

BIOSKETCH

Barron J. Orr, Ph.D.

Barron J. Orr is a Professor in the Office of Arid Lands Studies in the School of Natural Resources and the Environment at the University of Arizona where he has been on faculty since 2001. He is also Arizona's Geospatial Extension Specialist, a novel position that links the missions of NASA, USDA, NOAA, and that of Land Grant universities to bridge the gap between Earth systems science and technology and its use by the general public. This is made possible by a highly interdisciplinary career path encompassing international business, international development and academia, with expertise in anthropology, rangeland ecology, land degradation processes, and remote sensing and spatial analysis. His research focuses on the diffusion of innovation, knowledge transfer, technology adoption and the integration of local and scientific knowledge. His approach to knowledge transfer covers all facets of communication and education, ranging from hands-on training to online decision support systems (converting scientific data into insightful products that can assist decision makers) to mobile phone applications designed to educate and motivate youth. He is involved in several global initiatives focused in increasing the impact of scientific endeavor on real societal needs, including collaboration with the UN Convention to Combat Desertification (UNCCD) and the African Innovation Foundation/ UN Economic Commission for Africa (ECA). He was a Fulbright Scholar and a Spanish Government Visiting Scientist in 2010, working with the Fundación Centro de Estudios Ambientales del Mediterráneo (CEAM). He was named Profesor avalista, Programa de Doctorado en Conservación y Restauración de Ecosistemas at the University of Alicante in Spain and Adjunct Professor, International Center for Desert Affairs, at Xinjiang University in Urumuqi, China.

CURRICULUM VITAE

Barron Joseph ORR

Office of Arid Lands Studies
University of Arizona
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Chronology of Education

University of Arizona, Tucson, Arizona

Doctorate of Philosophy in Arid Lands Resource Sciences (December 2000)

Dissertation Advisor: Dr. Charles F. Hutchinson. Title:

More Users and More Uses: Choosing between Land and Forest in Malawi's Protected Areas

Columbia University, New York, New York

Master of International Affairs (January 1988)

Indiana University, Bloomington, Indiana

Bachelor of Arts in French and Political Science; Certificate in African Studies (May 1984)

Université de Strasbourg, France

Diplôme d'Université – Etudes Politiques (International Relations, May 1983)

Chronology of Employment

1885 Society Distinguished Scholar, University of Arizona, 2013 – to present

Professor, Arid Lands, University of Arizona, Tucson, Arizona, 2013 – to present

Professor, Natural Resources, Univ. of Arizona, Tucson, Arizona, 2013 – to present

Specialist, Geospatial Extension, Univ. of Arizona, Tucson, Arizona, 2013 – to present

Associate Director, Arizona Remote Sensing Center, UA, Tucson, Arizona, 2007 – to present

Associate Director, Arizona NASA Space Grant Consortium, Arizona, 2001 – present

Profesor de referencia, Dpto. Ecología, Universidad de Alicante, Spain, 2012 – present

Adjunct Professor, Intn'l Center for Desert Affairs, Xinjiang U. Urumuqi, China, 2004 – present

Profesor visitante, Universidad de Alicante & Fundación CEAM, Spain, 2010

Associate Professor, Arid Lands, University of Arizona, Tucson, Arizona, 2007 – 2012

Associate Professor, Natural Resources, Univ. of Arizona, Tucson, Arizona, 2007 – 2012

Associate Specialist, Geospatial Extension, Univ. of Arizona, Tucson, Arizona, 2007 – 2012

Assistant Specialist, Geospatial Extension, University of Arizona, Tucson, Arizona, 2001 – 2007

Assistant Professor, Arid Lands, University of Arizona, Tucson, Arizona, 2002 – 2007

Assistant Professor, Natural Resources, University of Arizona, Tucson, Arizona, 2003 – 2007

Assistant in Extension, Arid Lands, University of Arizona, Tucson, Arizona, 2000

Research Associate, Office of Arid Lands Studies, University of Arizona, Tucson 1998 – 1999

Research Coordinator, USAID/Gov. of Malawi/University of Arizona, Malawi, 1996 – 1997

Research Assistant, Office of Arid Lands Studies, University of Arizona, Tucson 1992 – 1996

General Manager, Maidenform International, Ltd. Shannon, Ireland, 1990 – 1992

Marketing Manager, Maidenform, Inc. New York, New York 1988 – 1989

Land Degradation Analyst, US Peace Corps and Moroccan Ministry of Agriculture, 1986 – 1987

Teacher, US Peace Corps and Sidi Ahmed Bennisr School, Zagora, Morocco 1985 – 1986

Courses

ARL 564 (University of Arizona) – Arid and Semi-arid Lands

DVP 620 (University of Arizona) – Introduction to Natural Systems

TRANSF (University of Alicante) – Knowledge transfer and communication for management

Synergistic activities

As one of the first three Geospatial Extension Specialists in the U.S., collaborate with NASA, NOAA and USDA through Cooperative Extension to bridge the gap between geospatial technology and its potential users. My research focuses on the diffusion of innovation, knowledge transfer, technology adoption and the integration of local and scientific knowledge (over 60 research and education initiatives totalling more than \$25.5M). These collaborative projects contributed to 86 peer reviewed and 184 non-peer reviewed publications, exploiting the full range of media options available. My approach to knowledge transfer covers all facets of communication and education, ranging from hands-on training (programs involving over 1,500 educational events and 38,000 participants over the past twelve years), to online decision support systems (converting scientific data into insightful products that can assist decision makers), to mobile phone applications designed to education and motivate youth. This work now takes place on a global scale, including support to the United Nations Convention to Combat Desertification (UNCCD) effort to refine the provisional set of impact indicators under review for global and national reporting on desertification and its mitigation.

Honors and Awards

- University of Arizona 1885 Society Distinguished Scholar (2013)
- Technical Evaluator, Innovation Prize for Africa (2013)
- Fulbright Scholar, Spain (2010)
- Visiting Scientist Award, Ministry of Education, Spain (2010)
- Fine Outreach for Science Fellow at Carnegie Mellon University (2010)
- Career Leadership Gold Award, Association of Natural Resource Extension Professionals (2008)
- Special Achievement in GIS Award, ESRI (2007)
- Geospatial Leadership Award, NACAA – USDA – NASA “On-Target” Alumni Association (2005)
- Outstanding Service Award, Society for Range Management, Arizona Section (2004)

Service/Outreach

- Since its inception in 2001, the Arizona Geospatial Extension Program has engaged 38,157 participants in 1,761 educational events (presentations, field days, meetings, workshops, conferences, etc.). A significant proportion of the participants have been from groups traditionally underrepresented in science, technology, engineering and mathematics (47% women, 36% minorities). In addition to direct contacts, services also include knowledge and technology transfer over websites developed under this program.
- United Nations Convention to Combat Desertification (UNCCD) effort to refine the provisional set of impact indicators under review for global and national reporting on desertification and its mitigation. (2010-Present)
- U.S. National Geospatial Technology Extension Network (NGTEN). Founding Member (2001-Present).
- Scientific Advisory Board member for the European Commission-funded knowledge transfer research initiative entitled “Prevention and Restoration Actions to Combat Desertification. An Integrated Assessment” (PRACTICE). (2008-2012)

