

T. Scott Murrell

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Areas of Professional Specialization

My areas of interest center on developing more robust nutrient recommendation approaches that are scientifically sound yet usable and understandable to the end user. The pursuit of this goal has required developing skills in:

- modeling crop response to nutrient additions
- conducting economic evaluations of nutrient use
- assembling literature reviews directed toward answering specific applied questions on nutrient management practices
- conducting hands-on computer workshops
- using gaming in technical training sessions

Degrees Received

Doctor of Philosophy, Soil Science, Texas A&M University 1996
Master of Science, Soil Fertility and Plant Nutrition, Purdue University, 1991
Doctor of Philosophy Student, Near Eastern Languages and Literature, Yale University, 1986-1987.
Bachelor of Arts, General History Major, Religious Studies Minor, Purdue University, 1986

Professional Positions Held

Northcentral Director, 2007-present, International Plant Nutrition Institute, Norcross, Georgia
Northcentral Director, 1996-2006, Potash & Phosphate Institute, Norcross, Georgia
Graduate Research Assistant, 1991-1996, Texas A&M University, College Station, Texas
Graduate Teaching Assistant, 1992, Texas A&M University, College State, Texas
SAS® Software Consultant, 1990-1991, Purdue University, West Lafayette, Indiana
Grader, Graduate Statistics, 1990, Purdue University, West Lafayette, Indiana
Graduate Research Assistant, 1988-1991, Purdue University, West Lafayette, Indiana

Membership

American Society of Agronomy
Crop Science Society of America
Soil Science Society of America
Sigma Xi Scientific Research Society

Honors and Awards Received

Gamma Sigma Delta Honorary Society
Golden Key National Honor Society
Phi Kappa Phi Honorary Society
Sigma Xi Scientific Research Society
American Society of Agronomy Educational Materials Award, 2006
International Minerals Corporation Fellowship, 1992-1995
Gary Fitzgerald Scholarship, Texas Plant Food Institute, 1994
J. Fielding Reed Potash and Phosphate Institute Fellowship, 1992
Graduated with Distinction from Purdue University, 1986
Valedictorian, Twin Lakes High School, 1982
Bausch and Lomb Honorary Science Award, 1982

Scientific Service – ASA-CSSA-SSSA, ICCA

ASA Northcentral Branch, Secretary-Treasurer, 2007-2008 (elected)
ASA Northcentral Branch, President-Elect, 2008-2009 (elected)
ASA Board of Directors, 2006-Present (elected)
ASA Division A9 Board Representative, 2006-Present (elected)
CSSA Editorial Affairs, Policies, & Practices Committee 2003 (appointed)
CSSA Crop Management Editorial Board, 2003 (appointed)
ICCA – Indiana: Board Member, 2005-Present (appointed)
ICCA – Minnesota: Board Member, 2003-Present (appointed)
ICCA – South Dakota: Board Member, 1997-2000 (appointed)

Scientific Service - Other

Co-Chair, IPNI Decision Support Systems for Maize Working Group, 2008-present
(appointed)
Program Committee Member, Northcentral Extension Industry Conference, 2003-2006
(appointed)
Scientific Reviewer, Wisconsin Fertilizer Research Program, 2001, 2002, 2004, 2006
(appointed)
Committee Member, Minnesota Agricultural Nutrient Task Force, 2005 (appointed)
Scientist, Nitrogen Fertilizer Rapid Assessment Program, Scientific Committee on
Problems of the Environment, 2004 (appointed)
Program Committee Member, International Precision Agriculture Conference, 2000,
2002, 2004 (appointed)
Committee Member, Minnesota Crop Production Research Foundation, 2003-4
(appointed)
Program Committee Member, InfoAg Conference, 1999, 2001, 2003 (appointed)
Member, Soil and Plant Analysis Council, 2000-3 (appointed)
Agronomy Society of America Division A9 Annual Meeting Program Committee, 2002
(appointed)
American Chemical Society 1994-1996
Texas Society for Electron Microscopy 1994-1996

