

TEXAS STATE VITA

I. Academic/Professional Background

**A. Name: Thomas Hardy Title: Meadows Professor of Environmental Flows,
Department of Biology**

B. Educational Background

Degree	Year	University	Major	Thesis/Dissertation
Ph.D.	1988	Utah State University	Civil and Environmental Engineering	State-parameter estimation of real time river water quality
Masters	1982	University of Nevada	Aquatic Ecology	Ecological interactions of the introduced and native fishes in the outflow of Ash Springs, Lincoln County, Nevada
Bachelors	1978	University of Nevada	Biology	NA
Bachelors	1977	University of Nevada	Education	NA

C. University Experience

Position	University	Dates
Professor; Department of Biology	Texas State University	2014-present
Research Professor/Senior Lecturer, Department of Biology	Texas State University	2009-2014
Chief Science Officer, Meadows Center for Water and the Environment	Texas State University	2009-present
Professor; Department of Civil and Environmental Engineering	Utah State University	2002-2009
Associate Director, Utah Water Research Laboratory	Utah State University	2002-2009
Associate Professor, Department of Civil and Environmental Engineering	Utah State University	1995-2002 (Tenured in 1995)
Assistant Professor, Department of Civil and Environmental Engineering	Utah State University	1990-1995
Research Assistant Professor, Department of Civil and Environmental Engineering	Utah State University	1988-1990
Director, Institute for Natural Systems Engineering	Utah State University	1987-2009
Acting Research Assistant Professor, Department of Civil and Environmental Engineering	Utah State University	1987-1988
Research Scientist, Aquatic Biology	University of Nevada at Las Vegas	1980-1982

D. Relevant Professional Experience

Position	Entity	Dates
Principal	Watershed Systems Group, INC	1978-present
Principal	Environmental Mapping and Remote Sensing, Inc.	1994-1999
Instructor, Computer Techniques	Utah Division of Wildlife Resources	1988

Research Engineer	BIO/WEST, Inc.	1984-1987
Research Diver	University of Nevada at Las Vegas Utah Water Research Laboratory	1979-1984 1984-1985
Civil Engineer	Twelve-Nine, Inc.	1984
Project Manager/Aquatic Ecologist	Environmental Consultants, Inc.	1979-1985
Surveyor	Clark County Engineering Department	1976

II. TEACHING

A. Teaching Honors and Awards: NA

B. Courses Taught:

Course	Entity	Dates
BIOL 7360 – Approaches to Aquatic Resource Modeling	Texas State University	2012,2013,2014
CEE 5690/6690 - Natural Systems Engineering	Utah State University	2002,2003,2004,2005,2006, 2008
CEE 6930 - Special Problems	Utah State University	1999,2003,2004,2005,2006
CEE 5700/6700 - Field sampling techniques	Utah State University	1999,2000,2001
CEE 493/693 - Special problems in natural systems engineering	Utah State University	1998
CEE 596/696 - Management of Regulated Rivers	Utah State University	1994,1995
CEE 588 - Senior Design Seminar	Utah State University	1993,1994,1995,1996,1997, 1998,1999,2002,2003,2004, 2005,2006
CEE 369 - Environmental Systems Engineering	Utah State University	1993,1994,1995,1996,1997, 1998
CEE 796 (5720/6720) - Natural Systems Modeling	Utah State University	1992,1997,1998,1999,2000, 2001,2003,2004,2005,2006
CEE 363 - Introduction to Environmental Engineering	Utah State University	1992,1993,1994,1995,1996
CEE 103 – Digital computer applications in engineering	Utah State University	1990,1991,1992
CEE 693 – Ecology and management of regulated rivers	Utah State University	1990

C. Graduate Theses/Dissertations or Exit Committees:

1. Ph.D. students (Committee Chair)

Michele Crawford Recreation induced impacts on Texas wild rice growth and fitness, Texas State University, anticipated completion Fall 2015

Nikki Davis Predicting future range expansion of Whooping Crane (*Grus americana*) winter habitat using long-term censure and remotely sensed data, Texas State University, anticipated completion Fall 2015

Alphonse Guzha Integrating surface and sub-surface flow models of different spatial and temporal scales using potential coupling interfaces, Utah State University, 2008. Post Doctoral Research Associate, University of Florida, 2008-2011; Visiting Research Scientist, George-August Goettingen University, Germany, 2011-present.

Leon Basdekas Virgin River operations optimization model, Utah State University, 2007. Senior Engineer, Watercourse Engineering, Inc., 2005-2008; Principal Engineer (Water Resources), Colorado Springs Utilities, 2008-present.

Craig Addley Habitat modeling of river ecosystems: multidimensional spatially explicit and dynamic habitat templates at scales relevant to fish, Utah State University, 2006. Senior Consultant, Cardno Entrix, Inc., 2006-present.

Anji Dodd Two-dimensional mobile bed hydrodynamic model for the transport of mixed sediments, Utah State University, 2006. CALFED Science Fellow, Humboldt State University, Arcata, CA, 2005-2008; Senior Environmental Scientist/Engineer, Huffman and Carpenter, LLC, 2007-2008; Senior Project Manager, Manhard Consulting, 2008-2013; Visiting Faculty, Humboldt State University, 2013-present; Senior Project Manager, Kimley-Horn and Associates, Inc., 2013-present.

Ekaterina Saraeva Development of an instream flow-based extrapolation procedure for the Nooksack Watershed, Utah State University, 2006. Post Doctoral Research Associate, Utah Water Research Laboratory, Utah State University, 2006-2011. Research Engineer, Watershed Systems Group, Inc. 2013-present.

Ph.D. Committee member/exit committee

Paravathis Nair (Texas State University – San Marcos)

Graham Daly (Geography – Texas State University – San Marcos)

Francesco Zignol (Geography – Texas State University – San Marcos)

Adrian Vogl (Texas State University – San Marcos)

Ahmed Mohamed (Utah State University)

Anga Rebane (Utah State University)

Bethany Neilson (Utah State University)

David Kikkert (Utah State University)

Hussein Batt (Utah State University)

Issaak Vasquez (Utah State University)

Jacing Chou (Utah State University)

Joon Hee Lee (Utah State University)

Karen Williams (Utah State University)

Kiran Chinnayakanahalli (Utah State University)

Madeline Merck (Utah State University)

Mark Schmelter (Utah State University)

Miaohsi Wang (Utah State University)

Rajiv Prasad (Utah State University)

Robert Black (Utah State University)

Sanyogita Andriyas (Utah State University)

Shyamal Bikash Chowdhury (Utah State University)

Somkiat Prajamwong (Utah State University)

Tong Yin (Utah State University)

2. Master's students (Committee Chair)

Ovie Shola Acoustic responses of Black Bass to prey sounds, anticipated completion date, Fall 2015

Jacob Bilbo Seasonal impact of recreation based suspension of turbidity on the macroinvertebrate assemblage of the San Marcos River, anticipated completion Fall 2015

Greg Cummings Habitat association of Rainbow Trout in the Canyon Reservoir tailrace, anticipated completion Fall 2015

Alison Tarter Impacts of small dams on the distribution of potential mussel host fish in the Colorado River basin, Texas, anticipated completion data, Spring 2016

Ariane McClendon Topic not specified yet

Laura Clark Applications of unmanned autonomous vehicle systems: Mapping salt cedar and change detection of petroleum exploration, 2014

Eric McKlesky A behavioral-based, mechanistic population model for sympatric stream salmonids using the SWARM simulation system, Utah State University, 2005

Britanie Ames A simplified method for estimating sediment transport flow regimes based on a stream classification system, Utah State University, 2005

Mikhail Bhosle Estimating uncertainty in fish habitat modeling using two-dimensional hydraulics, Utah State University, 2004

Jason Thompson A methodology for assessing aquatic habitat and riparian habitat quality at the watershed scale, Utah State University, 2003

Hans Milliken A comparative evaluation of instream flow protection criteria for aquatic resources on Forest Service managed stream systems, Utah State University, 2003

Nathan Kennard Development and testing of a rapid assessment methodology for instream habitat, Utah State University, 2000

Loni Johnson The application of multi-spectral airborne imagery for the detection of temporal changes in stream channel characteristics, Utah State University, 1999

Greg Guensch Validation of an individual-based, mechanistic habitat selection model for drift-feeding salmonids, Utah State University, 1999

Jennifer Ludlow Comparison of physical habitat simulation models with energetic modeling for habitat use, Utah State University, 1997

Nathan Bartsch Development and utilization of a physical habitat model for *Etheostoma fonticola* in the Landa Lake and Comal River systems, Utah State University, 1996