- National Phenology Network (NPN) NPN Committee on Education, Citizen Science, and Outreach (ECSO) (2005-Present)
- The Research Ranch Foundation, a private, nonprofit organization that promotes scientific research at the Appleton-Whittell Research Ranch, Elgin, AZ, and elsewhere in the American Southwest. Board Member (2012-Present)
- The Research Ranch Foundation, a private, nonprofit organization that promotes scientific research at the Appleton-Whittell Research Ranch, Elgin, AZ, and elsewhere in the American Southwest. Board Member (2012-Present)
- Aerial Appleton Research Fellowships (http://researchranch.audubon.org/Research_Fellowships_Appleton.html). Reviewer (2012-Present).
- Imagine Greater Tucson (IGT), a community-based, collaborative, multi-disciplinary effort to develop a shared regional vision and plan for future growth and development of the greater Tucson Region. Scientific Advisor. (2011-Present)
- Arizona Space Grant Consortium. Associate Director (2001-Present)
- Editorial board of *Sitientibus série Ciências Biológicas* (SCB) (<http://www2.uefs.br/revistabiologia/>), journal of the Department of Biological Sciences of the Universidade Estadual de Feira de Santana, in Bahia, Brazil. Member (2010-Present)
- International Center for Desert Affairs, Xinjiang University Xinjiang University, Urumuqi, China. Adjunct Professor (2004- Present)
- Arizona Forest Health Advisory Council: Mapping and Assessment Subcommittee. Chair (2004-2007).

Publications

Note: my name and the names of students mentored who are co-authors are identified in **bold**.

Summary of publications resulting from research and extension programs.

	Peer-reviewed	Not peer-reviewed	Total
Books	4	0	4
Chapters	5	0	5
Journal articles			0
-published/in press	19	3	22
-submitted	2	0	2
-in preparation	11	0	11
Proceedings	3	12	15
Factsheets	16	77	93
Websites/Apps	12	6	18
Abstracts	13	13	26
Research reports	0	20	20
Curricula	1	10	11
Posters	0	37	37
Media (videos)	0	6	6
Total	86	184	270

International Reports (peer-reviewed)

UNCCD. 2011. *Report on the refinement of the set of impact indicators on strategic objectives 1, 2 and 3.*

Note by the secretariat. ICCD/COP(10)/CST/2 (Official Document). Tenth Conference of the Parties (COP-10), Changwon, Republic of Korea, 9-21 October 2011. Available online:

<http://www.unccd.int/php/document2.php?ref=ICCD/COP%2810%29/CST/2> [author]

UNCCD. 2011. *Report on the scientific peer review for the refinement of the set of impact indicators on strategic objectives 1, 2 and 3. Note by the secretariat.* ICCD/COP(10)/CST/INF.1 (Information

- Document). Tenth Conference of the Parties (COP-10), Changwon, Republic of Korea, 9-21 October 2011. Available online: <http://www.unccd.int/cop/officialdocs/cop10/pdf/cstinf1eng.pdf> [author]
- UNCCD. 2011. *Scientific review of the UNCCD provisionally accepted set of impact indicators to measure strategic objectives 1, 2 and 3*. ICCD/CST(S-2)/INF.1 (Information Document), 11 February 2011. Committee on Science and Technology Second special session (CST-S2) Bonn, 16–18 February 2011. Available Online: <http://www.unccd.int/cop/officialdocs/cst-s2/pdf/inf1eng.pdf> [author]
- Orr, B.J.** 2011. *Scientific review of the UNCCD provisionally accepted set of impact indicators to measure the implementation of strategic objectives 1, 2 and 3*. White Paper - Version 1, 04 February 2011. Consultancy report for the CST of the UNCCD. 145 pp. (Same as ICCD/CST(S-2)/INF.1, but includes all Annexes). Available Online: http://www.unccd.int/science/docs/Microsoft%20Word%20-%20White%20paper_Scientific%20review%20set%20of%20indicators_Ver1_31011%E2%80%A6.pdf.
- Chapters in scholarly books and monographs and proceedings (peer-reviewed)*
- Zucca, C., S. Bautista, **B.J. Orr**, and F. Previtali. 2013. Desertification: Prevention and Restoration. In: S.E. Jorgensen (ed.) *Encyclopedia of Environmental Management*. New York: Taylor & Francis Group; New York; Vol I, 594-609.
- Wisneski, K.D.**, and **B.J. Orr**. 2012. Taking Akshen in communities and the environment with mobile, social and geospatial technologies. [Text Box] In: (R. Sagarin and A. Pauchard, eds.) *Observation and Ecology: Broadening the Scope of Science to Understand a Complex World*. Washington D.C.: Island Press.
- Bautista, S., **B.J. Orr**, J.A. Alloza, and V.R. Vallejo. 2009. Evaluating the restoration of dryland ecosystems in the northern Mediterranean. In: G. Schneier-Madanes and M-F Courel, eds. *Water and Sustainability in Arid Regions: Bridging the Gap between Physical and Social Sciences*. Section III. Management for Sustainability, Chapter 18. Dordrecht: Springer, pp. 295-310.
- Morehouse, B.J., and **B.J. Orr**. 2007. Integrating science and community into decision support. Chapter 11. In: W.E. Martin, C. Raish and B. Kent, eds. *Wildfire Risk: Human Perceptions and Management Implications*. Washington DC: Resources for the Future Press, pp. 194-211.
- Morehouse, B., G. Christopherson, **M. Crimmins**, **B. Orr**, J. Overpeck, T. Swetnam, S. Yool. 2006. Modeling interactions among wildland fire, climate, and society in the context of climate variability and change in the US Southwest. In: M. Ruth, K. Donaghy, and P. Kirshen, (eds). *Regional Climate Change and Variability: Impacts and Responses*. Cheltenham, UK: Edward Elgar, pp. 58-78.
- Orr, B.J.**, W. Grunberg, **A.B. Cockerham**, A.Y. Thwaites, S.H. Severson, **N.M.D. Lerman**, **R.M. Miller**, M. Haseltine, B.J. Morehouse, J.T. Overpeck, S.R. Yool, T.W. Swetnam, and G.L. Christopherson. 2005. An On-line interface for integrated modeling of wildfire, climate and society for strategic planning for the sky islands. In: Gottfried, G.J., Gebow, B.S., Eskew, L.G., and Edminster, C.B. (compilers). *Connecting Mountain Islands and Desert Seas: Biodiversity and Management of the Madrean Archipelago II*. May 11-15, 2004; Tucson, AZ. Proceedings RMRS-P-36. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, pp. 469-473.
- Orr, B.J.**, **G.M. Casady**, **D.G. Tuttle**, W.J.D. van Leeuwen, **L.E. Baker**, **C.L. McDonald**, and S.E. Marsh. 2005. Phenology and trend indicators derived from spatially dynamic bi-weekly satellite imagery to support ecosystem monitoring. In: Gottfried, G.J., Gebow, B.S., Eskew, L.G., and Edminster, C.B. (compilers). *Connecting Mountain Islands and Desert Seas: Biodiversity and Management of the Madrean Archipelago II*. May 11-15, 2004; Tucson, AZ. Proceedings RMRS-P-36. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, pp. 206-211.
- Mau-Crimmins, T.M.** and **B.J. Orr**. 2005. Monitoring nonnative plants using hand-held GIS technology. In: Gottfried, G.J., Gebow, B.S., Eskew, L.G., and Edminster, C.B. (compilers). *Connecting Mountain Islands and Desert Seas: Biodiversity and Management of the Madrean Archipelago II*. May 11-15, 2004; Tucson, AZ. Proceedings RMRS-P-36. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, pp. 298-301.