Peer-Reviewed Publications

- Chusuei, C.C., T.S. Murrell, J.S. Corneille, M.G. Nooney, S.M. Vesecky, L.R. Hossner, and D.W. Goodman. 1999. Liquid reaction apparatus for surface analysis. *Rev. Sci. Instrum.* 70(5):2462-2464.
- Murrell, T.S. 2008. Measuring nutrient removal, calculating nutrient budgets. p. 159-182. *In* S. Logsdon et al. (ed.) *Soil science: Step-by-step field analysis*. ASA, Madison, WI.
- Murrell, T.S. 2004. Using advanced technologies to refine nitrogen management at the farm scale: A case study from the U.S. Midwest. p. 155-165. *In* A.R. Mosier, K. Syers, and J.R. Freney (eds.) *Agriculture and the nitrogen cycle: Assessing the impacts of fertilizer use on food production and the environment*. SCOPE 65. Island Press, Washington, D.C.
- Murrell, T.S., M.G. Nooney, L.R. Hossner, D.W. Goodman. 1996. Growth kinetics of phosphate films on metal oxide surfaces. p. 71-86. *In* G. Jerkiewicz, M. P. Soriaga, K. Uosaki, and A. Wieckowski (ed.) *Solid-liquid electrochemical interfaces*. ACS Symp. Ser. 656. American Chemical Society, Washington, DC.
- Murrell, T.S., Q.B. Rund, and H.F. Reetz, Jr. 2007. Gleaning more information from yield data. p. 121-140. *In* Pierce, F.J. (ed.) *GIS applications in agriculture*. CRC Press, Boca Raton, FL.
- Nooney, M.G., A. Campbell, T.S. Murrell, X.-F. Lin, L.R. Hossner, C.C. Chusuei, and D.W. Goodman. 1998. Nucleation and growth of phosphate on metal oxide thin films. *Langmuir* 14(10):2750-2755.
- Nooney, M.G., T. S. Murrell, J. S. Corneille, E. I. Rusert, L. R. Hossner, and D. W. Goodman. 1996. A spectroscopic investigation of phosphate adsorption onto iron oxides. *J. Vac. Sci. Tech. A* 14(3):1357-1361.
- Palm, C., P. Machado, T. Mahmood, J. Melillo, T.S. Murrell, J. Nymangara, M. Scholes, E. Sisworo, J. Olesen, J. Pender, J. Stewart, and J. Galloway. 2004. Societal responses to meeting nitrogen input needs. p. 71-89. *In* A.R. Mosier, K. Syers, and J.R. Freney (eds.) *Agriculture and the nitrogen cycle: Assessing the impacts of fertilizer use on food production and the environment*. SCOPE 65. Island Press, Washington, D.C.

Conference Proceedings

- Fixen, P.E. and T.S. Murrell. 2002. Soil test summary and nutrient trends. *In* R. Minks (ed.) *Proc. Annual Soils, Fertilizer and Agricultural Pesticides Short Course and Equipment Exposition, 52nd, Minneapolis, MN. 10-12 Dec. 2002*. Minnesota Crop Production Retailers, St. Paul, MN.
- Murrell, T.S. 2007. The importance of phosphorus placement. *Proc. Crop Production Conf., Columbus, OH. 4 Jan. 2007*. Ohio Agribusiness Association.
- Murrell, T.S. 2005. High-precision guidance systems: Will they change nutrient management practices? *In* R. Minks (ed.) *Proc. Annual Soils, Fertilizer and Agricultural Pesticides Short Course and Equipment Exposition, 55th, Minneapolis, MN. 7-8 Dec. 2005*.
- Murrell, T.S. 2005. Phosphorus and potassium placement in the Midwest: Possibilities with automatic guidance technology. *In* *Proc. North Central Ext. Industry Conf., Des Moines, IA. 16-17 Nov. 2005*. Potash & Phosphate Institute, Brookings, SD.
- Murrell, T.S. 2005. Placement and timing issues for P & K in the eastern Corn Belt. *In* *Proc. Indiana CCA Conf., Indianapolis, IN. 13-14 Dec. 2005*.