Karl Tarbet Evaluation of two-dimensional hydraulic modeling in a natural river and implications in instream flow assessment methods, Utah State University, 1996

Michael Chulick Statistical modeling methodology for the determination of habitat suitability and habitat preferences of the endangered fountain darter, Utah State University, 1995

James Shoemaker Use of multispectral aerial videography for jurisdictional delineation of wetland areas, Utah State University, 1994

Thomas Redd Use of airborne multispectral videography for the classification and delineation of riparian vegetation, Utah State University, 1994

Kiran Panja Classification of mesoscale hydraulic features based on spectral analysis of multispectral aerial videography, Utah State University, 1994

Brent Crowther Delineation of mesoscale hydraulic features, subaqueous sediments, spawning sites, and riverine bathymetry in the south fork of the Salmon River utilizing multispectral, airborne videography, Utah State University, 1994

Craig Addley A mechanistic approach to modeling habitat needs of drift feeding salmonids, Utah State University, 1991

Brent Bartz Sources of uncertainty and effects on interpretation of results in the development of instream flows for fisheries habitat, Utah State University, 1990

M.S. Committee member/exit committee

Anna Perez (Texas State University – San Marcos)
Bianca Hernandez (Texas State University – San Marcos)
Emily Cowles (Texas State University – San Marcos)
Sarah Zappitello (Texas State University – San Marcos)
Kerstin Hoesel (Texas State University – San Marcos)
Rachel Byrne (University of Houston – Clear Lake)
Casey Williams (Texas State University – San Marcos)
Kristina Tolman (Texas State University – San Marcos)
Clara Fobb (Texas State University – San Marcos)
Lauren Loney (Texas State University – San Marcos)
Kenneth Behen (Texas State University – San Marcos)
Kerstin Hoesel (Texas State University – San Marcos)
Rachel Byrne (University of Houston – Clear Lake)
Abdelmonaim Angallouch (Utah State University)
Ben Case (Utah State University)
Brian Hines (Utah State University)
Bruce Savage (Utah State University)
Cynthia Tyler (Utah State University)
El-Hassan K. El-Hassan (Utah State University)
Lizzette Oman (Utah State University)
Mark Woodbury (Utah State University)
Paul Badame (Utah State University)
Rajan Phadnis (Utah State University)
Shanda Fallau (Utah State University)
Walter Wilson (Utah State University)

D. Courses Prepared and Curriculum Development:

BIOL 7360 – Approaches to Aquatic Resource Modeling
 IF310 – Using the computer based PHABSIM system
 CEE 103 – Digital computer applications in engineering
 CEE 363 – Introduction to Environmental Engineering
 CEE 369 – Environmental Systems Engineering
 CEE 493/693 Special problems in natural systems engineering
 CEE 5690/6690 – Natural Systems Engineering
 CEE 5700/6700 – Field sampling techniques
 CEE 5720/6720 – Natural Systems Modeling
 CEE 596/696 – Management of Regulated Rivers
 CEE 693 – Ecology and management of regulated rivers

Member of Curriculum Committee for transition of USU's Civil and Environmental Engineering program through conversion from quarters to semesters and subsequent ABET Accreditation.

E. Funded External Teaching Grants and Contracts: NA

F. Submitted, but not Funded, External Teaching Grants and Contracts: NA

G. Funded Internal Teaching Grants and Contracts: NA

H. Submitted, but not Funded, Internal Teaching Grants and Contracts: NA

I. Other: NA

III. SCHOLARLY/CREATIVE

A. Works in Print

1. Books (if not refereed, please indicate)

The Science of Instream Flows: A Review of the Texas Instream Flow Program (2005).
Committee on Review of Methods for Establishing Instream Flows for Texas Rivers,
National Research Council. Washington, D.C., National Academies Press, c2005. ISBN:
0-309-54808-X, 162 pages.

a. Scholarly Monographs: NA

b. Textbooks:

The Theory and Application of the Physical Habitat Simulation System (PHABSIM). Copyright
- Thomas B. Hardy 2006. All rights reserved. 148pp.
Translated into Japanese (2009).
Translated into Korean (2006).

c. Edited Books:

Texas Riparian Areas. 2015. The Meadows Center for Water and the Environment. Texas A&M
Press, College Station, Texas. Thomas B. Hardy and Nicole A. Davis editors. ISBN: 978-
1-62349-255-7. 219 pages.

d. Chapters in Books:

Hardy, T.B., and T.A. Shaw. 2013. Application of real-time management for environmental flow regimes. In: Ecohydraulics: An Integrated Approach (I. Maddock, A. Harby, P. Kemp, and P. Wood, Eds), John Wiley & Sons, Chichester, UK.
(doi: 10.1002/9781118526576.ch16)

Hardy, T.B., D.S. Bowles, and K. Bosworth. 1987. Recursive river water quality estimation using abstract evolution equations in functional Sobolev spaces. In: Systems analysis in water quality management (M.B. Beck, Ed). Pergamon Press, London. 321-331 pp.

Deacon, J.E., and T.B. Hardy. 1984. Streamflow requirements of woundfin (*Plagopterus argenteus*): Cyprinidae in the Virgin River, Utah, Arizona, Nevada. In: Festschrift for

Walter W. Dalquest in Honor of His Sixty-sixth Birthday (N.V. Horner, Ed). Department of Biology, Midwestern State University, 1984. 141-163 pp.

Hardy, T.B., C.G. Prewitt, and K.A. Voos. 1982. Application of a physical habitat usability model to the fish community in a spring-fed desert stream. In: *Analysis of Ecological Systems: State-of-the-Art in Ecological Modeling* (Lauenroth, Skogerboe, and Flug, Eds). *Developments in Environmental Modeling* 5. Elsevier Scientific Publishing Company. 391-397 pp.

e. Creative Books:

Arielle's Answer (Copyright 2003 - Thomas B. Hardy. Self Published)

2. Articles

a. Refereed Journal Articles (Students underlined):

Hardy, T.B., K. Kollaus, K. Tolman, T. Heard, and M. Howard. 2015. Ecohydraulics in applied river restoration: a case study in the San Marcos River, Texas, USA. *Journal of Applied Water Engineering and Research*, 2015.

<http://dx.doi.org/10.1080/23249676.2015.1090352>

Som, N.A., D.H. Goodman, R.W. Perry, and T.B. Hardy. 2015. Habitat suitability criteria via parametric distributions: Estimation, model selection, and uncertainty. *River Research and Applications*. DOI: 10.1002/rra.2900

Birdsong, T.W., M. Bean, T.B. Grabowski, T.B. Hardy, T. Heard, D. Holdstock, K. Kollaus, S. Magnelia, and K. Tolman. In press. Unmanned Aerial Systems in Aquatic Resources Management. *Journal of the Southeastern Association of Fish and Wildlife Agencies*.

Kollaus, K.A., K.P.K. Behen, T.C. Heard, T.B. Hardy, T.H. Bonner. 2014. Influence of urbanization on a karst terrain stream and fish community. *Urban Ecosystems*, 29 June 2014. ISSN 1083-8155. DOI 10.1007/s11252-014-0384-x

Basdekas, L., L.A. Bastidas, T.B. Hardy, A.J. Caplan, and M. McKee. 2012. Virgin River multi-objective optimization: Maximizing endangered fish habitat and minimizing costs. *International Journal of River Basin Management*. Vol. 12 (1):15-28pp

Perkin, J.S., Z.R. Shattuck, P.T. Bean, T.H. Bonner, E. Saraeva, and T.B. Hardy. 2010. Movement and microhabitat associations of Guadalupe Bass in two Texas rivers. *North American Journal of Fisheries Management* 30:33-46.

Guzha, A.C., and T.B. Hardy, 2009. Application of the distributed hydrological model, TOPNET, to the Big Darby Creek watershed, Ohio, USA. *Water Resources Management Journal* 24:979-1003. (DOI 10.1007/s11269-009-9482-6).

Saraeva, E., and T.B. Hardy. 2009. Prediction of fisheries physical habitat values based on hydraulic geometry and frequency distributions of depth and velocity. *International Journal of River Basin Management* 7:31-41.

Saraeva, E., and T.B. Hardy. 2009. Extrapolation of site-specific weighted usable area curves and instream flow requirements to unmeasured streams within the Nooksack watershed in support of strategic watershed planning. *International Journal of River Basin Management* 7:91-103.