- Orr, B.**, K. Heaton, N. Suverly. 2003. Drought and climate related web sites. In: Western Beef Resource Committee, (ed.) *Cattle Producer's Library: Drought and Other Natural Disasters Section* CL1119. Moscow, ID: Western Beef Resource Committee. [handbook fact sheet, CD-ROM, and Internet Edition (Online: <http://www.av.s.uidaho.edu/wbrc>)].
- Giuliano, A.R., H. Ilahiane, and **B.J. Orr**. 1998. *Evaluation of USAID Title II Food Aid Programs: Review of Ten CARE Country Programs*. Atlanta: CARE USA, 123 pages.
- Hutchinson, C.F. and **B.J. Orr**. 1995. An overview of desertification in the drylands of North America. In: *Biological Diversity in the Drylands of the World for the International Panel of Experts Subgroup on Biodiversity (IPED)*. Geneva: UN Intergovernmental Committee for a Convention on Desertification (INCD), p. 199-229.
- Orr, B.J.** 1987. *La lutte contre la désertification et la vulgarisation de l'agro-sylviculture dans les vallées de Draa et Taghbalte, Maroc*. Government of Morocco, Peace Corps, and UNEP.

Refereed journal articles

- Conceição, A.A. and **B.J. Orr**. 2012. Post-fire flowering and fruiting in *Vellozia sincorana*, a caulescent rosette plant endemic to Northeast Brazil. *Acta Botanica Brasilica* 26(1): 94-100.
- Hao, Q., H. Zhao, R. Zhou, X. Zou, Y. Luo, S. Wang, J. Wang, J., **B.J. Orr**. 2012. Effects of sand burial on the survival and physiology of three psammophytes of Northern China. *African Journal of Biotechnology* 11(20), pp. 4518-4529. doi: 10.5897/AJB11.3793
- Hao, Q., H. Zhao, R. Zhou, X. Zou, J. Wang, J. Li, **B.J. Orr**. 2012. Effects of sand burial stress on maize (*Zea mays* L.) growth and physiological responses. *Australian Journal of Crop Science* 6(5):869-876.
- Hongu, N., K.D. Wisneski, and **B.J. Orr**. 2012. Bringing university innovation to the retirement community: An outdoor walking program for older adults. *The Forum for Family and Consumer Issues* 17(1) Available Online: <http://ncsu.edu/ffci/publications/2012/v17-n1-2012-spring/hongu-wisneski-orr.php>
- Hongu, N., **B.J. Orr**, **J.M. Wise**, R.G. Reed, D. Roe, S.B. Going. In Press. Global Positioning System (GPS) watches for estimating energy expenditure during walking. *The Journal of Strength & Conditioning Research*.
- Newingham, B.A., A.C. Ganguli, and **B.J. Orr**. 2012. Building a teaching technology toolbox for rangeland ecology. *Rangelands* 34(3):26-31.
- Rojo, L., S. Bautista, **B.J. Orr**, Vallejo, V.R., Cortina, J., and M. Derak. 2012. Prevention and restoration actions to combat desertification. An integrated assessment: The PRACTICE Project. *Sécheresse* 23(3):219-226. doi: 10.1684/sec.2012.0351. http://www.jle.com/e-docs/00/04/7B/E7/vers_alt/VersionPDF.pdf
- Moreno-Báez, M.**, R. Cudney-Bueno, **B.J. Orr**, W.W. Shaw, T. Pfister, J. Torre-Cosio, R. Loaiza, and M. Rojo. 2012. Integrating the spatial and temporal dimensions of fishing activities for management in the Northern Gulf of California, Mexico. *Ocean & Coastal Management*. 55(1):111-127. doi:10.1016/j.ocecoaman.2011.10.001
- Hao, Q., XY. Zhao, HL. Zhao, XA. Zuo, SK. Wang, XY. Wang, **B.J. Orr**. 2011. Litter decomposition rates in Horqin Sandy Land, Northern China: Effects of habitat and litter quality. *Fresenius Environmental Bulletin*. 20(12):3304-3312.
- Hongu, N., M.D. Hingle, N.C. Merchant, **B.J. Orr**, S.B. Going, **M.I. Mosqueda**, and C.A. Thomson. 2011. Dietary assessment tools using mobile technology. *Topics in Clinical Nutrition* 26(4):300-311. doi: 10.1097/TIN.0b013e3182379525
- Moreno-Baez, M.**, **B.J. Orr**, R. Cudney-Bueno, and W.W. Shaw. 2010. Using fishers' local knowledge to aid management at regional scales: Spatial distribution of small-scale fisheries in the Northern Gulf of California, Mexico. *Bulletin of Marine Science* 86(2):339-353.