- Murrell, T.S. 2003. Analyzing site-specific soil test data to help farmers make management decisions [Online]. Proc. 2003 Wisconsin Fert., Aglime, & Pest Management Conf., Madison, WI. Available at <http://www.soils.wisc.edu/extension/publications/wfapm.htm> (verified 10 Jan. 2004).
- Murrell, T.S. 2001. Returns from P and K inputs [Online]. Proc. 2001 Wisconsin Fert., Aglime, & Pest Management Conf., Madison, WI. Available at <http://www.soils.wisc.edu/extension/publications/wfapm.htm> (verified 10 Jan. 2004).
- Murrell, T.S. 2000. Precision agriculture: What have we learned so far? In R. Minks (ed.) Proc. Annual Soils, Fertilizer and Agricultural Pesticides Short Course and Equipment Exposition, 50th, Minneapolis, MN. 12-14 Dec. 2000. Minnesota Crop Production Retailers, St. Paul, MN.
- Murrell, T.S. 2000. Selling nutrient inputs in today's market [Online]. Proc. 2000 Wisconsin Fert., Aglime, & Pest Management Conf., Madison, WI. Available at <http://www.soils.wisc.edu/extension/publications/wfapm.htm> (verified 10 Jan. 2004).
- Murrell, T.S. 1999. Managing Nutrients for Optimum Crop Yield. Eastern Canada Nutrient Management Workshop, Guelph, Ontario, Canada. 14 July. 1999. Canadian Fertilizer Institute, Ottawa, Ontario, Canada.
- Murrell, T.S. 1999. Selling nutrient inputs in today's market. Proc. Soils, Fert., and Agric. Pesticides Short Course and Equip. Expo., 49th, Minneapolis, MN. 7-9 Dec. 1999. Potash & Phosphate Institute, Norcross, GA.
- Murrell, T.S. 1998. P and K fertilizer economics. Soils, Fertilizer, and Agricultural Pesticides Short Course and Exposition, Minneapolis, MN, 1998, 14 Dec.-15 Dec. 1998.
- Murrell, T.S. 1998. Understanding Fertilizer Economics. *In* Proceedings of the 1999 Wisconsin Fertilizer, Aglime & Pest Management Conference, Madison, WI, January 19-21. University of Wisconsin, Madison, WI.
- Murrell, T.S. and P.E. Fixen. 2004. Why more Midwest K problems in 2003? [Online]. Proc. 2004 Wisconsin Fert., Aglime, & Pest Management Conf., Madison, WI. Available at <http://www.soils.wisc.edu/extension/publications/wfapm.htm> (verified 20 Jan. 2004).
- Murrell, T.S. and D. Frieberg. 1998. Major program profitability trends and findings, 1997. Proc. Iowa Soybean Association's Producer Profitability Conference, Ames, Iowa, 1998.
- Murrell, T.S. and L.J. Murrell. 2004. Nitrogen recommendations based on local databases. Proc. Indiana CCA Conf., Indianapolis, IN. 14-15 Dec. 2004.
- Murrell, T.S., H.F. Reetz, Jr., and Q.B. Rund. 2004. Mapping nutrient budgets within fields [Online]. Proc. ESRI Int. User Conf., 24th, San Diego, CA. 9-13 Aug. 2004. Available at <http://gis.esri.com/library/userconf/proc04/docs/pap1368.pdf> (verified 22 Jul. 2008).
- Murrell, T.S., H.F. Reetz, Jr., and Q.B. Rund. 2003. Using the internet as a dealer information source [Online]. Proc. 2003 Wisconsin Fert., Aglime, & Pest Management Conf., Madison, WI. Available at <http://www.soils.wisc.edu/extension/publications/wfapm.htm> (verified 10 Jan. 2004).
- Murrell, T.S., H.F. Reetz, Jr., Q.B. Rund, and L.J. Murrell. 2003. Using site-specific soil test results to check management practices. Proc. 2003 Southern Plant. Nutr. Conf., Olive Branch, MS. 7-8 Oct. 2003. Univ. of Kentucky, Lexington.

- Murrell, T.S. and Q.B. Rund. Using ArcGIS for yield data analysis [Online]. Proc. ESRI Int. User Conf., 23rd, San Diego, CA. 7-11 Jul. 2003. Available at <http://gis.esri.com/library/userconf/proc03/p0897.pdf> (verified 22 Jul. 2008).
- Murrell, T.S. and R. Vanden Heuvel. 2000. Principles of fertilizer economics: Small grain example. Proc. Great Plains Soil Fertility Conf., Denver, CO. 7-8 March 2000. Potash & Phosphate Institute, Norcross, GA.
- Reetz, H., Q. Rund, and S. Murrell. 2004. GIS in nutrient management: A 21st century paradigm shift. Proc. ESRI Int. User Conf., 24th, San Diego, CA. 9-13 Aug. 2004. Available at www.esri.com (verified 31 May 2005).
- Rund, Q., H. Reetz, and S. Murrell. 2004. ArcGIS for certified crop advisers (CCAs): A training program. Proc. ESRI Int. User Conf., 24th, San Diego, CA. 9-13 Aug. 2004. Available at www.esri.com (verified 31 May 2005).

