale camera trap network. Biodiversity and Management of the Madrean Archipelago III: Merging Science and Management in a Rapidly Changing World. May 1-5, 2012 in Tucson, Arizona. *In preparation*.

Villarreal, M.L., Drake, S., and D.J.A. Wood. 2012. Resolving burn severity in montane conifer forests using multitemporal high resolution satellite imagery. *In preparation*.

M.J. Johnson, **Villarreal, M.L.**, Holmes, J. and C. van Riper III. 2012. Development of a Yellow-billed Cuckoo Habitat Model to Inform Strategic Habitat Conservation. *In preparation*.

Wallace, C.S.A., **Villarreal, M.L.**, and C. van Riper III. 2012. Mapping Landscape Phenology Preference of Yellow-billed Cuckoo with AVHRR data. *In preparation*.

Published

Villarreal, M.L., W.J.D. van Leeuwen, and J.R. Leon-Romo. 2012. Mapping and monitoring riparian vegetation distribution, structure and composition with regression tree models and post-classification change metrics. *International Journal of Remote Sensing*, 33:13, 4266-4290. [<http://dx.doi.org/10.1080/01431161.2011.644594>].

Villarreal, M.L., Drake, S., Marsh, S.E and A.L. McCoy. 2012. The influence of wastewater subsidy, flood disturbance and neighbouring land use on current and historical patterns of riparian vegetation in a semi-arid watershed. *River Research and Applications*. [DOI:10.1002/rra.1510].

Norman, L.M., **Villarreal, M.L.**, Lara-Valencia, F., Wilson, S., Yuan, Y., Nie, W., Amaya, G., and R. Sleeter, 2012. Mapping Socio-Environmentally Vulnerable Populations Access and Exposure to Ecosystem Services at the U.S.-Mexico Borderlands. *Applied Geography* 34:413-424. [<http://dx.doi.org/10.1016/j.apgeog.2012.01.006>].

Villarreal, M.L., L.M. Norman, R.H. Webb, D.E. Boyer and R.M. Turner. 2011. Unravelling long-term vegetation change patterns in a binational watershed using multitemporal land cover data and historical repeat photography. *Proceedings of MULTITEMP 2011, 6th International Workshop on the Analysis of Multitemporal Remote Sensing Images*. Bruzzone, L. and F. Bovolo (Eds.). IEEE Geoscience and Remote Sensing Society, IEEE Xplore, p. 101-104. [[10.1109/Multi-Temp.2011.6005058](http://dx.doi.org/10.1109/Multi-Temp.2011.6005058)].

Villarreal, M.L., van Riper, C., Lovich, Robert E., Palmer, Robert L., Nauman, T., Studd, S., Drake, S., Malusa, J. Rosenberg, A. and Ronald L. Pearce. 2011. An Inventory and Monitoring Plan for a Sonoran Desert Ecosystem: Barry M. Goldwater Range – West. U.S. Geological Survey Open-File Report 2011-1232, 103 p.

[<http://pubs.usgs.gov/of/2011/1232/>].

Villarreal, M. L., W. van Leeuwen, R. Romo, and J. A. Hubbard. 2011. Assessing landscape dynamics using multitemporal remotely sensed imagery in the Sonoran Desert Network. Natural Resource Technical Report NPS/SODN/NRTR—2011/494. National Park Service, Fort Collins, Colorado.

[<http://science.nature.nps.gov/im/units/sodn/docs/LndscpDynMon.pdf>].

Villarreal, M.L., L. M. Norman, C. S. A. Wallace, and C. van Riper III. 2011. A Multi-temporal (1979-2009) Land Use/Land Cover Data Set of the Bi-National Upper Santa Cruz Watershed. U.S. Geological Survey Open-File Report 2011-1131, 26 p. and database [<http://pubs.usgs.gov/of/2011/1131/>].

Wallace, C.S.A., **Villarreal, M.L.**, and Norman, L.M., 2011, Development of a high-resolution binational vegetation map of the Santa Cruz River riparian corridor and surrounding watershed, southern Arizona and northern Sonora, Mexico: U.S. Geological Survey Open-File Report 2011-1143, 22 p. [<http://pubs.usgs.gov/of/2011/1143/>].

Norman, L.M., **Villarreal, M.L.**, Wallace, C.S.A., Gil Anaya, C.Z., Diaz Arcos, Israel and Gray, Floyd. 2010. A high-resolution land-use map; Nogales, Sonora, Mexico: U.S. Geological Survey Open-File Report 2010-1156, 21 p.

[<http://pubs.usgs.gov/of/2010/1156/>].

Drake, S., S. Buckley, **M.L. Villarreal**, S. Studd and A.J., Hubbard. 2009. Vegetation classification, distribution and mapping report: Tumacácori National Historical Park. Natural Resource Report NPS/SODN/NRR-2009/148. National Park Service, Fort Collins, Colorado. [www.southwestlearning.org/download_product/1338/0].