- van Leeuwen, W.J.D., **G.M. Casady**, D.G. Neary, S. Bautista, J.A. Alloza, Y. Carmel, L. Wittenberg, D. Malkinson, and **B.J. Orr**. 2010. Monitoring post-wildfire vegetation response with remotely sensed time-series data in Spain, USA and Israel. *International Journal of Wildland Fire* 19(1):75-93.
- Carrière, Y., Ellers-Kirk, C., **Cattaneo, M.G.**, Yafuso, C.M., Antilla, L, Huang, C-Y, **Rahman, M., Orr, B.J.**, and S.E.Marsh. 2009. Landscape effects of transgenic cotton on non-target ants and beetles. *Basic and Applied Ecology* 10(7):597-606.
- Rahman M.M.**, M.S. Moran, D.P. Thoma, R. Bryant, C.D. Holifield Collins, T. Jackson, **B.J. Orr** and M. Tischler. 2008. Mapping surface roughness and soil moisture using multi-angle radar imagery without ancillary data. *Remote Sensing of Environment* 112(2): 391-402.
- Rahman M.M.**, M.S. Moran, D.P. Thoma, R. Bryant, E.E. Sano, C.D. Holifield Collins, S. Skirvin, C. Kershner and **B.J. Orr**. 2007. A derivation of roughness correlation length for parameterizing radar backscatter models. *International Journal of Remote Sensing* 28(18): 3995-4012.
- van Leeuwen, W.J.D., **B.J. Orr**, S.E. Marsh, and S. Herrmann. 2006. Multi-sensor NDVI data continuity: Uncertainties and implications for vegetation monitoring applications. *Remote Sensing of Environment* 100(1):67-81.
- van Leeuwen, W.J.D. and **B.J. Orr**. 2006. Spectral vegetation indices and uncertainty: insights from a user's perspective. *IEEE Transactions on Geoscience and Remote Sensing* 44(7): 1931-1933.
- Gilruth, P.T., S. Kalluri, J.W. Robinson, J. Townshend, F. Lindsay, P. Davis, and **B. J. Orr**. 2006. Measuring performance: Moving NASA Earth science products into the mainstream user community. *Space Policy* 22(3): 165-175.
- Cattaneo, M.G., C. Yafuso, C. Schmidt, C-Y. Huang , **M. Rahman**, C. Olson, C. Ellers-Kirk, **B.J. Orr**, S.E. Marsh, L. Antilla, P. Dutilleul, and Y. Carrière. 2006. Farm-scale evaluation of the impacts of transgenic cotton on biodiversity, pesticide use, and yield. *Proceedings of the National Academy of Sciences* 103(20):7571-7576.
- Marsh, S.E., Park, T.K, Eiswerth, B.A., Farah, M.H., **Rautenkranz, D.S.**, and **Orr, B.J.**, 2003. Development of sampling procedures based upon satellite derived land cover histories for the NSF African Cities Project. *Journal of Political Ecology* 10(2):63-68.
- Orr, B., L. Baker**, A. Thwaits, and C. Baker. 2003. Participatory geospatial research and development: Interactive access to spatially dynamic time-series satellite imagery for natural resource management. *Arid Lands Newsletter*. Issue 53. Online: <http://ag.arizona.edu/OALS/ALN/aln53/orr.html> .
- Electronic publications (peer-reviewed chapters, articles, fact sheets, etc.)*
- Hartfield, K., C. Ellers-Kirk, **K. Wisneski, B.J. Orr**, S.E. Marsh, and Y. Carrière. 2011. Novel ground truth method for crop fields combining a global positioning system (GPS) and Handheld Geographic Information System (HGIS). *eXtension.org* Available online: <http://extension.org/60989>
- Wise, J.M, B.J. Orr, K.D. Wisneski**, and N. Hongu. 2008. *GPS Watches for Measuring Energy Expenditure during Physical Activity*. [peer-reviewed factsheet]. Tucson: University of Arizona Cooperative Extension. Online: <http://cals.arizona.edu/pubs/health/az1476.pdf>.
- Nowatski, J., A. Hays, G. Bonyng, S. Bradt, J. McGee, **B. Orr**, S. Prisloe, P. Rasmussen, N. Mattox, K. Vlasek, and N. Watermeier. 2008. Geospatial Technology Resource Area for eXtension: Map@Syst. 100+ peer-reviewed fact sheets, FAQs and learning modules. eXtension is an interactive learning environment where university content providers can gather and produce new educational and information resources on wide-ranging topics. Map@Syst is the community of practice generating and peer-reviewing educational content focused on geospatial technology. Online: <http://www.extension.org/geospatial+technology>.
- Orr, B.**, K. Heaton, N. Suverly. 2003. Drought and climate related web sites. In: Western Beef Resource Committee, (ed.) *Cattle Producer's Library: Drought and Other Natural Disasters Section* CL1119. Moscow, ID: Western Beef Resource Committee. [handbook fact sheet, CD-ROM, and Internet Edition (Online: <http://www.av.uidaho.edu/wbrc>)].

Electronic publications (peer-reviewed web development)

Note: The nature of geospatial technology changes frequently. As a result, these websites have been updated on a regular basis as peer-review and stakeholder feedback are received. Where relevant, this is reflected by a range of years, from the original publication to the most recent update.

- Ribeiro Carvalho, E., V.R. Vallejo, S. Bautista, A. Major, J.A. Alloza, and **B.J. Orr**. 2011-2012. *PRACTICE NetWeb: Prevention and Restoration Actions to Combat Desertification*. Valencia, Spain: Fundación Centro de Estudios Ambientales del Mediterráneo (CEAM). Online: <http://practice-netweb.eu/105> indexed web pages.
- Parizek, P., D. Hammond, D. Thompson, S.S. Kuma Reddy, **D.M. Kulasinghe**, D. Seethur, N. Merchant, **K. Wisneski**, **N. Knutson**, **J. Vancel**, **I. Liang**, **C. Hannah**, **K. Nakazny**, **J. Choquehuanca**, **B.J. Orr**, **S.E. Marsh**, L. Macias Navarro, S. Grace, S. Going, M. Hingle, M. Nichter, N. Hongu, K. Astroth, L. Borden. 2009-2012. Akshen.org Application Suite. Online: <http://www.akshen.org>
- Meymaris, K., S. Henderson, K. Havens, S. Mazer, C. Brewer, **B. Orr**, S. Wright S. Mulder, B. McBride, B. Haggerty, T. Crimmins, R. Yu, N. Risen. 2007-2011. *Project BudBurst: A National Phenology Network Field Campaign for Citizen Scientists*. Online: <http://www.budburst.org/> 120 indexed web pages.
- Nowatski, J., A. Hays, G. Bonyngge, S. Bradt, N. Mattox, J. McGee, **B. Orr**, S. Prisloe, P. Rasmussen, K. Vlasek, and N. Watermeier. 2008-2011. *Geospatial Technology Resource Area for eXtension: Map@Syst*. Online: <http://www.extension.org/geospatial+technology/> 100+ peer-reviewed fact sheets, FAQs and learning modules.
- Olsson, A.**, S.E. Marsh, **B.J. Orr**, E. Pfirman, R.A. Schowengerdt, C.F. Hutchinson, F. Rojas, **J. Goodhue**, **Y. Torrey**, **W. Kaplan-Dunn**, **I. Lizarraga**, and D. Innes-Gwan. 1997-2011. *Arizona Regional Image Archive (ARIA)*. Tucson, AZ: Arizona Remote Sensing Center, University of Arizona. Online: <http://aria.arid.arizona.edu/>. 170 indexed web pages, 12,182 scenes, 16,627 registered users.
- Hongu, N., **B.J. Orr**, Y. Torrey, **N. Knutson**, S. Hoelscher Day, **M. Mosqueda**, M.J. Rahr, and L.M. Block. 2010-2011. *Walk Across Arizona* web development. Online: <http://cals.arizona.edu/walkacrossaz/>
- Marsh, S., **B. Orr**, W. van Leeuwen, A. Thwaites, A-M. White, W. Grunberg, K. Jain, C. Baker, J. Dale, **L. Baker**, Y. Yang, C-L. Kao, **N. Lerman**, **J. Saints**, **A. Olsson**, M-S. Kang, **G. Casady**, G. Oldham, C. Wallace, **C. McDonald**, **M. Hertzfeld**, **D. Tuttle**, **E. Benally**, K. Mauz, S. Herrmann, C. Hutchinson, B. Hutchinson, G. Ruyle, L. Howery, and P. Krausman. 2000-2010. *RangeView: Geospatial Tools for Natural Resource Management*. Tucson, AZ: Arizona Remote Sensing Center, University of Arizona. Online: <http://rangeview.arizona.edu>. 321 indexed web pages.
- Orr, B.J.**, W. Grunberg, A. Thwaites, **A. Olsson**, H. Severson, A. Cockerham, M. Haseltine, **N. Lerman**, J.C. Dale, M-S. Kang, B.J. Morehouse, T.W. Swetnam, S.R. Yool, J.T. Overpeck, G.L. Christopherson, **M. Crimmins**, and S. Mayden. 2001-2007. *WALTER: Exploring Wildfire Alternatives*. Tucson, AZ: Arizona Remote Sensing Center, University of Arizona. Online: <http://walter.arizona.edu>. 276 indexed web pages.
- Orr, B.J.**, **Y. Torrey**, **M. Hertzfeld**, **P. Porras**, A. Thwaites, J. McGee, G. Bonyngge, S. Prisloe, K. Vlasek, and A. Hays. 2005-2008. *National Geospatial Technology Extension Network (NGTEN)*. Online: <http://geospatialextension.org/>. 95 indexed web pages.
- Hutchinson, B.S., M. Haseltine, C.L. Casler, **B.J. Orr**, **J. Saints**, **J. Moeller**, W. Grunberg, J-C Dale, **N. Lerman**, Y. Yang, **Y. Yamaguchi**, J. Schalaus, and M. Baker. 2002-2006. *Managing Arid and Semi-Arid Watersheds*. Tucson, AZ: College of Agriculture and Life Sciences, University of Arizona. Online: <http://ag.arizona.edu/OALS/watershed/>. 864 indexed web pages.
- Olsson, A.**, **B.J. Orr**, W. Grunberg, A. Thwaites, S. Marsh, G. Beuttner, G. Trobia, and K. Hemenway. 2004-2008. Arizona FIREMAP (Fuels, Information, Restoration, and Education Mapping and Assessment Program) On-line: <http://www.azfiremap.org/azfiremap/>.