Decision Support Tools

- Murrell, T.S. 2009. Excel calculator: Estimating yield loss from nutrient rate reductions [online]. Available at <http://www.ipni.net/toolbox> (verified 11 Mar. 2009).
- Murrell, T.S., N. Baxley, and Q.B. Rund. 2009. Nutrient uptake and removal database (NURD) [online]. Available at <http://ipni.net/toolbox> (verified 11 Mar. 2009).
- Murrell, T.S. and K.J. Moore. 2001. Planning and analyzing on-farm experiments with Microsoft Excel 2000: single year, single location [online]. Available at <http://www.ipni.net/toolbox> (verified 11 Mar. 2009).
- Murrell, T.S., H.F. Reetz Jr., L.J. Murrell, and Q.B. Rund. Finding trends in soil test data [online]. Available at <http://www.ipni.net/toolbox> (verified 11 Mar. 2009).
- Murrell, T.S. and Q.B. Rund. 2003. PKalc: Nutrient budget estimator [online]. Available at <http://www.ipni.net/toolbox> (verified 11 Mar. 2009).

Extension Publications

- Bly, A., R.H. Gelderman, J. Gerwing, and T.S. Murrell. 2002. Symptoms associated with potassium deficiency in corn. *Better Crops* 86(3):12-15. Available at <http://www.ppi-ppic.org/bettercrops> (verified 4 Dec. 2006).
- Bruulsema, T.W. and T.S. Murrell. 2008. Corn fertilizer decisions in a high-priced market. *Better Crops* 92(3):16-18. Available online at <http://www.ipni.net/bettercrops> (verified 12 Mar. 2009).
- Bruulsema, T.W. and T.S. Murrell. 2006. Nutrient placement in reduced tillage systems: Considerations [Online]. Available at [http://www.ppi-far.org/ppiweb/ppibase.nsf/\\$webindex/article=F7CCCB EF852571B2004328E08C54B69E](http://www.ppi-far.org/ppiweb/ppibase.nsf/$webindex/article=F7CCCB EF852571B2004328E08C54B69E) (verified 9 Mar. 2007).
- Johnson, J.W., T.S. Murrell, and H.F. Reetz, Jr. 1997. Balanced fertility management: A key to nutrient use efficiency. *Better Crops* 81(2):3-5. Available at <http://www.ppi-ppic.org/bettercrops> (verified 4 Dec. 2006).
- Kastens, T.L., H. Nivens, W.M. Stewart, and T.S. Murrell. 1998. Profitability surveys: Evaluating management factors. *Better Crops* 82:8-10. Available at <http://www.ppi-ppic.org/bettercrops> (verified 4 Dec. 2006).