Buckley, S., J. A. Hubbard, S. Studd, S. Drake, **M.L. Villarreal**, and J. Greene. 2009. Vegetation classification, distribution, and mapping report: Casa Grande Ruins National Monument. Natural Resource Report NPS/SODN/NRR—2009/158. National Park Service, Fort Collins, Colorado. [www.southwestlearning.org/download_product/879/0].

Villarreal, M.L. and S.R. Yool. 2008. Analysis of fire-related vegetation patterns in the Huachuca Mountains, AZ and Sierra los Ajos, Sonora, Mexico. *Fire Ecology* 4(1): 15-33. [DOI: 10.4996/fireecology.0401014].

Mau-Crimmins, T., A. Hubbard, D. Angell, C. Filippone, N. Kline. (**M.L. Villarreal** - Contributor). September 2005. Sonoran Desert Network Vital Signs Monitoring Plan. Technical Report NPS/IMR/SODN-003. National Park Service. Denver, CO.

PAPERS PRESENTED (^β = poster)

Villarreal, M.L., Norman, L.M., C.S.A. Wallace, and K.G. Boykin, K.G. Evaluating long-term biodiversity changes across a heterogeneous land use mosaic. 2012 Association of American Geographers Annual Meeting, New York, New York.

Villarreal, M.L., Norman, L.M., C.S.A. Wallace, and K.G. Boykin, K.G. Land use matters: Private and public land stewardship efforts moderate the effects of drought and resource consumption on watershed habitat loss. Developing Ecologically-Based Conservation Targets Under Global Change: The 2nd Emerging Issues Conference of the Ecological Society of America, February 27-March 1, 2012, Shepherdstown, WV. ^β

Villarreal, M.L., Norman, L.M., C.S.A. Wallace, and K.G. Boykin, K.G. Historical determinants of past and current biodiversity patterns and their implications for conservation under future climate change. 2011 American Geophysical Union, San Francisco, California. ^β

Wallace, C.S.A., **Villarreal, M.L.**, and C. van Riper III. Mapping Landscape Phenology Preference of Yellow-billed Cuckoo with AVHRR data. 2011 American Geophysical Union, San Francisco, California. ^β

Villarreal, M.L., L.M. Norman, R.H. Webb, D.E. Boyer and R.M. Turner. Unravelling long-term vegetation change patterns in a binational watershed using multitemporal land cover data and historical repeat photography. MULTITEMP 2011, 6th International Workshop on the Analysis of Multitemporal Remote Sensing Images. Trento, Italy, July 12-14, 2011.

Villarreal, M.L. Monitoring spatial and temporal dynamics of grassland and xeroriparian communities using multitemporal land cover data and repeat historical photography. Pima County Regional Flood Control District Seminar, Tucson, Arizona, June, 2011.

Villarreal, M.L., Norman, L.M., Boyer, D.E., Webb, R.H. and C. van Riper III. Development of a landscape change narrative for a semi-arid watershed using historical repeat ground photography and multi-temporal land cover data. 2011 Association of American Geographers Annual Meeting, Seattle, Washington.

Wallace, C.S.A., **Villarreal, M.L. (co-presenter)** and L. Norman. Development of landscape-scale geospatial data sets describing the vegetation and land use of the binational Santa Cruz watershed. Santa Cruz River Researchers' Day. Tucson, Arizona. March, 2011.

Norman, L.M., Tallent-Halsell, N., Labiosa, W., **Villarreal, M.**, Callegary, J., Weber, M., McCoy, A., Guertin, D. P., Hirshboeck, K., Wallace, C., Scott, C., and Lopez-Hoffman, L., 2010. Ecosystem services, binational water management, and decision support in the Santa Cruz Watershed Ecosystem Portfolio Model (SCWEPM). 2010 Global Land

Project Open Science Meeting, October 17-19, 2010, Arizona State University, Tempe, AZ.

Villarreal, M.L., Drake, S., Marsh, S.E and A.L. McCoy. Examination of historical riparian dynamics, natural disturbance and land use interactions in a semi-arid watershed. 2010 Association of American Geographers Annual Meeting, Washington DC.

Labiosa, W, Norman, L., Tallent-Halsell, N., Hirschboeck, K., Weber, M., McCoy, A., Callegary, J., Huth, H., Wallace, C., and **M. Villarreal**. Ecosystem Services Assessments under Climate Change and Urban Growth Scenarios; the Santa Cruz Watershed Ecosystem Portfolio Model (SCWEPM). 3rd USGS Modeling Conference, Denver, CO, June, 2010.

L. M. Norman, J. B. Callegary, C. van Riper, F. Gray, N. Paretti, and **M.L. Villarreal (presenter)**. The Border Environmental Health Initiative: Investigation of the Transboundary Santa Cruz Watershed. 2009 American Geophysical Union, San Francisco, California.

Villarreal, M.L., van Leeuwen W. and R. Romo. Mapping and Monitoring Change in Riparian Vegetation Structure and Pattern Using Landsat TM Satellite Imagery. 2009 Association of American Geographers Annual Meeting, Las Vegas, Nevada.