Curricula

Orr, B.J., A. Aledo Tur and S. Bautista. 2010-2011. Máster en Gestión y Restauración del Medio Natural, Universidad de Alicante (Masters in Management and Restoration of the Natural Environment), Alicante, Spain. Designed and taught a new course entitled “Transferencia y comunicación del conocimiento para la gestión” (TRANSF) (Knowledge transfer and communication for management), 3 units equivalent.

Wisneski, K., B. Orr, C. Hannah, J. Choquehuanca, J. Davies, K. Nakazny, and M. Moreno-Baez. 2010. Guidelines and “how to” fact sheets for integrating participatory, collaborative mapping into community and youth programs. Arizona Geospatial Extension Program, Arizona Remote Sensing Center, University of Arizona. (5 fact sheets, English and Spanish language versions).

- | | |
|--|---|
| - Overview: Google MyMaps and Participatory Mapping for Community Groups | - Sinopsis: Google <i>MyMaps</i> y Mapeo Participativo para Grupos Comunitarios |
| - How to Create a Gmail account for Participatory Mapping | - Cómo crear una cuenta de <i>Gmail</i> para el Mapeo Participativo |
| - Facilitating Participatory Mapping Project in Google MyMaps | - Facilitación del Proyecto de Mapeo Participativo en Google <i>MyMaps</i> |
| - Content Creation and Information in Participatory Mapping | - Creación del Contenido e Información en el Mapeo Participativo |
| - Enhancing your Google Maps for Participatory Mapping | - Mejorando tus mapas de Google para Mapeo Participativo |

Orr, B., K. Wisneski, P. Rasmussen, C. Stephens, G. Searle, J. Choquehuanca, D. Garcia, C. Pruden, T. Kong, and A. Olsson. 2007-2010. Geospatial Tool Kit and Collaborative Mapping Series. 44 Fact sheets created for a variety of Extension programming activities designed to support local needs for field mapping (using GPS and handheld GIS) and collaborative mapping (using Google Maps). Arizona and Utah Geospatial Extension Programs. University of Arizona and Utah State University. Contents include:

- | | |
|---|---|
| - How to use Google MyMaps for invasive species mapping | - GPSmap60 basics |
| - What is collaborative mapping? | - Getting to Know Your Garmin GPSmap 60 |
| - Collaborative mapping using Google MyMaps: Overview | - Getting started: using your GPSmap 60 |
| - Collaborative mapping for technology-based youth groups: Invasive species detection and eradication | - GPSmap 60 application #1: Marking and saving waypoints |
| - Collaborative mapping using Google MyMaps: Overview | - GPSmap 60 application #2: Finding, or navigating to, a waypoint |
| - Buffelgrass on right-of-ways data collection instructions | - GPSmap 60 Application #3: Finding a waypoint that was defined by someone else |
| - How to use the Buffelgrass Greenness Reporter | - GPSmap 60 Application #4: Recording your movements and retracing your steps |
| - How to use the InvaderRater Tool for identifying buffelgrass | - GPSmap 60 Application #5: Estimating area |
| - What is the Geospatial Toolkit (GTK)? | - Garmin GPSmap60 Quicklist |
| - Youth-driven community asset mapping | - Downloading GPS data and saving it in a useful format |
| - Maps, technology and geospatial tools: The GTK Trainer | - Using USGS global visualization viewer |
| - Why is mapping important? | - Getting started with an iPAQ handheld computer |
| - An introduction to topographic maps | - Getting started with HGIS |
| - Understanding scale and geospatial data | - More advanced topics in HGIS |
| - Using a topography map to define the boundaries of invasive species growth | - How to create an HGIS template file in Excel |
| - Location ref. systems & topographic maps | - Templates in HGIS: Customized data attribution |
| | - Images I can easily use: Aerial photos |
| | - Images I can easily use: Scanned Topo sheets |

- Using a compass and a topographic map
- How the global positioning system (GPS) works
- GPS sources of error
- Methods to improve GPS accuracy
- What is metadata?
- Sources of imagery and GIS data layers: USA
- Sources of imagery and GIS data layers: Global
- Imagery Viewers: Which one is for me?
- How to Obtain DOQs and DRGs
- Using TerraServer-USA

Orr, B., P. Rasmussen, R. Smith, C. Stephens, J. Payne, G. Searle, M. Hertzfeld, J. Moeller, T. Mau-Crimmins, L. Baker, A. Olsson, J. Schalau, J. Riggs, and D. Wright. 2002-2009. *The "Geospatial Tool Kit": Fact Sheets for Digital Field Mapping*. A series of 15 fact sheets (77 pages) addressing cartography, GIS and the use of aerial photography and satellite imagery in support of field mapping efforts. Tucson, AZ: National Geospatial Technology Extension Network (NGTEN). Online: <http://geospatialextension.org/resources/cool-tools/the-geospatial-toolkit>. Contents include:

- Maps, Technology and Geospatial Tools
- GPS Basics: Using the Garmin GPSmap 60
- Garmin GPSmap 60 Quick List
- Images I Can (Easily) Use (DOQs and DRGs)
- Using TerraServer-USA
- Imagery Viewers: Which One Is for Me?
- Sources of Imagery and GIS Data Layers
- Pocket PC Basics
- Pocket PC HGIS Tutorial
- Advanced HGIS
- Templates in HGIS: Customized Data Attribution
- Importing Field Data into a Desktop GIS
- ArcView 3.x Tips
- "Geospatial Tool Kit" Training System Specs
- Online Mapping with Google My Maps

Orr, B., T. Mau-Crimmins, L. Baker and M. Hertzfeld. 2002-2006. *The Geospatial Tool Kit: Digital Field Mapping Basics*. A lecture series of presentations (that can be tailored to course length) which corresponds to the Geospatial Tool Kit fact sheet series. [CD ROM: 3 PowerPoint Presentations/700 slides] Tucson, AZ: Office of Arid Lands Studies, University of Arizona.