- Mallarino, A.P., M.U. Haq, and T.S. Murrell. 2005. Early season foliar fertilization of soybeans. *Better Crops* 89(3):11-13. Available at <http://www.ppi-ppic.org/bettercrops> (verified 4 Dec. 2006).
- Mallarino, A.P. and T.S. Murrell. 2004. Detecting phosphorus with plasma emission spectroscopy may require unique field calibration data. *Better Crops* 88(2):12-15. Available at <http://www.ppi-ppic.org/bettercrops> (verified 4 Dec. 2006).
- Mallarino, A.P. and T.S. Murrell. 1998. No-till corn grain yield responses to band applications of potassium. *Better Crops* 82:4-6. Available at <http://www.ppi-ppic.org/bettercrops> (verified 4 Dec. 2006).
- Malzer, G.L., D.J. Mulla, and T.S. Murrell. 1999. Getting specific with site-specific nutrient management. *Site Specific Management Guidelines SSMG-23*. Available at <http://www.ppi-ppic.org/ssmg> (verified 4 Dec. 2006).
- Murrell, T.S. 2009. Chances of losing yield from fertilizer rate reductions. International Plant Nutrition Institute, Norcross, GA. Available at <http://www.ipni.net/fertilizer2009> (verified 12 Mar. 2009).
- Murrell, T.S. 2008. 2007 corn and soybean harvest in the Northcentral region. *Plant Nutr. Today*. Spring 2008, No. 4. Available at <http://www.ipni.net/pnt> (verified 11 Mar. 2009).
- Murrell, T.S. 2008. A soil fertility assessment checklist for Winter. *Plant Nutr. Today*. Winter 2008, No. 4. International Plant Nutrition Institute, Norcross, GA. Available at <http://www.ipni.net/pnt> (verified 11 Mar. 2009).
- Murrell, T.S. 2008. Average nutrient removal rates for crops in the Northcentral region. *Plant Nutr. Today*. Fall 2008, No. 4. Available at <http://www.ipni.net/pnt> (verified 11 Mar. 2009).
- Murrell, T.S. 2008. Keep a log of soil acidity. *Plant Nutr. Today*. Summer 2008, No. 4. Available at <http://www.ipni.net/pnt> (verified 11 Mar. 2009).
- Murrell, T.S. 2006. 2005 corn and soybean nutrient harvest in the Northcentral region. *Agri-Briefs*, Summer 2006, No. 4. Available at [http://www.ppi-far.org/ppiweb/agbrief.nsf/\\$webcontents](http://www.ppi-far.org/ppiweb/agbrief.nsf/$webcontents) (verified 4 Dec. 2006).
- Murrell, T.S. 2007. Biofuels' potential impact on nutrient use in the U.S. *Plant Nutr. Today*. Summer 2007, No. 4. Available at <http://www.ipni.net/pnt> (verified 11 Mar. 2009).
- Murrell, T.S. 2007. Starter fertilizer: Considerations for corn following corn. *Plant Nutr. Today*. Winter 2007, No. 4. Available at <http://www.ipni.net/pnt> (verified 11 Mar. 2009).
- Murrell, T.S. 2007. The 2006 corn and soybean harvest in the Northcentral region. *Plant Nutr. Today*. Spring 2007. International Plant Nutrition Institute, Norcross, GA.
- Murrell, T.S. 2007. The delta yield concept: An update. *Better Crops* 91(3):20-21. Available online at <http://www.ipni.net/bettercrops> (verified 13 Mar. 2009).
- Murrell, T.S. 2006. Coordinate for success. *Agri-Briefs*, Fall 2006, No. 4. Available at [http://www.ppi-far.org/ppiweb/agbrief.nsf/\\$webcontents](http://www.ppi-far.org/ppiweb/agbrief.nsf/$webcontents) (verified 4 Dec. 2006).
- Murrell, T.S. 2006. Fertilizer nitrogen BMPs for corn in the Northcentral region. *Better Crops* 90(2):16-18. Available at <http://www.ppi-ppic.org/bettercrops> (verified 4 Dec. 2006).
- Murrell, T.S. 2006. Northcentral soil test summary: Changes in phosphorus and potassium. *Better Crops* 90(1):14-15.