Villarreal, M.L., van Leeuwen W. and R. Romo. National Park Service Landscape Dynamics Monitoring: Seven Decades of Landscape and Vegetation Change at Tumacácori National Historical Park. Santa Cruz River Researchers' Day. Tucson, Arizona. March, 2009.

Drake, S. and **M.L. Villarreal**. Vegetation Map of Tumacácori National Historical Park. Santa Cruz River Researchers' Day. Tucson, Arizona. March, 2009. ^β

Villarreal, M.L., van Leeuwen W. and R. Romo. National Park Service Landscape Dynamics Monitoring: Assessing Seventy Years of Change at Tumacácori National Historical Park. George Wright Society Biennial Meeting. Portland, Oregon. March 2009. ^β

Villarreal, M.L., van Leeuwen W. and R. Romo. Integrating Phenology into Satellite-based Classifications for Landscape Dynamics Monitoring. Characterizing the Phenology of Southwest Landscapes. U.S.A. National Phenology Network (NPN) & Southwest U.S. Region, American Society of Photogrammetry and Remote Sensing (ASPRS). Tucson, Arizona. October 2008.

Villarreal, M.L. Linking Fine-Scale Ecosystem Disturbance with Historical Landscape Change. 2008 Association of American Geographers Annual Meeting, Boston, Massachusetts.

Villarreal, M.L., van Leeuwen W. and R. Romo. Satellite Image-based Classifications for Landscape Dynamics Monitoring of Sonoran Desert National Parks. University of

Arizona Graduate Interdisciplinary Program Student Poster Contest: Remote Sensing and Spatial Analysis Program Selection. Tucson, Arizona. November, 2008.

Villarreal, M.L., van Leeuwen W. and R. Romo. Protocol Development of Landscape Dynamics Monitoring for Sonoran Desert Network National Parks. National Park Service Sonoran Desert Network I&M Program Review. Hilton Tucson East, Tucson, Arizona. July, 2008.

Villarreal, M.L. Mapping and Monitoring Riparian Vegetation: Remote Sensing Applications. Sonoran Desert Regional Monitoring Partnership. Saguaro National Park, Tucson, Arizona. May, 2007.

Villarreal, M.L. Resolving Burn Severity in Montane Conifer Forests using Multitemporal High Resolution Satellite Imagery. 2007 Association of American Geographers Annual Meeting. San Francisco, California.

Villarreal, M.L. Using Remote Sensing and Repeat Photography to Monitor Riparian Vegetation. Sonoran Desert Regional Monitoring Partnership. US Fish & Wildlife Service, Tucson, Arizona. January, 2007.

Villarreal, M.L. Detecting Trails and Roads in Protected Areas on the U.S/Mexico Border Using High-Resolution Satellite Imagery. 2006 Association of American Geographers Annual Meeting. Chicago, Illinois.

Villarreal, M.L. and C. Sorrenson. Analysis of Urbanization and Related Forest Fragmentation in the Brazilian Lower Amazon Using Remote Sensing. 2003 Association of American Geographers Annual Meeting. New Orleans, Louisiana. ^p

RESEARCH GRANTS, AWARDS and ACADEMIC FELLOWSHIPS

2012 Ecological Society of America, 2nd Emerging Issues Conference Travel Award
2011-13 Evaluation of anthropogenic impacts at the Barry M. Goldwater Range-West
PI = M. Villarreal; Co-PI = G. Christopherson, Award: \$84,999. Sponsor:
USMC/DOD

2011-12 NPS Sonoran Desert Network Vegetation Mapping: 2011-2012
PI = M. Villarreal, Award: \$49,190. Sponsor: NPS

2011 Multi-species habitat modeling of the binational Santa Cruz River Watershed to support ecosystem services evaluation

PI = M. Villarreal, Award: \$30,000. Sponsor: USGS

2000-09 Graduate Fellowship, University of Arizona

2003-09 Travel Grant, Department of Geography and Regional Development

2003 Graduate College Professional Development Award, University of Arizona

2002 University of Arizona Minority Student Fellowship, University of Arizona

JOURNAL REVIEWS

Acta Oecologica
Remote Sensing of Environment

SERVICE AND CONSULTATION

Graduate Student Representative. 2009. University of Arizona Graduate Interdisciplinary Program Advisory Council

City of Tucson and City of Marana. 2008. Remote Sensing and Long-term Ecological Monitoring for Habitat Conservation Plans (HCPs).

Pima County. 2007. Remote Sensing and Land Cover monitoring for the Sonoran Desert Conservation Plan.

MEMBERSHIPS AND PROFESSIONAL ASSOCIATIONS

Association of American Geographers
American Geophysical Union
Ecological Society of America
The George Wright Society

HONORS AND AWARDS

2008 University of Arizona, Graduate Interdisciplinary Programs Advisory Council
Recognition for Exceptional Graduate Research