Marsh, S., B. Orr, L. Baker, L., A. Thwaites, K. Mauz, G. Oldham, and B. Orr. 2002-2004. *RangeView Educational Materials*. These hands-on, multi-media materials provide an introduction to remote sensing basics for natural resource managers, with real application scenarios (e.g., vegetation monitoring, climate, wildfire), transitioning the student from guided instruction to personal exploration. Tucson, AZ: Office of Arid Lands Studies, University of Arizona. Online: <http://rangeview.arizona.edu>. Contents include:

- Tutorials
 - Remote Sensing Basics
 - Correlation of Monitoring and Satellite Data
- Instructional "How To" Movies
- Glossary of Remote Sensing Terms
- Instructional Presentations
- Student and Instructor Manuals
- Workshop Exercises
 - Vegetation Monitoring
 - Historical Trends in Vegetation Greenness (climate and urbanization)
 - Remote Sensing Basics in RangeView
 - Precipitation and Vegetation Greenness
 - Wildfire and Vegetation Dynamics

de Rosas, C., and B. Orr. 2004. *Santa Cruz County ArcView 3.3 Database for Cooperative Extension*. [CD-ROM: GIS database and instructional materials]. Tucson, AZ: Arizona Remote Sensing Center, University of Arizona.

Orr, B., C. de Rosas, and C. McDonald. 2004. *Introduction to GPS and GIS for Youth Programs*. Curriculum focused on introducing geospatial technology into youth programming in Cooperative Extension. [CD ROM: 2 PowerPoint presentations/170 slides, 8 fact sheets, resource materials]. Tucson, AZ: Office of Arid Lands Studies, University of Arizona.

Miller, R., C. de Rosas, H. Rodriguez, B. Orr, C. McDonald, and R. Parades. 2004. *RangeView Ejercicios y Recursos: Taller para Directores de Recursos Naturales*. Training materials,

exercises, and resources (32 pages) introduced initially at a training of natural resource managers and ecologists at IMADES in Sonora, Mexico. Tucson, AZ: Office of Arid Lands Studies, University of Arizona. Online: http://rangeview.arizona.edu/presentations/rv_intro_spanish_3-31-04.pdf .

Orr, B. 2001-2005. *Remote Sensing 101 & 102*. “Train the trainer” curricula for natural resource management and precision agriculture with emphasis on coordinate systems, remote sensing fundamentals, and geospatial data sources [CD-ROM: 270 slides/3 presentations]. Tucson, AZ: Office of Arid Lands Studies, University of Arizona.

Orr, B., D. Rautenkranz, and S. Skirvin. 2001. *Introduction to the Global Positioning System*. An introductory training on GPS for a “Train the Trainer” program. [CD-ROM: sample data specific to each county in Arizona, web resources, training documentation, 48 slide presentation]. Tucson, AZ: Office of Arid Lands Studies, University of Arizona.

Selected Scholarly Presentations

Summary of scholarly presentations as an Associate Specialist & Professor, including the proportion of those traditionally underrepresented in science, technology, engineering and mathematics (STEM).

	Scholarly Presentations	Total Participants
Colloquia	59	1674
Symposia	72	3973
Seminars	429	11788
Conferences	90	4699
Community Presentations	1092	15233
Total	1742	37367

Mentoring: Independent Studies, Theses, Dissertations

Summary of independent studies, theses and dissertations.

	Completed (chair)	Completed (committee)	In Progress (chair)	In Progress (committee)	Total
Independent studies	4	0	0	0	4
Undergraduate theses	0	5	0	3	8
NASA Space Grant undergrad interns	14	6*	3	5	28
NASA Space Grant graduate fellows	7	*	1	1	9
Masters theses	1	2	1	1	5
Dissertations	0	4	1	8	13

*Have provided less direct advising for numerous Space Grant awardees – those numbered here (and listed in the tables below) involved a more direct mentoring relationship

Extension and Educational Outreach

Summary of the Geospatial Extension Program by principle program components (2007-2012).

Principle Program Components	Events	Participants	Program (hrs)	Contact (hrs)*
<i>Geospatial Technology</i>	135	4,022	284	7,484
<i>Workforce Development</i>				
Extension Clientele	47	1,257	139	3,458
University Students	65	1,740	89	2,296
<i>Precision Approach to Natural Resources</i>				
Vegetation Monitoring	85	2,423	246	8,022
Forest Health & Wildfire Management	84	1,892	198	5,664
Invasive Species Mitigation	36	1,368	164	8,259
Climate, Water, Watershed Management	80	1,613	271	4,414
Precision Agriculture	17	413	70	900
Open Spaces - Exurbanization	34	581	48	1,533
Total	583	15,309	1,509	42,030

*Estimated number of participants was multiplied by the duration of the program.

Program Identification and Development

The mission of the Geospatial Extension Program is to facilitate the practical use of Earth systems science and technology, and to help meet the growing demand for a spatially literate workforce. The goal is to bridge the gap between geospatial research/technology and its use by the general public, with particular emphasis on natural resource managers, ranchers, farmers, and planners.

Program Objectives

1. Facilitate the use of Earth science technological capabilities, which include Earth observations from space, modeling and systems engineering, and other geospatial technology (e.g., GIS and GPS).
2. Define the market of potential users of geospatial technology by characterizing the needs of the different constituencies in Arizona (e.g., extension agents, ranchers, government agency personnel, etc.).
3. Identify lead users (early adopters vs. later adopters) among Extension professionals and their clientele and strategically involve them in education programs to help promote the diffusion of geospatial technology innovations to the broader community.
4. Identify and partner with academic and commercial interests in Arizona that are best positioned to meet those needs and facilitate partnerships with Cooperative Extension across the state.
5. Invest in efforts to make geospatial research and technology operational by promoting the development of web-based and ground-based geospatial applications.
6. Tailor geospatial extension programming, educational materials, training programs and decision support tools to help established Cooperative Extension programs meet their own objectives through use of geospatial technology (i.e., rangeland monitoring, water & watershed, wildfire, invasive species mitigation, youth and community development).
7. Promote spatial literacy through a) “train the trainer” approach within Extension, b) the promotion of appropriate certification programs in Arizona’s community colleges, and c) web-based educational materials, and c) collaborative workshops conducted in partnership with Extension agents.
8. Promote workforce development among Extension professionals and their clientele, with the underlying objective of helping meet the growing demand for a spatially literate workforce.
9. Promote workforce development among university students, with particular emphasis on science, technology, engineering and mathematics (STEM). This includes supporting University of Arizona and NASA Space Grant efforts to involve those traditionally underrepresented in STEM.
10. Involve undergraduate and graduate students in the development and implementation of extension and research initiatives, and provides the mentoring necessary for their success.