- Murrell, T.S. 2006. Rooting for starter fertilizer. Agri-Briefs, Spring 2006, No. 4. Available at [http://www.ppi-far.org/ppiweb/agbrief.nsf/\\$webcontents](http://www.ppi-far.org/ppiweb/agbrief.nsf/$webcontents) (verified 4 Dec. 2006).
- Murrell, T.S. 2006. The highs and lows of soil test potassium variability. Agri-Briefs, Winter 2006-7, No. 4. Available at [http://www.ppi-far.org/ppiweb/agbrief.nsf/\\$webcontents](http://www.ppi-far.org/ppiweb/agbrief.nsf/$webcontents) (verified 4 Dec. 2006).
- Murrell, T.S. 2005. Average nutrient removal rates for crops in the Northcentral region. International Plant Nutrition Institute. Available online at <http://www.ipni.net/northcentral/nutrientremoval> (verified 12 Mar. 2009).
- Murrell, T.S. 2005. High fertilizer prices: What do I do? Agri-Briefs, Winter 2005-6, No. 4. Available at [http://www.ppi-far.org/ppiweb/agbrief.nsf/\\$webcontents](http://www.ppi-far.org/ppiweb/agbrief.nsf/$webcontents) (verified 4 Dec. 2006).
- Murrell, T.S. 2005. High fertilizer prices: What do I do? News & Views Sep. 2005. Available at <http://www.ppi-ppic.org/news> (verified 4 Dec. 2006).
- Murrell, T.S. 2005. Northcentral phosphorus and potassium research funded by the foundation for agronomic research (FAR). News & Views Jul. 2005. Available at <http://www.ppi-ppic.org/news> (verified 4 Dec. 2006).
- Murrell, T.S. 2005. Phosphorus and potassium best management practices for soybeans. Agri-Briefs, Fall 2005, No. 4. Available at [http://www.ppi-far.org/ppiweb/agbrief.nsf/\\$webcontents](http://www.ppi-far.org/ppiweb/agbrief.nsf/$webcontents) (verified 4 Dec. 2006).
- Murrell, T.S. 2005. Record yields mean record nutrient removal in corn-soybean rotations. Agri-Briefs, Spring 2005, No. 4. Available at [http://www.ppi-far.org/ppiweb/agbrief.nsf/\\$webcontents](http://www.ppi-far.org/ppiweb/agbrief.nsf/$webcontents) (verified 4 Dec. 2006).
- Murrell, T.S. 2005. Remember 2004 as 2005 crop management plans are finalized. News & Views Mar. 2005. Available at <http://www.ppi-ppic.org/news> (verified 4 Dec. 2006).
- Murrell, T.S. 2005. When scouting for rust, keep an eye on nutrients, too. Agri-Briefs, Summer 2005, No. 4. Available at [http://www.ppi-far.org/ppiweb/agbrief.nsf/\\$webcontents](http://www.ppi-far.org/ppiweb/agbrief.nsf/$webcontents) (verified 4 Dec. 2006).
- Murrell, T.S. 2004. Early growth of corn – is it important? Agri-Briefs, Summer 2004, No. 4. Available at [http://www.ppi-far.org/ppiweb/agbrief.nsf/\\$webcontents](http://www.ppi-far.org/ppiweb/agbrief.nsf/$webcontents) (verified 4 Dec. 2006).
- Murrell, T.S. 2004. Getting more from soil test data. Agri-Briefs, Winter 2004-5, No. 4. Available at [http://www.ppi-far.org/ppiweb/agbrief.nsf/\\$webcontents](http://www.ppi-far.org/ppiweb/agbrief.nsf/$webcontents) (verified 4 Dec. 2006).
- Murrell, T.S. 2004. How important is fertilization when soils test “medium”? [Online]. Available at <http://www.ppi-ppic.org/fallfertilization> (verified 4 Dec. 2006).
- Murrell, T.S. 2004. Northcentral phosphorus and potassium research funded by the foundation for agronomic research (FAR). News & Views Oct. 2004. Available at <http://www.ppi-ppic.org/news> (verified 4 Dec. 2006).
- Murrell, T.S. 2004. Potassium deficiency: Listening to your ears of corn. Agri-Briefs, Fall 2004, No. 4. Available at [http://www.ppi-far.org/ppiweb/agbrief.nsf/\\$webcontents](http://www.ppi-far.org/ppiweb/agbrief.nsf/$webcontents) (verified 4 Dec. 2006).
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- Murrell, T.S. 2003. Agriculture's balancing act. *Better Crops* 87(2):9-11. Available at <http://www.ppi-ppic.org/bettercrops> (verified 4 Dec. 2006).
- Murrell, T.S. 2003. Can your local fertilization programs be improved? *Agri-Briefs*, Fall 2003, No. 4. Available at [http://www.ppi-far.org/ppiweb/agbrief.nsf/\\$webcontents](http://www.ppi-far.org/ppiweb/agbrief.nsf/$webcontents) (verified 4 Dec. 2006).
- Murrell, T.S. 2003. Is your soil fertility program keeping up? *Agri-Briefs*, Spring 2003, No. 4. Available at [http://www.ppi-far.org/ppiweb/agbrief.nsf/\\$webcontents](http://www.ppi-far.org/ppiweb/agbrief.nsf/$webcontents) (verified 4 Dec. 2006).
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- Murrell, T.S. 2003. Target phosphorus this fall [Online]. Available at <http://www.ppi-ppic.org/fallfertilization> (verified 4 Dec. 2006).
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- Murrell, T.S. 2003. What have your phosphorus and potassium soil test levels been doing? *Agri-Briefs*, Summer 2003, No. 4. Available at [http://www.ppi-far.org/ppiweb/agbrief.nsf/\\$webcontents](http://www.ppi-far.org/ppiweb/agbrief.nsf/$webcontents) (verified 4 Dec. 2006).
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- Murrell, T.S. 2002. Early season phosphorus nutrition is important for wheat. *Agri-Briefs*, Fall 2002, No. 3. Available at [http://www.ppi-far.org/ppiweb/agbrief.nsf/\\$webcontents](http://www.ppi-far.org/ppiweb/agbrief.nsf/$webcontents) (verified 4 Dec. 2006).
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- Murrell, T.S. 2001. Phosphorus and potassium are your business partners. *Agri-Briefs*, Fall 2001, No. 4. Available at [http://www.ppi-far.org/ppiweb/agbrief.nsf/\\$webcontents](http://www.ppi-far.org/ppiweb/agbrief.nsf/$webcontents) (verified 4 Dec. 2006).
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