Hardy, T.B., T. Shaw, R.C. Addley, G.E. Smith, M. Rode, and M. Belchik. 2006. Validation of chinook fry behavior based escape cover modeling in the lower Klamath River. *International Journal of River Basin Management* 4:169-178.

- Hardy, T.B., and C. Addley. 2003. Instream flow assessment modeling: combining physical and behavioral-based approaches. *Canadian Water Resources Journal* 28:1-10.
- Gregory, P.J., J.S.I. Ingram, R. Anderson, R.A. Betts, V. Brovkin, T.N. Chase, P.R. Grace, A.J. Gray, N. Hamilton, T.B. Hardy, S.M. Howden, A. Jenkins, M. Meybeck, M. Olsson, I. Ortiz-Monasterio, C.A. Palm, T.W. Payn, M. Rummukainen, R.E. Shulze, M. Thiem, C. Valentin, and M.J. Wilinon. 2002. Environmental consequences of alternative practices for intensifying crop production. *Agriculture, Ecosystem and Environment* 88:279-290.
- Guensch, G.R., T.B. Hardy, and R.C. Addley. 2001. Validation of an individual-based, mechanistic habitat selection model for drift-feeding salmonids. *Canadian Journal of Fisheries and Aquatic Science* 58:446-457.
- Goodwin, P., and T.B. Hardy. 1999. Integrated simulation of physical, chemical and ecological processes for river management. *Journal of Hydroinformatics* 1:33-58.
- Gilver, D.J., R. Bryant, and T.B. Hardy. 1999. Remote sensing of channel morphology and in-stream fluvial processes. *Progress in Environmental Science* 1:257-284.
- Hardy, T.B. 1998. The future of habitat modeling and instream flow assessment techniques. *Regulated Rivers: Research and Management* 14:405-420.
- Hardy, T.B. 1995. Assessing environmental effects of severe sustained drought. *Water Resources Bulletin, American Water Resources Association* 31:867-875.
- Kershner, J.L., and T.B. Hardy. 1992. The rules of the game for evaluation of FERC relicense proposals. *Rivers* 2:342-345.
- Modde, T., and T.B. Hardy. 1992. Influence of different microhabitat criteria on salmonid habitat simulation. *Rivers* 3:37-44.
- Bishop, A.B., T.B. Hardy, and B.D. Glabou. 1990. Analyzing instream flow tradeoffs for small hydropower development. *Rivers* 1:173-182.
- Valdez, R., P. Holden, and T.B. Hardy. 1990. Habitat suitability index curves for humpback chub in the upper Colorado River Basin. *Rivers* 1:31-42.

b. Non-refereed Articles:

- Hardy, T.B. 2005. Klamath basin water resources issues: perspectives from the center of the event horizon. *The Water Report* 11:9-12, 16-17.

3. Conference Proceedings

3.a Referred Conference Proceedings

- Hardy, T.B., K. Kollaus, K. Tolman, T. Heard, and M. Howard. 2014. Ecohydraulics in applied river restoration: A case study in the San Marcos River, Texas, USA. 10th International Symposium on Ecohydraulics 2014. Trondheim, Norway, June 23-27th.
- Kollaus, K.A., K.M. Tolman, T.C. Heard, N. Raphelt, and T.B. Hardy. 2014. Assessing potential removal of two low-head dams in an urbanized Texas karst stream. 10th International Symposium on Ecohydraulics 2014. Trondheim, Norway, June 23-27th.
- Tolman, K., K. Kollaus, T. Heard, T. Hardy, J. Jensen, and N. Currit. 2014. Habitat suitability modeling of endangered, *Zizania texana*, within a highly urbanized, artesian ecosystem in San Marcos, Texas. 10th International Symposium on Ecohydraulics 2014. Trondheim, Norway, June 23-27th.
- Duel, H., and T.B. Hardy. 2012. River ecosystem observatory network initiative. 9th International Symposium on Ecohydraulics 2012. H. Mader, and J. Kraml (Eds). ISBN: 978-3-200-02862-3. <http://www.iahr.org/site/cms/contentviewarticle.asp?article=663>

- Hardy, T.B., R. Perry, S. Williamson, and T. Shaw. 2012. Application of a salmonids life cycle model for evaluation of alternative flow regimes. 9th International Symposium on Ecohydraulics 2012. H. Mader, and J. Kraml (Eds). ISBN: 978-3-200-02862-3.
- Hardy, T.B., K.A. Kollaus, T. Heard, J.M. Tennant, and K. Tower. 2012. Incorporating physical habitat and water temperature modeling at high spatial and temporal scales to evaluate required minimum flow regimes during sustained drought. 9th International Symposium on Ecohydraulics 2012. H. Mader, and J. Kraml (Eds). ISBN: 978-3-200-02862-3. <http://www.iahr.org/site/cms/contentviewarticle.asp?article=663>
- Hardy, T.B., W. Nowlin, B. Schwartz, and T. Bonner. 2010. Implementation of the San Marcos river observing system: a spatially explicit delineation of a spring system based on physical, hydrologic, chemical, and biological monitoring. 8th International Symposium on Ecohydraulics, Seoul, Korea, September 12-16, 2010. 1714-1721 pp. <http://www.iahr.org/site/cms/contentviewarticle.asp?article=663>
- Hardy, T.B., A.M. Jensen, S. Clemens, and M. McKee. 2010. Development and application of a low cost unmanned autonomous vehicle for multispectral imaging of riparian and stream habitats. 8th International Symposium on Ecohydraulics, Seoul, Korea, September 12-16, 2010. 1200-1204 pp. <http://www.iahr.org/site/cms/contentviewarticle.asp?article=663>
- Hardy, T.B. 2008. River restoration: Integration of sediment and riparian modeling for assessment of long-term post restoration conditions for aquatic resources. International Symposium on the Stream Corridor Restoration, River Environmental Technology Institute, Seoul, Korea. November 11, 2008. English and Korean papers printed in Symposium Proceedings.
- Hardy, T.B., and R.C. Addley. 2001. Vertical integration of spatial and hydraulic data for improved habitat modeling using geographic information systems. In: Hydro-ecology: Riverine Ecological Response to Changes in Hydrological Regime, Sediment Transport, and Nutrient Loading (M.C. Acreman, Ed.). IAHS Publication 266.
- Addley, R.C., and T.B. Hardy. 1999. Three dimensional physical and bioenergetics habitat in large river systems using state-of-the-art hydroacoustics, GPS, GIS, photogrammetry, and computational fluid dynamics. In: Proceedings of the 3rd International Symposium on Ecohydraulics – Strategies for Sampling, Characterization and Modeling of Aquatic Ecosystems in Applied Multi-disciplinary Assessment Frameworks. 7 pp. <http://www.iahr.org/site/cms/contentviewarticle.asp?article=663>
- Shoemaker, J., J. Ludlow, and T.B. Hardy. 1999. A system for collection of high precision bathymetry. In: Proceedings of the 3rd International Symposium on Ecohydraulics – Strategies for Sampling, Characterization and Modeling of Aquatic Ecosystems in Applied Multi-disciplinary Assessment Frameworks. 7 pp. <http://www.iahr.org/site/cms/contentviewarticle.asp?article=663>
- Guensch, G. and T.B. Hardy. 1999. Validation of a mechanistic habitat selection model for drift feeding salmonids. In: Proceedings of the 3rd International Symposium on Ecohydraulics – Strategies for Sampling, Characterization and Modeling of Aquatic Ecosystems in Applied Multi-disciplinary Assessment Frameworks. 8 pp. <http://www.iahr.org/site/cms/contentviewarticle.asp?article=663>
- Hardy, T.B. 1996. Formation of the international aquatic modeling group. In: The 2nd International Symposium on Habitat Hydraulics, Quebec, Canada. pp A845-850. ISBN 2-89146-380-3: Volume A <http://www.iahr.org/site/cms/contentviewarticle.asp?article=663>
- Bartsch, N., C.P. Gubala, and T.B. Hardy. 1996. Determining habitat criteria for the endangered fountain darter through aquatic mapping and hydrologic modeling. In: The 2nd International Symposium on Habitat Hydraulics, Quebec, Canada. pp B251-B262. ISBN 2-89146-381-1: Volume B <http://www.iahr.org/site/cms/contentviewarticle.asp?article=663>

- Tarbet, K., and T.B. Hardy. 1996. Evaluation of one-dimensional and two-dimensional hydraulic modeling in a natural river and implications in instream flow assessment methods. In: The 2nd International Symposium on Habitat Hydraulics, Quebec, Canada. pp B395-B406. ISBN 2-89146-381-1: Volume B
<http://www.iahr.org/site/cms/contentviewarticle.asp?article=663>
- Hardy, T.B. 1996. The future of habitat modeling. In: The 2nd International Symposium on Habitat Hydraulics, Quebec, Canada. pp B448-B463. ISBN 2-89146-381-1: Volume B
<http://www.iahr.org/site/cms/contentviewarticle.asp?article=663>
- Ludlow, J.A., and T.B. Hardy. 1996. Comparative evaluation of suitability curve based habitat modeling and a mechanistic based bioenergetic model using 2-dimensional hydraulic simulations in a natural river system. In: The 2nd International Symposium on Habitat Hydraulics, Quebec, Canada. pp B519-B530. ISBN 2-89146-381-1: Volume B
<http://www.iahr.org/site/cms/contentviewarticle.asp?article=663>
- Hardy et al. 1985. A survey of graduate education in environmental engineering. In: Proceedings of the third annual conference on education in engineering. ASCE Fall Meeting, Columbus, Ohio. 6 pp.