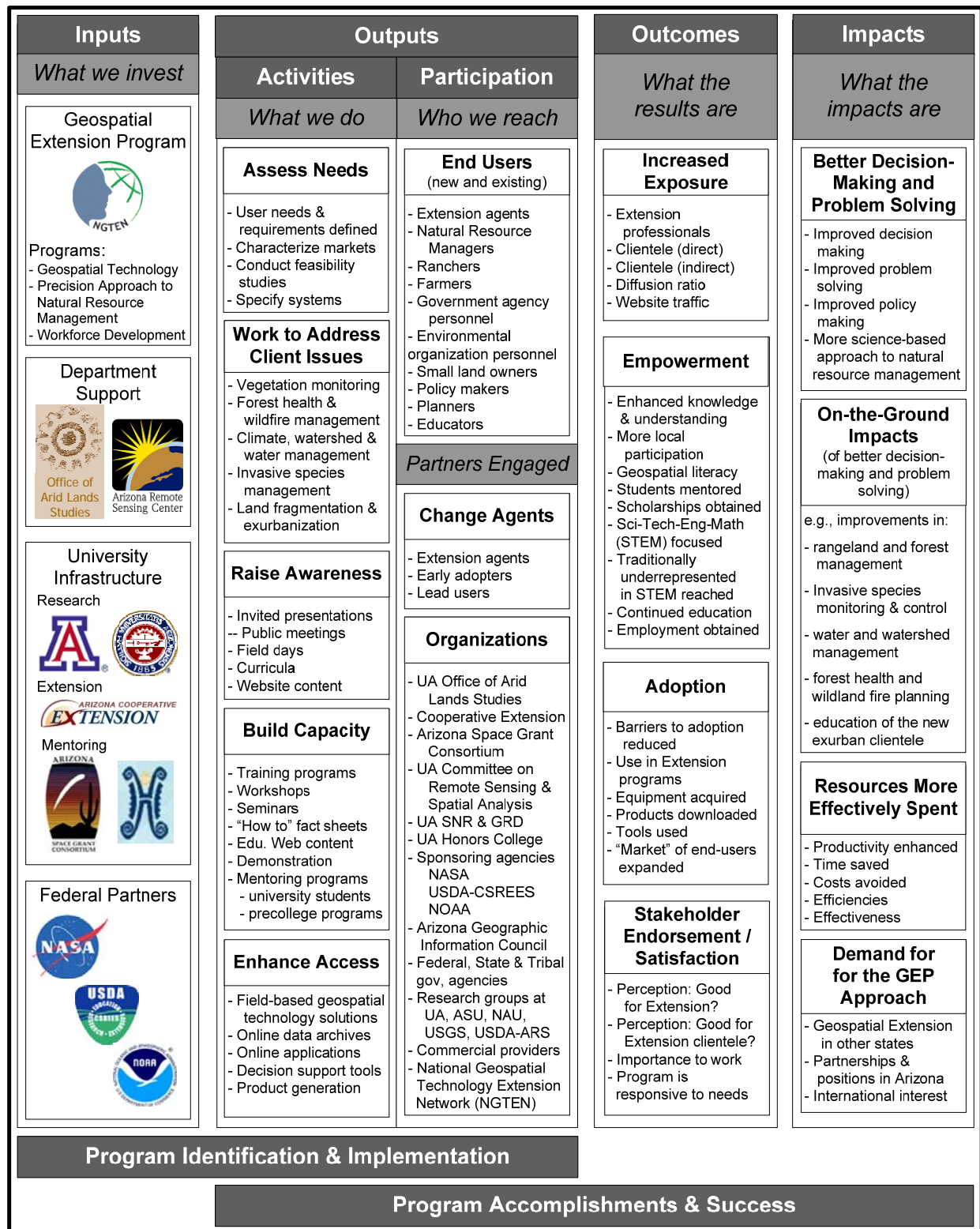


Figure 1. Logic model for the Geospatial Extension Program. Performance measures for outputs, outcomes and impacts are listed. (See Table 8 for these and corresponding program accomplishments.)

Selected Grants and Contracts

My research, extension and workforce development advising/mentoring programs are closely integrated. Since 2001 I have lead or supported 60 trans-disciplinary research & technology transfer projects totaling (\$25.6 M total, with an aggregate 23% effort or \$5.8M) from agencies including NASA, USDA, EPA, USGS, NSF, European Commission as well as a variety of state and local government and non-profit organizations.

Linkages between grants, student mentoring, and publications relative to research and extension programming.

	Geospatial Technology/ Extension	Workforce Development	Precision Natural Resources	Healthy Environments/ Lifestyles	Total
<i>Total (2001-2012)</i>					
-number of grants	8	13	34	5	60
-value of grants	\$2,430,669	\$7,100,003	\$14,406,222	\$1,606,699	\$25,543,593
-students mentored	13	0	40	22	75
-my contribution	\$363,801	\$3,550,002	\$1,211,315	\$509,514	\$5,634,632
-peer-reviewed pubs	17	1	50	18	86
-not peer-reviewed pubs	57	2	95	30	184

Some examples are listed below.

Planning, Development and Implementation of a State-wide Research Initiative in Environmental Informatics: “Arizona Environmental Grid Infrastructure Service (AEGIS)”. \$1,350,000. 2013 – 2016. ABOR Regents’ Innovation Fund. Co-I with M. Bruck, N. Merchant, R. Monson, J. Russell (UA); P. Flikkema, P. Heinrich, S. Shuster, A. Whipple (NAU); J. Collins, R. Quay, K. Galluppi, K. Ogle, K. Gurney (ASU). Effort: 10% author, extension & research.

Providing Virtual Cultural Context to Enhance Informal Language Learning. \$28,000 (2,800,000 ¥). 2013-2015. Japan Society for the Promotion of Science (JSPS). Effort: 25% author, research. Co-PI with K. Fujii and J. Matlock.

*Prevention and Restoration Actions to Combat Desertification. An Integrated Assessment (PRACTICE). \$1,246,852 (976,965 €). 2009 – 2012. *European Commission*. Effort: 25% author, research, extension. Scientific Advisory Board Member with V.R. Vallejo, S. Bautista, G. Enne, C. Zucca, J. Hill, P. Nunes, I. Ispikoudis, H. Geist, I. Rojo Serrano, N. Jürgens, E. Menezes de Sequeira, M. Shachak, K. Kellner, D. Wang, J. Gutiérrez, M. Cotera, et al.

Evaluación Participativa y Ciencia de la Transferencia para Combatir la Desertificación. \$28,960 (22,691 €). 2010. Spanish Government. Effort: 100% author, research.

Participatory Assessment and Translational Science to Combat Desertification. \$21,821 (17,098 €). 2010. *Fulbright Commission*. Effort: 100% author, research.

Assessing and supporting drought monitoring needs on the Hopi and Navajo Nations. 2010-2012. *NOAA*. Effort: 15%, extension. C-I with M. Crimmins, D. Ferguson, S. Marsh, W. van Leeuwen, and G. Casady (UA).