3.b Non-refereed:

- Hardy, T.B., and J.A. Shoemaker. 1995. Use of multispectral videography for spatial extrapolation of fisheries habitat use in the Comal river. Proceedings of the 15th Workshop on Color Photography and Videography for Resource Assessment. Indiana State University, Indiana. pp.134-142.
- Crowther, B.E., T.B. Hardy, and C.M.U. Neale. 1995. Application of multispectral video for the classification of fisheries habitat components in Salmon river, Idaho. Proceedings of the 15th Workshop on Color Photography and Videography for Resource Assessment. Indiana State University, Indiana. pp. 143-157.
- Panja, K.V., T.B. Hardy, and C.M.U. Neale, 1995. Comparison of multispectral videography based classification of mesoscale habitats and ground based mapping under turbid riverine conditions, Proceedings of the 15th Workshop on Color Photography and Videography for Resource Assessment, 02-03 May, Indiana State University, Indiana, pp. 158-166.
- Redd, T.H., C.M.U. Neale, and T.B. Hardy. 1993. Classification and delineation of riparian vegetation on two western river systems using airborne multispectral video imagery. In: Proceedings of the 14th Biennial Workshop on Color Photography and Videography for Resource Monitoring. Utah State University, Logan, Utah, May 25-28, 1993, Editor C.M.U. Neale.
- Panja, K.V., T.B. Hardy, and C.M.U. Neale. 1993. Comparison of meso-scale hydraulic features at different discharges in a turbid river system using multispectral videography. In: Proceedings of the 14th Biennial Workshop on Color Photography and Videography for Resource Monitoring. Utah State University, Logan, Utah, May 25-28, 1993, Editor C.M.U. Neale.

4. Abstracts:

- Hardy, T.B. 2009. Addressing repeatability, uncertainty, scalability and bias in habitat mapping based approaches to instream flow assessments. The 7th International Symposium on Ecohydraulics, Concepcion, Chile. February 12-16, 2009.
<http://www.iahr.org/site/cms/contentviewarticle.asp?article=663>

- Hardy, T.B., and E. Saraeva. 2009. A comparative evaluation of habitat mapping versus hydraulic based habitat modeling to assess river restoration actions. The 7th International Symposium on Ecohydraulics, Concepcion, Chile. February 12-16, 2009.
<http://www.iahr.org/site/cms/contentviewarticle.asp?article=663>
- Hardy, T.B., E. Saraeva, and L. Jensen. 2009. Application of stochastic time series modeling for incorporation of increased variability of flow in the development of instream flow recommendations. The 7th International Symposium on Ecohydraulics, Concepcion, Chile. February 12-16, 2009.
<http://www.iahr.org/site/cms/contentviewarticle.asp?article=663>
- Perkin, J., T. Bonner, and T.B. Hardy. 2009. Moving beyond a flat river – multidimensional attributing of river characteristics for aquatic resource investigations. The 7th International Symposium on Ecohydraulics, Concepcion, Chile. February 12-16, 2009.
- Hardy, T.B., and R.C. Addley. 2007. Physical habitat and bioenergetic assessments of anadromous fish flow needs. An integrated application of the natural flow paradigm to recommending instream flows. The 6th International Symposium on Ecohydraulics, Christchurch, New Zealand. February 19-27, 2007.
<http://www.iahr.org/site/cms/contentviewarticle.asp?article=663>
- Basdekas, L., T.B. Hardy, R.C. Addley, W. Bradford, and J. Hammond. 2004. Benefits evaluation of channel reconstruction on lower LaVerkin Creek using two-dimensional hydrodynamics and biological habitat modeling. Presented at the 5th International Symposium on Ecohydraulics in Madrid, Spain. September 12-17, 2004.
<http://www.iahr.org/site/cms/contentviewarticle.asp?article=663>
- Bhosle, M., and T.B. Hardy. 2004. Estimating uncertainty in fish habitat modeling using two-dimensional hydraulics. Presented at the 5th International Symposium on Ecohydraulics in Madrid, Spain. September 12-17, 2004.
<http://www.iahr.org/site/cms/contentviewarticle.asp?article=663>
- Combs, M., I. Gowing, and T.B. Hardy. 2004. Comparative evaluation of a rapid assessment methodology for instream flow assessments with intensive physical habitat simulation (PHABSIM) approaches. Presented at the 5th International Symposium on Ecohydraulics in Madrid, Spain. September 12-17, 2004.
<http://www.iahr.org/site/cms/contentviewarticle.asp?article=663>
- Hardy, T.B., and R.C. Addley. 2004. Incorporation of fish behavior in physical habitat models. Presented as the keynote address at the 5th International Symposium on Ecohydraulics in Madrid, Spain. September 12-17, 2004.
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- Kollaus, K., K.P. Behen, T.C. Heard, J.M. Tennant, T.B. Hardy, and T.H. Bonner. 2012. Influence of watershed and instream alterations on the upper San Marcos River fish assemblage. Texas Chapter American Fisheries Society, Galveston, TX.
- Behen, K.P., S.G. Curtis, K.A. Kollaus, T.B. Hardy, and T.H. Bonner. 2012. Effects of recreational activities on the spatial and temporal trends in habitat associations for the fish assemblage of the San Marcos River. Texas Chapter American Fisheries Society, Galveston, TX.
- Hardy, T.B., K. Kollaus, T. Heard, and J. Tennant. 2011. Use of UAV for remote sensing of surface water systems. 14th World Lake Conference. Austin, TX. 31 October - 4 November, 2011.
- Tolman, K., T.B. Hardy, K. Kollaus, T. Heard, and J. Tennant. 2012. Use of small, autonomous unmanned aerial vehicles for capturing multispectral aerial imagery. TNRIS GIS Forum. Pickle Center in Austin, Texas.

- Bonner, T., T.B. Hardy, and K. Mayes. 2011. Calculating habitat suitability for Texas fishes from expert perception: a request for participation. Texas Chapter American Fisheries Society, February 10-12, 2011, San Marcos, Texas. (poster).
- Mayes, K., K. Aziz, J. Botros, C. Robertson, T.B. Hardy, and B. Littroll. 2011. Using envelope curves to derive fish habitat suitability indices for instream flow assessments. Texas Chapter American Fisheries Society, February 10-12, 2011, San Marcos, Texas.
- Hardy, T.B., W.H. Nowlin, B. Schwartz, and T. Bonner. 2011. San Marcos Observing System: integrating physical, chemical, and biological data at high resolution spatial and temporal scales. American Fisheries Society 141st Annual Meeting. Seattle, Washington, September 4-8, 2011.
- Kollaus, K.K., T.B. Hardy, T. Heard, J. Tennant, and A. Jensen. 2011. Deployment and flight training procedures associated with using small, autonomous unmanned aerial vehicles for capturing multispectral aerial imagery. American Fisheries Society 141st Annual Meeting. Seattle, Washington, September 4-8, 2011.
- Behen, K., K.K. Kollaus, T.B. Hardy, and T.H. Bonner. 2011. Spatial and temporal trends in habitat associations of the fish community in Spring Lake and the headwaters of the San Marcos River. American Fisheries Society 141st Annual Meeting. Seattle, Washington, September 4-8, 2011.
- Tower, K., Hardy, T.B., Kollaus, K., T.C. Heard, and J.M. Tennant, 2011. Habitat characterization of *Zizania texana* within the San Marcos River. Southwestern Association of Naturalist 58th annual meeting. University of Texas in Tyler, TX. April 22, 2011.
- Tower, K., T.B. Hardy, K. Kollaus, T.C. Heard, and J.M. Tennant. 2011. Modeling the spatial relationship of riparian shade distribution as it relates to aquatic species distribution within the San Marcos River. Texas Academy of Science, St. Edwards University, Austin, TX. March 4, 2011
- Williams, C.R., T.B. Hardy, and K. Tower. 2010. Spring Lake aquatic vegetation mapping project. Student oral presentation, 2nd Place. Texas Aquatic Plant Management Society, Bandera, Texas. October 25-27, 2010.
- Mock, L., B.F., Schwartz, W.H. Nowlin, B.T. Hutchins, T.B. Hardy, T. H. Bonner, A. Lockwood, and A. Steinback. 2011. The role of metrology in monitoring and preserving the water quality in the Edwards Aquifer in Central Texas. National Conference of Standards Laboratories International Workshop and Symposium. August 21-25, 2011, Gaylord National Convention Center, National Harbor, Maryland.
- Williams, C.R., T.B. Hardy, and K. Tower. 2010. Distribution and habitat of *Hygrophila polysperma* along the San Marcos River. 2010. Student Poster, 1st Place. Texas Aquatic Plant Management Society, Bandera, Texas. October 25-27, 2010.
- Hardy, T.B., and M. McKee. 2009. Role of science and scientists in stakeholder driven instream flow assessments. 139th meeting of the American Fisheries Society, August 30 – September 3, 2009.
- Hardy, T.B. 2009. Addressing repeatability, uncertainty, scalability and bias in habitat mapping based approached to instream flow assessments. The 7th International Symposium on Ecohydraulics, Concepcion, Chile. February 12-16, 2009.
- Hardy, T.B., and E. Saraeva. 2009. A comparative evaluation of habitat mapping versus hydraulic based habitat modeling to assess river restoration actions. The 7th International Symposium on Ecohydraulics, Concepcion, Chile. February 12-16, 2009.
- Hardy, T.B., E. Saraeva, and L. Jensen. 2009. Application of stochastic time series modeling for incorporation of increased variability of flow in the development of instream flow

- recommendations. The 7th International Symposium on Ecohydraulics, Concepcion, Chile. February 12-16, 2009.
- Perkin, J., T. Bonner, and T.B. Hardy. 2009. Moving beyond a flat river – multidimensional attributing of river characteristics for aquatic resource investigations. The 7th International Symposium on Ecohydraulics, Concepcion, Chile. February 12-16, 2009.
- Hardy, T.B., and R.C. Addley. 2007. Physical habitat and bioenergetic assessments of anadromous fish flow needs. An integrated application of the natural flow paradigm to recommending instream flows. The 6th International Symposium on Ecohydraulics, Christchurch, New Zealand. February 19-27, 2007.
- Basdekas, L., T.B. Hardy, R.C. Addley, W. Bradford, and J. Hammond. 2004. Benefits evaluation of channel reconstruction on Lower LaVerkin Creek using two-dimensional hydrodynamics and biological habitat modeling. Presented at the 5th International Symposium on Ecohydraulics in Madrid, Spain. September 12-17, 2004.
- Bhosle, M., and T.B. Hardy. 2004. Estimating uncertainty in fish habitat modeling using two-dimensional hydraulics. Presented at the 5th International Symposium on Ecohydraulics in Madrid, Spain. September 12-17, 2004.
- Combs, M., I. Gowing, and T.B. Hardy. 2004. Comparative evaluation of a rapid assessment methodology for instream flow assessments with intensive physical habitat simulation (PHABSIM) approaches. Presented at the 5th International Symposium on Ecohydraulics in Madrid, Spain. September 12-17, 2004.
- Hardy, T.B., and R.C. Addley. 2004. Incorporation of fish behavior in physical habitat models. Presented as the keynote address at the 5th International Symposium on Ecohydraulics in Madrid, Spain. September 12-17, 2004.
- Saraeva, E., and T.B. Hardy. 2004. Development and application of GIS based instream flow extrapolation procedure for watershed planning in the Nooksack River basin. Presented at the 5th International Symposium on Ecohydraulics in Madrid, Spain. September 12-17, 2004.
- Thompson, J., and T.B. Hardy. 2004. Development and application of a GIS based river basin assessment tool for prioritization of aquatic habitat restoration at the watershed level. Presented at the 5th International Symposium on Ecohydraulics in Madrid, Spain. September 12-17, 2004.
- Basdekas, L., L. Bastidas, A. Caplan, T.B. Hardy, M. McKee, and D. Stevens. 2004. Balancing water use, water rights, endangered species, and economics: a multi-objective, system operations optimization approach. Presented at the UCOWR/NIWA Conference in Portland, OR. July 20-22, 2004.
- Hardy, T.B. 2004. Field validation of habitat modeling in the lower Klamath River. Presented at the Lower Klamath Basin Science Conference in Redding, CA. June 7-9, 2004. – Invited.
- Hardy, T.B. 2004. Field validation of habitat modeling of Chinook spawning and fry life stages in the lower Klamath River. Presented at the American Fisheries Society meeting in Redding, CA. April 22-23, 2004. abstract #H52A-1157.
- Hardy, T.B. 2004. An applied decision support system using multidisciplinary assessment methods for instream flows – Nooksack River basin. Presented at the American Fisheries Society Conference in Austin, TX. February 9-11, 2004.
- Dodd, A.M., E.M. Cashman, and T.B. Hardy. 2003. One-Dimensional Sediment Transport and Turbulence. Presentation at American Geophysical Union Fall Meeting, December 12, 2003. San Francisco, CA.
- Hardy, T.B. 2002. EDN 1: Hydraulic model calibration files and supporting analysis files. Prepared for The WRIA 1 Watershed Management Project. Institute for Natural Systems

- Engineering, Utah Water Research Laboratory, Utah State University, Logan, Utah.
- Addley, R.C., and T.B. Hardy. 2002. A decade of 2-dimensional instream flow modeling experience: Part 1 - Benefits and pitfalls of data collection and hydrodynamic modeling. Presented at the 4th International Symposium on Ecohydraulics in Cape Town, South Africa. March 3-8, 2002.
- Hardy, T.B., and R.C. Addley. 1999. Vertical integration of spatial and hydraulic data for improved habitat modeling in GIS. Annual Meeting of the Bonneville Chapter American Fisheries Society. March 15-18, 1999.
- Addley, R.C., and T.B. Hardy. 1997. Bioenergetics: a biological response base approach to instream flow assessments. American Fisheries Society Annual Meeting, Monterey, California.
- Hardy, T.B. 1995. Water resource system operations and endangered species in the Virgin River Basin: past, present and future. Proceedings of the Annual Spring Symposium of the American Water Resources Association, Water in the 21st Century: Conservation, Demand, and Supply. April 23-26, 1995, Salt Lake City, Utah.
- Addley, R.C., and T.B. Hardy. 1994. Distribution and abundance of Virgin Spinedace (*Lepidomeda mollispinis mollispinis*) in the Virgin River basin. Abstract and Presentation at the American Fisheries Society Bonneville Chapter and Wildlife Society Utah Chapter Joint Winter Technical Session, February 24-26, 1993, St. George, Utah.
- Neale, C.M.U., T.B. Hardy, and J.A. Shoemaker. 1994. Evaluation of coastal wetland states using spatial and spectral metrics derived from multispectral videographic imagery. Final Report to Environmental Protection Agency, Corvallis, Oregon. Department of Civil and Environmental Engineering, Utah State University, Logan, Utah.
- Hardy, T.B., P. Anderson, C.M.U. Neale, and D.K. Stevens, 1994. Application of multispectral videography for the delineation of riverine depths and mesoscale hydraulic features, Proceedings of the American Water Resources Association, on Effects on Human Induced Changes on Hydrologic Systems, 26–29 June, Jackson Hole, Wyoming, pp. 445–454.
- Hardy, T.B. 1994. Issues on endangered species. Abstract and Presentation at the Utah Water Users Group Annual Meetings. April 17, 1994. St. George, Utah.
- Hardy, T.B. 1994. Use of GIS in multidisciplinary studies for instream flow assessments of endangered species in the Comal River ecosystem. Paper and Presentation at the American Water Resources Association, Effects on Human-Induced Changes on Hydrologic Systems. June 26-29, 1994. Jackson Hole, WY.
- Hardy, T.B. 1993. Application of multi-spectral videography for resource management in the Virgin River Basin. Paper and Presentation at the 1993 American Fisheries Society Winter Technical Meeting, Bonneville Chapter. November 14, 1993. Wendover, Nevada.