San Simon Watershed Land Degradation/Mitigation Assessment. \$100,000. 2009-2014. *Bureau of Land Management*. Effort: 20% author, research. PI with M. Crimmins, B. Brandau, C. Hutchinson, S. Marsh, K. Uhlman (UA), and M. Nichols (ARS).

*Forest Fires under Climate, Social and Economic Changes in Europe, the Mediterranean and Other Fire-affected Areas of the World (FUME). \$8,761,224. (6,864,818 €) 2010 – 2013. *European Commission*. Effort: 2% author, research, extension. Co-PI with J.M. Moreno, V.R. Vallejo, P. Corona, S. Rambal, K.

Thornicke, T. Ricardo, C. Andrea, V. Bacciu, S. Sirca, L. Borgniet, M. Arianoutsou, N. Koutsia, A. Arneth, J. Gutiérrez, F. Mouillot, A. Venäläinen, C. Conese, M. Aguinaco, P. Martin, M. Fernandez, J. Pereira, C. Egenhofer, A. Madoui, K. Abdelmoula, A. Mokssit, A. Kavgacı, G. Midgley, A. Gonzalez, P. Fulé, D. Falk, T. Swetnam, J. Keeley, R. Bradstock, M. González, et al.

Stealth Health: Youth Innovation, Mobile Technology, Online Social Networking and Informal Learning to Promote Physical Activity. \$1,476,310. 2009 – 2011. USDA-CSREES-NRI. Effort: 30% author, research, extension. Co-PI with S. Going, N. Hongu, D. Roe, M. Nichter, K. Astroth, L. Borden, N. Merchant, S. Marsh (UA).

Arizona Space Grant Consortium (successfully renewed each of 10 consecutive years). \$6,155,000. 2002 – 2012. NASA. Effort: 50% co-author; workforce development. Co-PI with M. Drake, S. Brew (UA); H. Reed, T. Sharp (ASU); B. Lutz, N. Barlow (NAU); R. Madler (Embry-Riddle Aeronautical U.).

Assistance to the Senegal River Authority. \$379,988. 2007 – 2009. *Organisation pour la Mise en Valeur du Fleuve Sénégal (OMVS)*. Effort: 5% author, research, extension. Co-PI with T. Finan, M. Baro, J. Magistro, D. Slack, E. Martin, J. Valdes, W. van Leeuwen, G. Casady, S. Marsh, C. Hutchinson (UA).

Post-Fire Vegetation Recovery: Impacts of Restoration and Environment. \$100,000. 2009 – 2011. *International Arid Lands Consortium*. Effort: 10% author, research. Co-PI with W. van Leeuwen, G. Casady (UA), D. Neary (USFS), C. Allen (USGS), S. Bautista (U. de Alicante), L. Wittenberg, D. Malkinson (U. of Haifa).

Dryland Vegetation Dynamics and Landscape Vulnerability to Wildfire. \$100,000. 2004-2006. *USDA Forest Service (through International Arid Lands Consortium)*. Effort: 50% co-author; research. PI with W. van Leeuwen (UA), D. Neary (USDA/FS/RMRS), S. Bautista (U. de Alicante), L. Wittenberg (U. of Haifa), Y. Carmel (Israel Institute of Technology).

"High Tech, High Touch": Professional Development in Geospatial Applications for Invasive Species Management. \$60,560. 2007 – 2008. Western SARE (USDA). Effort: 50% author, extension. PI with S. Marsh and A. Thwaites.

Leadership and Mentoring of the Pascua Yaqui Intel Clubhouse for the United Way Youth Empowerment Program. \$15,394. 2006 – 2009. United Way of Tucson and Southern Arizona. Effort: 100% PI, author, extension. With K. Wisneski (UA).

Spirit of the Sun (SOS): Community Asset Mapping by Disadvantaged Youth. \$26,292. 2006 – 2009. USDA CYFAR. Effort: 100% PI, author, extension. PI with K. Wisneski, C. Hannah.

A Decision Model for Controlling Buffelgrass (*Pennisetum ciliare*) Invasion in an Urban-Wildland Interface Combining Dynamic Programming with the Analytical Hierarchy Process. \$119,000. 2006-2009. *USDA-ERS Program of Research on the Economics of Invasive Species Management (PREISM)*. Effort: 20% co-author; research. Co-PI with G. Frisvold, S. Marsh, A. Olsson, T. Bean (UA) and J. Betancourt (USGS).

An Investigation of the Upper Santa Cruz River 2005 Riparian Area Die-Off. \$11,940. 2006-2007. *USGS National Institutes for Water Resources (NIWR) 104b*. Effort: 50% co-author; research. PI with A. McCoy (UA).

Animated Simulations for Semi-Arid Watersheds. \$74,965. 2004-2006. *USDA Forest Service (through International Arid Lands Consortium)*. Effort: 25% co-author; extension. Co-PI with M. Haseltine, C. Casler, J. Schalau (UA); D. Neary (USDA/FS/RMRS).

Building Arizona's Wildfire Prevention Capacity through Geospatial Technology. \$209,044. 2004 – 2006. *Department of Homeland Security, Office of Domestic Preparedness, Fire Prevention & Safety Grant*. Effort: 75% co-author; extension; R&D in support of technology transfer. Co-PI with A. Rogstad (UA).

Assessment of Environmental Impact of Bt Cotton: Using Ant Species as a Biological Indicator. \$118,584. 2002 – 2004. EPA. Effort: 20% co-author; research Co-PI with Y. Carrière, D. Wheeler, P. Baker, T. Dennehy, and B. Tabashnik (UA).

RangeView: A Decision Support Tool for Ecological Monitoring. \$1,099,275. 2002 – 2005. *NASA/Raytheon Synergy Initiative*. Effort: 35% co-author; extension; R&D in support of technology transfer. Co-PI with S. Marsh, C. Hutchinson, W. van Leeuwen, B. Hutchinson, W. Grunberg, A. Thwaites, L. Howery, G. Ruyle (UA).

Arizona Space Grant Consortium (successfully renewed each of 8 consecutive years). \$4,520,000. 2002 – 2010. *NASA*. Effort: 50% co-author; workforce development. Co-PI with M. Drake, S. Brew (UA); H. Reed, T. Sharp (ASU); B. Lutz, N. Barlow (NAU); R. Madler (Embry-Riddle Aeronautical U.).

Climate and Human Contributions to Fire Regimes Affecting Ecosystems in the U.S. Southwest. \$1,260,993. 2001 – 2004. *Environmental Protection Agency Star Grant*. Effort: 20% co-author, research, extension. Co-PI with B. Morehouse, S. Yool, T. Swetnam, J. Overpeck, G. Christopherson (UA).

*European Commission rules changed after these grants were written, disallowing funds for US organizations, to match US policy to disallow subcontracts for foreign organizations participating on US. Federal funds. Therefore in each the University of Arizona is a designated “unfunded partner”.

Languages

English (fluent), French (advanced), Moroccan Arabic (intermediate), Spanish (beginning), Chichewa (beginning)