2. Invited Talks, Lectures, and Presentations:

- Hardy, T.B. 2015. The importance of the environment and ecosystems in the urban environment. Envision Austin, City of Austin. (Invited).
- Hardy, T.B. 2015. Protecting Rivers and Lakes in the face of Uncertainty. Instream Flow Council April 29-April 30, Portlad Oregon. (Invited).
- Hardy, T.B. 2015. Case Studies and Investigations – Meadows Foundation. Capital Area Erosion Control Network (CAECN). November 12, 2015. (Invited).
- Hardy, T.B. 2014. The evolution of ecohydraulics: The emergence of holistic systems in decision making from simple beginnings. Invited Keynote Address. 10th International Symposium on Ecohydraulics 2014. Trondheim, Norway, June 23-27th.

- Hardy, T.B. 2014. Status of aquatic habitat in Texas. Texas Commission on Environmental Quality (TCEQ) – Surface Water Quality Monitoring Workshop in Bandera, Texas on October 28, 2014.
- Hardy, T.B. 2013. Environmental economics. Regional Livability Symposium - Water: Key to Our Future. February 15, 2013 - University of Texas Union.
- Hardy, T.B. 2008. The ESP of instream flows. Texas Commission on Environmental Quality. November 13, 2008.
- Hardy, T.B. 2008. The role of decision support systems in strategic watershed planning: practice to pitfalls. Texas State University, River Systems Institute. May, 2008.
- Hardy, T.B. 2008. Applied river restoration under high flow constraints – A case study of design and implementation of fish habitat, sediment augmentation, and channel maintenance/riparian flow regimes in the Trinity River, California, USA. 4th International Workshop on River Environment - Prospects for the River Restoration Technique Harmonizing with Flood Control and River Environment, June 1-4, 2008 Seoul, Korea. Proceedings papers printed in English and Korean.
- Hardy, T.B. 2008. River restoration: Integration of sediment and riparian modeling for assessment of long-term post restoration conditions for aquatic resources. International Symposium on the Stream Corridor Restoration, River Environmental Technology Institute, Seoul, Korea. November 11, 2008.
- Chen Y., T.B. Hardy, and M. McKee. 2008. Unmanned autonomous vehicles: Emerging cost effective technologies for fisheries research and management. Texas Chapter American Fisheries Society. January 8, 2008.
- Hardy, T.B. 2008. Application of physical habitat modeling for game and non-games fish interactions. Texas Chapter of the American Fisheries Society. January 8, 2008.
- Hardy, T.B. 2008. The use of aerial drone technology to collect remote sensing data for GIS applications. Texas Geographic Information Committee. January, 2008.
- Hardy, T.B. 2008. Instream flow council science panel. Instream Flow Council 2008 Conference. October, 2008.
- Hardy, T.B. 2007. Conceptual validation of flow recommendations for salmon in the Klamath Basin using independent models. American Fisheries Society annual meeting in San Francisco, September, 2007.
- Hardy, T.B. 2006. Incorporating behavior and production estimates into instream flow assessments. International Conference on Ecological Modeling. 2006. Ube Yamaguchi, Japan. 28 Aug. - 1 Sep. 2007. (Invited – Keynote Address).
- Hardy, T.B. 2006. Incorporating ecological risk in assessing instream flows. Presented at LCRA/SAWS Science Symposium - Austin, TX. March, 2006.
- Hardy, T.B. 2005. The science of instream flows – Evidence of an adaptive process and the dichotomy of perceived information needs. Presented at Flows for the Future, 2005 Environmental Flows Conferences sponsored by River Systems Institute, October 31 & November 1, 2005, Texas State University - San Marcos, TX. October 31-November 1, 2005.
- Hardy, T.B. 2005. Modeling impact assessments in fluvial systems – A virtual river view. Presented as a keynote address at the Institut National Recherche Scientifique - Eau, Terre et Environnement/ Universite Laval sponsored Geosalar Conference, Geomatics and Fish Habitat Modeling in Rivers and Estuaries held in Quebec City, Quebec November 17-18, 2005.
- Hardy, T.B. 2005. Managing water for endangered fishes. Presentation at Water in the West: Use-Abuse-and Scarcity, An NR Week Symposium of the College of Natural Resources and the USU Water Initiative, Utah State University, Logan, Utah, October, 2005.

- Hardy, T.B. 2005. Use of GIS to integrate spatial data in instream flow assessments. Guest lecturer in the GIS in Water Resources course taught concurrently at University of Texas at Austin and USU (CEE 6440) November 15, 2005.
- Hardy, TB. 2004. Field validation of habitat modeling in the lower Klamath River. Presented at the Lower Klamath Basin Science Conference in Redding, CA. June 7-9, 2004.
- Hardy, T.B. 2003. Presentation/panelist at Inland Northwest Research Alliance 2003 Subsurface Science Symposium. Role of Stakeholders in Determining Environmental Policy". October 6, 2003. Salt Lake City, Utah.
- Bishop, B., T.B. Hardy, and M. McKee. 2003. Presentation at Northern Utah Conference on Evidence. October 10, 2003. Eccles Conference Center, USU, Logan, Utah.
- Hardy, T.B., and C. Addley. 2003. Instream flow assessment modeling: combining physical and behavioral-based approaches. American Fisheries Society 133rd Annual Meeting, Quebec City, Quebec. August 12, 2003.
- Hardy, T.B. 2003. Technical assessment of instream flows in the lower Klamath River. (Invited) Western Division of the American Fisheries Society Annual Meeting, San Diego, California. April 15, 2003.
- Hardy, T.B. 2002. The state-of-the-art in habitat modeling. 14th Annual International HydroVision Conference. Seattle, Washington. August 1, 2002.
- Hardy, T.B. 2002. A decade of 2-dimensional instream flow modeling experience benefits and pitfalls of 2-dimensional habitat modeling. Fourth International Ecohydraulics Conference, Cape Town, South Africa. March, 2002.
- Hardy, T.B., and R.C. Addley. 1999. Vertical integration of spatial and hydraulic data for improved habitat modeling in GIS. Hydro-ecology Session at IAHS Annual Meeting, Birmingham, England, July, 1999.
- Hardy, T.B., and G. Guensch. 1999. Field validation of a mechanistic based bioenergetic model for drift feeding salmonids. Hydro-ecology Session at IAHS Annual Meeting, Birmingham, UK, July, 1999.
- Hardy, T.B., N. Bartsch, and P. Connor. 1998. Habitat and flow requirements – instream flow methodology, monitoring, and the best guess. Watershed Management to Protect Declining Species and Symposium on Water Resources and World Wide Web. American Water Resources Association Annual Water Resources Conference. December 6-9 1996, Seattle Washington.
- Hardy, T.B., P. Waite, and G. Geuntsch. 1998. Evaluation of a mechanistically based salmonid model for stream position choice. Paper and Abstract at INTECOL 1998. International Symposium for Ecology, Florence, Italy.
- Hardy, T.B., and R.C. Addley. 1998. Physical data necessary to describe trout populations at the stream reach and larger scale. Invited Presentation at Trout Population Dynamics at Stream Reach and Stream Network Scales: Quantifying Physical and Biological Processes. April, 1998, Fort Collins, Colorado.
- Hardy, T.B. 1998. Linkages between spatial sampling strategies, habitat heterogeneity and hydraulic modeling with implications to applied instream flow assessments. Invited Paper and Abstract at INTECOL 1998. International Symposium for Ecology, Florence, Italy.
- Hardy, T.B. 1997. Understanding the biology of your watershed. Fourth Annual Water Summit, Utah Water Users Association. November, 1997, Salt Lake City.
- Hardy, T.B. 1997. Moving toward trophic-level-based, ecologically-based instream flow regimes. Instream and Environmental Flows Symposium Technology and Policy Issues. 17th International Symposium of the North American Lake Management Society. December 2, 1997, Houston, Texas.

- Gubala, C.P., T.B. Hardy, and J. Eilers. 1995. SONAR-GPS mapping of aquatic ecosystems and GPS assisted survey of small rivers, streams and creeks. Trimble Surveying and Mapping Users Conference and Exposition, August 9-11, 1995.
- Hardy, T.B. 1993. Environmental engineering and the real world. Environmental Studies Program Professional Seminar Series, University of Nevada at Las Vegas.
- Hardy, T.B. 1993. Environmental impacts of severe sustained drought: case studies. Abstract and Presentation at the 29th Annual Conference and Symposium "Effluent Use Management" American Water Resources Association, August 29-September 2, 1993. Tucson, Arizona.
- Hardy, T.B., D.S. Bowles, and B.A. Finney. 1986. A case for real time water quality management in the United States. Paper presented at the American Geophysical Union Fall Annual Meeting, San Francisco, California.
- Hardy, T.B., and R.C. Addley. 2007. Physical habitat and bioenergetic assessments of anadromous fish flow needs. An integrated application of the natural flow paradigm to recommending instream flows. Presented at the 6th International Symposium on Ecohydraulics, Christchurch, New Zealand.
- Hardy, T.B. 2008. Modeling game and non-game species – assessing flow dependent needs. Presented at 2008 Texas Chapter of the American Fisheries Society meeting at Texas Tech University-Junction, January 17-19, 2008.
- Hardy, T.B. 2008. The use of aerial drone technology to collect remote sensing data for GIS applications. Presented at the Texas Geographic Information Council Quarterly Meeting, Austin, TX. January 30, 2008.
- Acreman, M.C., D.J. Booker, M.J. Dunbar, T. Goodwin, A.R. Young, I.M. Gowing, M. Rivas-Casado, I. Maddock, G. Hill, T.B. Hardy, and S. Allan. 2006. A risk-based approach to rapid assessment of physical habitat sensitivity to abstraction. Presented at TISOR International Conference on "Riverine Hydroecology: advances in research and applications" Sterling University, UK.
- Stevens, D.K. and T.B. Hardy, 2005. Linking operational hydrology and water quality modeling in the Weber basin: A decision support system. Presented at GSA Annual Meeting and Exposition in Salt Lake City, Utah. October 16, 2005
- Hardy, T.B. 2004. The use of hydrologic modeling in the development of flow recommendations. Presented at the Lower Klamath Basin Science Conference in Redding, CA. June 7-9, 2004.
- Hardy, T.B. 2004. An applied decision support system using multidisciplinary assessment methods for instream flows – Nooksack River Basin. Presented at the American Fisheries Society Conference in Austin, TX. February 9-11, 2004.
- Shoemaker, J., P. Dey, T.B. Hardy, and K. Panja. 1996. Application of multispectral videography for natural resource classifications. Annual ERDAS Users Group Meeting.
- Hardy, T.B. 1996. Integration of Low Cost GPS with GIS for Fisheries Resource Management. Presentation at the Winter Meeting of the Bonneville Chapter of the American Fisheries Society, February 29 1996, Logan Utah.
- Hardy, T.B., K.V. Panja, and P.C. Anderson. 1993. Application of multi-spectral videography for resource management in the Virgin River basin. Abstract and Presentation at the American Fisheries Society Bonneville Chapter and Wildlife Society Utah Chapter Joint Winter Technical Session, February 24-26, 1993, St. George, Utah.
- Shoemaker, J., C.M.U. Neale, J.P. Dobrowolski, and T.B. Hardy. 1993. Use of multispectral videography for jurisdictional delineation of wetland areas. In: Proceedings of the 14th Biennial Workshop on Color Photography and Videography for Resource Monitoring (C.M.U. Neale, Ed). Utah State University, Logan, Utah, May 25-28, 1993.

- Anderson, P.C., T.B. Hardy, and C.M.U. Neale. 1993. Application of multispectral videography for the delineation of riverine depths and mesoscale hydraulic features. In: Proceedings of the 14th Biennial Workshop on Color Photography and Videography for Resource Monitoring (C.M.U. Neale, Ed). Utah State University, Logan, Utah, May 25-28, 1993.
- Dupont, R.R., and T.B. Hardy. 1988. Estimating the uncertainty of hazardous air emissions from land treatment systems using the Thibodeaux-Hwang air emission model. 88.116-6 Presented to the 81st Annual Conference of the Air Pollution Control Federation, Dallas, Texas. June 20-24. 1988. 18 pp.

3. Consultancies:

- Development of tribal instream flow water right claims on the Flathead Indian Reservation, Montana. - Confederated Salish and Kootenai Tribes.
- Member of science team for development and application of a Chinook Salmon full life cycle model to evaluate Klamath River Dams removals for the Secretarial Determination (Secretary of the Interior). – Department of Interior.
- Lead expert witness for federal fish related water claims on Forest Service lands in the Snake River Basin Adjudication. – Department of Justice
- Technical review of Forest Service claims for fisheries in the Upper Klamath River Basin, Oregon. – Department of Justice
- Mono Basin Hearings before the California Water Development Board – City of Los Angeles.
- Expert witness in behalf of her Majesty the Queen of England in the Axford Inquiry. – The Crown of England.
- Technical facilitator for Alberta Environment with first nations and oil sands development companies for water withdraw from the Athabasca River. Provincial Government of Alberta, Canada.

4. Workshops:

- Unmanned Autonomous Vehicle Workshop, Texas Parks and Wildlife Department. Kerr Wildlife Management Area, Texas. April 2013.
- Unmanned Autonomous Vehicle Workshop, Texas Parks and Wildlife Department. Kerr Kerr Wildlife Management Area, Texas. April 2011.
- Masters Class – Instream Flow Assessment Techniques - 8th International Symposium on Ecohydraulics, Seoul, Korea, September 11, 2010.
- Application of physical habitat modeling for salmonid restoration, Buckley Valley Resource Center, Smithers, Canada, 2009.
- Application of physical habitat and behavior based modeling in fish communities. The 7th International Symposium on Ecohydraulics, Concepcion, Chile. February 12-16, 2009.
- Two-dimensional hydraulic and habitat modeling, Southwest Florida Water Management District, 2008.
- Instream Flows – Integration and Interpretation of study results, Texas State University, 2008.
- Instream Flows 101, Texas State University, 2008.
- Physical Habitat Simulation, Yamaguchi University, Japan, 2006.

IF310 Using the computer based PHABSIM system, National Ecology Research Center, U.S. Fish and Wildlife Service, 1989-2008.

Application of habitat based assessment of project impacts on fisheries, U.S. Forest Service, 1999-2001.

Application of habitat based assessment of project impacts on fisheries, Alberta Environment, Alberta, Canada, 1998.

Advanced instream flow techniques for quantification of impacts in rivers, Mexico Institute of Freshwater Ecology, Chutepeck, Mexico, 1997.

Advanced instream flow techniques, International Workshop-Institute of Hydrology, Center of Hydrology and Ecology, Wallingford, England, 1997.

Applications of advanced instream flow techniques for protection of aquatic resources, University of Portugal, Eva, 1996.

Advanced instream flow techniques in ephemeral rivers, International workshop – Lisbon Portugal, 1996.

Advanced instream flow techniques, International Workshop, Vienna, Austria, 1995-1996.

Applications of advanced instream flow techniques for protection of aquatic resources, National Rivers Authority, United Kingdom, 1995.

Threatened and Endangered Species Consultation and Management Short Course, Bureau of Land Management, 1994.

Northern Rivers Basin Instream Flow Technical Workshop, Alberta Fish and Wildlife Service, Canada, 1994.

Wildlife habitat and plant management, Utah State University, Department of Fisheries and Wildlife, 1994-1998.

Research Methods, Utah Water Research Laboratory, 1994-1995.

Instream Flow Techniques, Bureau of Land Management, 1994.

Central Asian Republic Interactive Site Workshops on Water Management, USAID, 1994.

Instream negotiation strategies, Utah State University, 1991.

IFIM Field techniques, U.S. Forest Service Technical Training, 1989-1991.

Development of instream flows for fisheries, U.S. Forest Service Technical Training, 1990-1991.

Development of instream flows for fisheries, Utah Division of Water Resources Professional Development Series, 1989.

5. Other Works not in Print:

a. Works “submitted” or “under review”

b. Works “in progress”:

Wright, K.A., D.H. Goodman, N.A. Som, and T.B. Hardy. In review. Development of a validation approach for two-dimensional hydraulic models. River Research and Applications.

c. Other works not in print: NA

C. Grants and Contracts

1. Funded External Grants and Contracts:

Fiscal Year	Grant Start Date	Grant End Date	Grant	Pi/Co-Pi listed SAP	Total Budget
2008	07/15/08	06/14/11	Facilitating Sustain Water-YR4-XIA	Hardy	\$50,429.00
2008	08/01/08	12/31/09	EAA Recovery Implementation Plan	Hardy	\$254,940.00
2009	06/30/09	08/31/12	Sul Ross YR5-Hardy	Hardy	\$41,485.00
2010	10/01/09	08/31/11	ARRA-River System's Monitoring Proje	Hardy/Sansom	\$372,955.00
2010	10/01/09	08/31/11	ARRA-River System's Monitoring Proje	Hardy/Sansom	\$226,000.00
2010	10/01/09	08/31/11	ARRA-River System's Monitoring Proje	Bonner/Sansom	\$109,000.00
2010	10/01/09	08/31/11	ARRA-River System's Monitoring Proje	Nowlin/Sansom	\$185,745.00
2010	10/01/09	08/31/11	ARRA-River System's Monitoring Proje	Schwartz/Sansom	\$106,300.00
2010	09/01/09	08/31/13	TPWD Texas Instream Flow Program	Hardy	\$189,998.00
2010	11/01/09	10/31/10	TAES (EAA) Rsch Improv Instream Fl	Hardy	\$165,940.00
2010	06/01/10	09/30/11	TAES (EAA) Setup Run Model For Mit	Hardy	\$40,070.00
2011	10/01/10	02/15/11	TWDB - Guadalupe Santonio/Mission-	Sansom/Hardy	\$5,709.48
2011	01/01/11	07/31/12	TWDB Channel Cross Section	Hardy	\$36,500.00
2011	01/01/11	07/31/12	TWDB Robotic Aerial Videography	Hardy	\$34,966.00
2011	01/01/11	12/31/12	GRTU Guadalupe River Habitat Charac	Hardy	\$10,000.00
2011	03/01/11	09/30/12	TWDB Evaluation of Riparian Process	Hardy	\$38,500.00
2011	04/26/11	12/31/11	TPWD Application of UAV Tech (Lland	Hardy	\$51,999.00
2011	04/12/11	09/01/11	CoSM GPR to Map River Sediments in	Hardy	\$25,000.00
2011	05/15/11	12/31/11	CoVictoria Effects on Guadalupe River	Hardy	\$62,976.00
2012	09/01/11	01/05/12	UT Subcontract Creation of Models	Hardy	\$20,641.00
2012	02/01/12	04/30/12	City of New Braunfels_Interlocal Agree	Hardy	\$5,625.00
2012	03/01/12	09/30/12	City of New Braunfels_USU Hydro Clir	Hardy	\$25,341.00
2012	07/16/12	09/30/12	CofSM Hydro Simulation Water Model	Hardy	\$10,000.00
2012	07/23/12	08/31/12	CofNB HCP Work Plan Development a	Hardy	\$54,302.00
2013	09/01/12	02/28/13	TxDOT Fountain Darter Mgmt Cape Co	Hardy	\$43,203.00
2013	10/16/12	01/15/13	TPWD Texas Wild Rice	Hardy	\$50,000.00
2013	03/05/13	12/31/14	UHCL HCP Texas Wild Rice - Year 1	Hardy	\$448,588.00
2013	04/01/13	12/31/13	GLEASON San Marcos WQPP	Hardy	\$25,862.00
2013	05/01/13	11/30/13	CofNB Technical Assistance for Habit	Hardy	\$11,000.00
2014	09/01/13	08/31/14	City of Victoria Conduct Phase II Aqu	Hardy	\$73,603.00
2014	10/02/13	12/31/14	COYPU Expansion of Whooping Cran	Hardy/Sansom	\$45,000.00
2014	01/01/14	12/31/14	UHCL HCP Texas Wild Rice - Year 2	Hardy	\$446,150.00
2014	03/20/14	08/31/14	LIVINGSTON LURES Behavioral Resp	Hardy	\$40,384.00
2014	03/13/14	06/30/15	CONFEDERATED SALISH KOOTENA	Hardy	\$362,778.00
2015	09/01/14	08/31/15	TPWD UAV Based Remote Sensing	Hardy	\$17,506.65
2015	01/12/15	01/11/16	Jacobs Technology	Hardy	\$175,175.00
2015	01/01/15	12/31/15	EAA Sediment Impacts om TX Wild R	Hardy	\$75,000.00
2015	9/1/2015	9/30/2017	GCPLLC - Quantification of Alligator G	Hoehinghaus(UNT)/Hardy	\$331,180.00
2015	11/01/15	09/30/17	CESU-COE Impacts of Navigation on	Schwab/Hardy	\$55,038.90
2015	09/01/15	09/30/18	TxDOT Evaluating the Effectiveness of	Schwab/Rodriguez/Forstner/Hardy	\$243,317.00
2015	07/01/15	09/30/16	Evaluation of the use of unmanned ae	Green/Hardy/others	\$43,809
2015	09/01/15	09/30/16	TPWD Development of HSC for Benth	Schwab/Hardy	\$26,000.00
2015	01/01/15	12/31/15	UHCL HCP Texas Wild Rice - Year 3	Hardy	\$516,813.00
2015	08/04/15	06/30/17	TPWD Assessment/Model Environmen	Hardy	\$83,838.00
2015	09/01/15	03/31/16	TPWD Peer Review Instream Flows	Hardy	\$10,000.00
2015	10/29/15	03/31/17	TPWD Lower Guadalupe Gar Modeling	Hardy	\$104,206.00

1985-2008 144 Additional Grants and Contracts

\$10,877,791

2. Submitted, but not Funded, External Grants and Contracts:

USDA AFRI Water for Agriculture Challenge Area Proposal "Precision Remote Sensing and Advanced Modeling Approaches for Sustainable Crop Water and Fertilization Management"

3. Funded Internal Grants and Contracts: NA

4. Submitted, but not Funded, Internal Grants and Contracts: NA**D. Fellowships, Awards, Honors:**

NATO Advanced Study Institute for the use of Expert Systems in Civil Engineering through a grant awarded by the National Science Foundation in Edinburgh, Scotland. 1989.

IV. SERVICE**A. University:**

Chair, Spring Lake Environmental Committee 2012-present.

Prepared the Edwards Aquifer Habitat Conservation Plan 2014 Technical Work Plans for Texas State University and the City of San Marcos collaboratively with Ms. Melani Howard of the City of San Marcos.

Prepared the Texas State University Edwards Aquifer Habitat Conservation Plan 2014 Annual Report Chapter.

Prepared the Edwards Aquifer Habitat Conservation Plan 2013 Technical Work Plans for Texas State University and the City of San Marcos collaboratively with Ms. Melani Howard of the City of San Marcos.

Central Promotion and Tenure Review, Utah State University, 2009.

College of Engineering – Promotion and Tenure Review Committee, Utah State University, 2004-2009.

Presidents Task Force on a Campus Wide Water Program, Utah State University, 2001-2005.

President's Diversity Team, Utah State University, 1995.

Natural Resource Policy Program Advisory Committee, Utah State University, 1995.

ASCE Student Chapter Faculty Advisor, Utah State University, 1990-1996.

B. Departmental:

Department of Biology. Aquatic Ecologist Faculty Search Committee. Texas State University. 2013.

College of Engineering – Promotion and Tenure Committee Chair, Utah State University, 2008-2009.

College of Engineering Post-Tenure Review Committee, Utah State University, 2006-2009.

Division of Environmental Engineering Curriculum Committee, Utah State University, 1998-2000.

College of Engineering Computer Committee, Utah State University, 1996-1998.

College of Engineering Outstanding Junior Committee, Utah State University, 1994-1995.

EE/CEE Microcomputer Laboratory Steering Committee, Utah State University, 1989-1992.

CEE Computer Committee, Utah State University, 1990-1999.

ASCE Student Chapter Faculty Advisor, Utah State University, 1989-1995.

C. Community:**D. Professional:**

Associate Editor of the Korean Journal of Civil and Environmental Engineering. 2011-Present

Technical Reviewer for the Norwegian Science Board of Strategic Research Proposals,
International, 1990-Present
Virgin River Fishes Recovery Team, USFWS, 1991-2009.
International Association for Hydro-Environment Engineering and Research- International,
1988-Present.

E. Organizations

International Association for Hydro-Environment Engineering and Research (IAHR)
Ecohydraulics Committee. President. International. 2012-2014.
International Association for Hydro-Environment Engineering and Research (IAHR)
Ecohydraulics Committee. Secretary. International. 2010-2012.
Utah Water Research Laboratory, Associate Director, Utah State University, 2002-2009.
Institute for Natural Systems Engineering, Director, Utah State University, 1989-2009.

1. Honorary: NA

2. Professional:

International Association for Hydro-Environment Engineering and Research
American Society of Civil Engineers
American Water Resources Association
American Society of Photogrammetry and Remote Sensing
American Fisheries Society - Certified Fisheries Scientist

F. Service Honors and Awards:

1st ever named Fellow of the Utah Water Research Laboratory, 2009.
Lifetime Achievement Award, Instream Flow Council, 2015.